EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT

15th INTERNATIONAL SYMPOSIUM ON THEORY AND PRACTICE IN TRANSPORT ECONOMICS

Key issues for transport beyond 2000

ARISTOTLE UNIVERSITY OF THESSALONIKI
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OECD

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INTRODUCTORY REPORTS AND SUMMARY OF DISCUSSIONS

Thessaloniki, 7-9 June 2000

ECMT

EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT (ECMT)

The European Conference of Ministers of Transport (ECMT) is an inter-governmental organisation established by a Protocol signed in Brussels on 17 October 1953. It is a forum in which Ministers responsible for transport, and more specifically the inland transport sector, can co-operate on policy. Within this forum, Ministers can openly discuss current problems and agree upon joint approaches aimed at improving the utilisation and at ensuring the rational development of European transport systems of international importance.

At present, the ECMT's role primarily consists of:

– helping to create an integrated transport system throughout the enlarged Europe that is economically and technically efficient, meets the highest possible safety and environmental standards and takes full account of the social dimension;
– helping also to build a bridge between the European Union and the rest of the continent at a political level.

The Council of the Conference comprises the Ministers of Transport of 41 full Member countries: Albania, Austria, Azerbaijan, Belarus, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, the Czech Republic, Denmark, Estonia, Federal Republic of Yugoslavia, Finland, France, FYR Macedonia, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Moldova, Netherlands, Norway, Poland, Portugal, Romania, the Russian Federation, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and the United Kingdom. There are six Associate member countries (Australia, Canada, Japan, New Zealand, Republic of Korea and the United States) and two Observer countries (Armenia and Morocco).

A Committee of Deputies, composed of senior civil servants representing Ministers, prepares proposals for consideration by the Council of Ministers. The Committee is assisted by working groups, each of which has a specific mandate.

The issues currently being studied – on which policy decisions by Ministers will be required – include the development and implementation of a pan-European transport policy; the integration of Central and Eastern European Countries into the European transport market; specific issues relating to transport by rail, road and waterway; combined transport; transport and the environment; sustainable urban travel; the social costs of transport; trends in international transport and infrastructure needs; transport for people with mobility handicaps; road safety; traffic management; road traffic information and new communications technologies.

Statistical analyses of trends in traffic and investment are published regularly by the ECMT and provide a clear indication of the situation, on a trimestrial or annual basis, in the transport sector in different European countries.

As part of its research activities, the ECMT holds regular Symposia, Seminars and Round Tables on transport economics issues. Their conclusions serve as a basis for formulating proposals for policy decisions to be submitted to Ministers.

The ECMT's Documentation Service has extensive information available concerning the transport sector. This information is accessible on the ECMT Internet site.

For administrative purposes the ECMT's Secretariat is attached to the Organisation for Economic Co-operation and Development (OECD).

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Mr. George PASHALIDIS
Minister of Macedonia and Thrace

Address by Mr. Jaromir Schling

Ladies and gentlemen,

I am greatly honoured, as Chairman of the ECMT, to open the 15th International Symposium on the subject of "Key Issues for Transport Beyond the Year 2000".

As an important human activity, transportation is at present subject to complex conditions. Society's growing economic potential and higher living standards are generating increased demands for transportation and transport infrastructure. Adequate capacity and the technological parameters of infrastructure are, at the same time, faced with the need to minimise transport's negative impacts, in particular the environmental impacts. Furthermore, such contradictory requirements have to be satisfied while incurring minimal expenditure.

Research and development is one of the main instruments for solving these issues. It is of fundamental importance for a stable and sustainable economic development and it should therefore be of general concern that the flow of know-how from basic research to developments applied to new technologies, competitive products and services, is continuous. R&D has to be supported not only by private but also by public means, notably in the transport sector.

The fields of research and development, science and technological progress cannot be conceived of without international co-operation which facilitates the transfer of results and specialisation in particular issues. In order to support the implementation of its policy recommendations, the ECMT arranges regular round tables, seminars and symposia dealing with questions of transport economics. Their conclusions form part of the information system and serve as a background for government decisions.

From such round tables and seminars important suggestions and ideas arise, which should be taken into account at transport policy decisionmaking level. They are often included on the ECMT Council of Ministers' agendas, as was the case at the last Ministerial meeting in Prague.

Mobility development reflects the economic and social situations of society and its rising living standards. It places higher demands on the satisfaction of individual needs in the transport sector. Such development is closely connected with the increase in negative environmental impacts. At the same time, mobility expressed in travelling time has remained, over the past twenty years, relatively stable. However, journey distances have increased substantially due to the increase in average speeds. The new road infrastructure meets the demand for transportation but generates new traffic. At the same time, half of all journeys by car are shorter than five kilometres. Accordingly, such journeys could be replaced by travel that is more friendly to the environment - by public transport. Experience shows that higher travel standards must be offered for the same price. Consequently, greater interest in public transport may be aroused.

For cities, especially for their commercial and production functions, freight transport is an essential element without which they could not exist. It is necessary to find methods of tackling transport supply which support the revitalisation of business activity in natural city centres. In connection with the minimisation of the negative environmental impacts of transport, a substantive contribution is the establishment of logistic centres and their optimum location within the centre of gravitation of transport. Technological progress in vehicle construction has produced more environment-friendly, quieter vehicles, which enables night-time supplies to business centres. A detailed analysis of specific issues in the field is hindered by a general absence of trustworthy data on freight transport in cities. Such issues should be dealt with at European level.

Another issue is the problem of rail infrastructure user charges. Generally, it can be said that the form of user charges is connected with the method of railway reform. To achieve a European-wide harmonization will be very difficult. The system of charging should support the most efficient use of existing resources. User charges should serve as an instrument for the maintenance and technical modernisation of railways, which is necessary to ensure their competitiveness with other transport modes. The purpose of user charges is to rationalise the use of infrastructure, to support it and adapt it to traffic needs.

Railway infrastructure user charges must be fixed simply, transparently and in a non-discriminatory way. A low charge for the entry of occasional users should be introduced so that they are not hindered in their access to the market and small undertakings are not discriminated against.

The infrastructure manager in a certain monopolistic position must be subject to independent control. Liberalisation must support the entry of new carriers and charges must not favour a particular undertaking at the expense of others.

It appears that in Europe the harmonization of the whole rail network is impossible but that progress may be achieved by establishing priorities. The same structure of charges may be introduced for international freight corridors. This would mean a uniform formula for charges which would lead to the development of international rail transport. The developing Freight Rail Freeways are a good example of this.

Regular bus services form an integral part of the public transportation system. Their operation may be supported as a public interest. The trend is towards service providers using new technologies (Internet, electronic payment) and the whole complex of transport telematics. Services are centralised by using a common terminal and provision to carriers of equal access to the terminal. In this area, government support is sought in the field of taxation, in particular.

The working conditions and regulations relating to professional drivers are also significant themes touching road transport. Research studies show that the fatigue and overburdening experienced by drivers are a consequence of non-regulated working time and night-time journeys. One likely solution is the systematic training of the undertaking's management staff and of entrepreneurs, focusing on compliance with working time regulations and working conditions. Rules need to be laid down and harmonized within the European Union countries, and especially within future candidate countries. Subsequently, the rules will have to be applied in non-EU member countries to entreprises which are, however, business partners and transport service providers.

A need is apparent to harmonize the system of sanctions for not adhering to the working time regulations and working conditions. Attention also needs to be given to new technologies whose utilisation would lead to not only higher safety levels but also to the improvement of drivers’ working conditions.

A substantive problem is the need for national programmes to ensure the stability and continuity of research in the long term. A national programme is of value for the education and preparation of young research workers, training of state administration officials and dissemination of research know-how and results. Such programmes, however, depend on financing from state budgets. In my view, in order to achieve progress, international relations between researchers and political decisionmakers must be considered as a priority. The objective should be the liquidation of barriers between policy and research. It is necessary to create conditions for a direct dialogue between politicians and researchers and to improve the social use of research results.

I am sure that the presentations and discussion to follow will be an important incentive to further work at national and especially international level, with the aim of solving urgent questions in the transport sector. By way of conclusion, I should like to express my thanks to Mr. Christos Verelis, the Minister of Transport of Greece, to the Mayor of the City of Thessaloniki and to all those who have helped to organise this Symposium. By this I declare the 15th Symposium open and I wish you every success with the meeting.

Address by Mr. G. Maniatis, representing Mr. C. Verelis

Minister,
Honoured Guests,
Ladies and Gentlemen,

It is an honour for our country to host the 15th Symposium of the European Conference of Ministers of Transport here in Thessaloniki, and particularly so in view of its theme which offers the prospect of comprehensive and innovative development of the transport sector as we enter the new millennium.

It is also an honour to see the many leading figures from the worlds of politics, learning and transport technology who have come to take part in this Symposium by engaging in a constructive exchange of views regarding the future of the transport sector in Europe and neighbouring areas.

With memories of the recent Ministerial meeting in Prague still fresh in our minds, we are called upon here to discuss ways in which practical policy approaches can be framed once account has been taken of the key parameters that have shaped developments in the transport sector.

With your permission, I would like to focus on those components of Greece's transport policy in the region which are concerned with the physical, institutional and practical measures needed to restore the health and competitiveness of the transport market.

Development of a peripheral infrastructure network in South-East Europe, alongside the Pan-European network, will clearly help to meet the objectives of both the development of peripheral regions and European integration. In view of the worsening conditions in the transport system as a result of the crisis in Yugoslavia, it is now of the utmost importance that these objectives be rapidly met.

The first priority of Greek transport policy is the **development of Pan-European corridors X, IX and IV**.

Pan-European corridor X is the shortest route by road and rail from Greece to the European Union and *vice versa*. Because of this, it is clearly an important link and one which, understandably, Greece, as well as other EU Member States (Austria, Germany), would like to see in place as soon as possible. It cannot be denied that for several decades the lack of such a corridor has helped to fuel growth in traffic flows in a large number of countries whose road networks are far superior to those found in the region today.

Greece, which currently chairs the steering committee for corridor X, has worked tirelessly to secure the development of this corridor and, within the framework of this committee, has set up and provided funding for a technical secretariat designed to provide full support for the activities of the Member States involved in the corridor X project.

Another priority of the Greek Government is the **development of Pan-European corridor IV** (Thessaloniki-Sofia-Vidin-Kalafat-Craiova-Timisoara-Budapest-Germany). This corridor runs through the centre of south-eastern Europe and, once completed, will be able to accommodate growth in traffic flows within the region and, at the same time, provide an alternative route to Pan-European Corridor°X for traffic flows through the region.

With regard to the Adriatic-Black Sea link, Greece, as you probably know, has set itself the goal of completing the **Via Egnatia** as soon as possible and is currently constructing the access roads perpendicular to the Via Egnatia, primarily those connecting it to the neighbouring countries of Albania, FYROM and Bulgaria.

The Via Egnatia, comprising road links, gateways and airports, is **a major infrastructure project which will shortly be completed and which, once operational, will help to improve East-West and particularly North-South traffic flows in the Balkans.**

Corridor IX, linking Alexandroupolis to Helsinki, will help to improve flows towards Eastern Europe and the Black Sea.

At the European Conference recently held in Helsinki, the European Commission introduced the concept of **Pan-European Transport Areas (PETRAs)** into the Pan-European Transport Corridor planning process with a view to examining the entire transport infrastructure in a given region from the standpoint of basic transport transhipment points (sea ports, airports). Greece is actively involved in work on the *Adriatic/Ionian Sea*, *Mediterranean* and *Black Sea* Pan-European Transport Areas, given their distinctive attributes and geographical location, and aims to develop a comprehensive transport sub-system linked to each of the above-mentioned regions which can subsequently be incorporated into the wider Pan-European transport system.

However, owing to the perceived disparities in the planning and development of infrastructure in the countries of South-East Europe, efforts are currently being made at many levels to ensure that needs are properly met. Mention should be made in this respect of the **political rehabilitation of South-East Europe through implementation of the Stability Pact for South-Eastern Europe.**

The obvious lack of the required funding calls for further efforts on the part of the international funding agencies and, in particular, highlights the need to attract private capital by creating a framework in which the risks associated with investment in transport can be reduced.

Obviously when peace eventually returns to the region similar measures will be needed with regard to Yugoslavia to restore cohesion to the region of South-East Europe.

The actions taken by Greece to promote transport infrastructure and the use of infrastructure as an instrument have, as I explained earlier, several different aims, namely to:

1. Achieve a consensus on transport policy;
2. Enhance the role of infrastructure as an instrument for development of the **region as a whole**;
3. End Greece's long history of being a country on the periphery of Europe;
4. Establish Greek enterprises in neighbouring countries where they can contribute to the development of local economies and, in addition, transfer technical know-how;
5. Introduce non-economic measures aimed at streamlining administrative procedures.

On the other hand, it is commonly acknowledged that successful development of a transport system does not depend solely on infrastructure. It is important to ensure that the transport sector is properly organised and regulated in order to remove the administrative and economic impediments to growth and development, since it is well known that operating difficulties of a legal, regulatory and economic nature can lead to distortions in the transport market.

At the initiative of the Ministry of Transport and Communications, on 28 April 1999 the Ministers of Transport of the countries of South East Europe met in Athens to adopt a Memorandum of Understanding aimed at improving international road freight movements in the region.

That initiative led to development of the South-East European Co-operative Initiative (SECI) involving Albania, Bosnia-Herzegovina, Bulgaria, FYROM, Romania, Hungary, Slovenia, Croatia, Moldavia, Greece and Turkey and supported by the USA and the UN/ECE.

This policy has two basic objectives, namely to:

1. Enhance and strengthen regional co-operation in the transport sector between the countries of South-East Europe; and
2. Undertake action to resolve long-standing legal difficulties with a view to facilitating international road haulage movements.

For the above reasons, the Memorandum of Understanding adopted at the meeting sets out policy principles and measures aimed at improving transport movements through the:

1. Phased liberalisation of the road haulage market;
2. Restructuring of the tax and duty systems applicable to international road freight transport to allow the various taxes and duties levied to be used as a support mechanism for the construction and maintenance of the road network;
3. Harmonization of technical regulations relating to maximum permissible weight, size of lorries, etc.
4. Creation of a freight information system on the Internet to provide details of taxes and duties payable on international road haulage shipments, which will be monitored and fully updated on a permanent basis;
5. Creation of a Regional Committee for Road Transport to monitor implementation of the Memorandum and the Multilateral Agreement on Road Transport between the countries participating in the SECI. This Committee has already met twice, which gives some indication of the significant progress that has been made towards implementing the provisions of the Memorandum.

This major initiative will draw attention to the transport sector as a factor in economic co-operation and development in the countries of South-East Europe and, at the same time, to the role played by Greece in promoting peace and productive co-operation among the nations in the region.

Greece has also launched an initiative with regard to the Black Sea, PETRA, by supporting measures aimed at facilitating all modes of transport (road, rail, maritime shipping) and, in particular, at simplifying customs procedures. Greece has drawn up a proposed framework for implementation of this initiative, which draws on the Memorandum of Understanding with regard to co-operation in the transport sector between the countries in the region.

In conclusion, we can say that Greece intends to play a major role in the rehabilitation of the Balkans by drawing upon not only its stability and its economic and social strengths, but also the ongoing development of infrastructure with regard to all the other countries in the region.

With these few thoughts, I wish you all a constructive and fruitful exchange of views and I hope that your stay here in Thessaloniki will be a pleasant one.

Thank you.

Address by Mr. M. Schmid

Future requirements in transport policy from the Austrian point of view

Secretary General,
Dear Colleagues,
Ladies and Gentlemen,

First of all, I would like to extend particular thanks to my Greek colleague, Mr Verelis, for inviting me to the 15th International ECMT Symposium in this beautiful, historical city.

I am also pleased to be able to greet so many eminent transport specialists from the ECMT Member States. Their attendance underlines the importance of the theme this Symposium has to tackle. The specialised reappraisal of the key issues that will confront the transport sector in this millennium is of great interest, especially in the field of transport policy.

Not least because recent years have seen the *Transport sector* develop more and more into a network that inextricably binds different elements – man, environment, economy and technology. And it is precisely these elements that define the area of tension in which transport policy is to be implemented and in which answers and solutions addressing the broadest range of problems are demanded. Because the ideas and goals of each of these areas are often in conflict, it is not always possible to achieve a perfect balance of different interests. But in my view it is the job of policymakers to set clear priorities in such cases and to provide those concerned with honest and clear arguments in support of them. Specialised assistance in producing a sound assessment of the situation is, however, indispensable here and, with this in mind, I would like to take another opportunity to thank you for having organised this Symposium.

In the century that lies ahead, transport will be faced with great challenges. Not only with respect to the forthcoming *consolidation* (key concept: reform of institutions) and *enlargement* of the European Union. Both processes will certainly contribute to a decisive and permanent change in Europe, with developments on the political and economic fronts, and also with the growth of transport infrastructure.

New and, above all, more intensive business transactions lead to a greater need for mobility and an increased demand for transport. This became clear with the emergence of the EU internal market and has been discussed at great length in this framework. Leaving aside the positive effects of transport, in promoting economic prosperity for example, it is a fact that the continuous increase in traffic also brings negative consequences, such as damage to persons (sickness, accidents) and the environment.

If we consider that within the European Union the percentage increase in traffic in recent years has actually outstripped economic growth, then clearly the key to overcoming future traffic problems lies, on the one hand, in decoupling transport intensity from economic growth – on this point I am completely at one with Dr Baum. On the other hand, traffic avoidance and traffic management measures should also be adopted. For it is not only a question of reducing traffic as a whole, given its enormous economic external costs. *Spending on traffic must be managed in such a way as is most sparing of resources.*

Transport policy is also *social policy*: in this connection, the question of the relationship between a basic right to mobility and the corresponding creation of a progressive, sustainable transport system is of central importance to me as a transport policymaker. The basic point is that transport and mobility cannot be pursued at the cost of the quality of life and the essential resources of future generations. Our goal must be to provide for mobility in a way that is consistent with the long-term wellbeing of man and the environment by actively seeking the right transport policy, one that will provide solutions compatible with both objectives. Furthermore, it should be stated at this point that *de facto* we have hardly increased our mobility over the past two decades. Mobility (the number of activities outside the home) has rather tended to remain constant. Only distance (longer) and speed (higher) have changed.

Resolving the conflict between transport and quality of life is one of the most important tasks of modern society. Consequently, people and their needs (good quality of life, unspoilt environment, welfare and mobility) must be central to political action. The transport system should not simply respond to growth in demand; until now transport policy in Europe has mainly been geared to need. Increasing demand has met with expanding infrastructure. An active and successful transport policy must play a formative role in the development of the transport system and demand a general approach to the solution of problems, involving all modes of transport.

It is necessary to optimise the specific advantages of each mode of transport if integrated, efficient, intermodal transport chains are to be established, providing an intelligent way of dealing with traffic. In order to achieve this goal, however, the necessary preconditions for fair competition, both between different modes of transport and within the same transport sector, must be created. It is of crucial importance to establish that the same conditions of competition still obtain, especially between road and rail. This is partly due to the fact that the railways – quite understandably – show little enthusiasm or willingness to change their rigid monopolistic position. The consequences are that in reality there is still no real competition between railways in Europe. Moreover, there is a lack of co-operation on the part of the railways, which is required for a rapid improvement in the quality and reliability of their service. Furthermore, the reform of the railways is only just beginning. Access to the infrastructure by third parties is not enough. The essential requirements, if competition between railways is to become a reality, are genuine interoperability and harmonization of railway regulations. In the road haulage sector it would be inconceivable that there should be a change of driver or traction unit of an articulated lorry at frontiers or that a driver should be required to take an examination on each country's routing arrangements before being allowed entry. But in the railway sector all this "goes without saying" at present.

In justification of the railways, it is only fair to emphasize that they are only partly responsible for the present situation. There is no doubt that the causes of the current lack of competitive conditions can also be attributed to transport policy, which has failed to implement the harmonization and liberalization process for railways at the same pace as for roads. Whereas the roads sector – especially within the EU – is now completely harmonized and liberalized, the rail sector is still at the initial stage of the process. I see a problem here in the fact that the railways – unlike the roads sector, where the process lasted thirty years – must take the necessary steps now, simultaneously and at a much faster pace, if they still want a chance to stop the drift towards a progressive decline in their market share.

One of the great challenges facing future transport policy is therefore to rectify the unfair competition between road and rail resulting from this two-speed approach. This calls in particular for the following measures.

- Establishing true costs;
- Co-ordinating infrastructure planning on the basis of economic efficiency;
- Reducing the burden of transit traffic;
- Transferring traffic by enforcing multimodal transport;
- Further improving technical aspects of environmental and safety standards.

I would like to dwell briefly on the first two points mentioned.

Road freight transport bears neither the infrastructure costs for which it is responsible nor the external costs. Thus every year in Austria costs arising from accidents amount to more than 40 billion Schillings, mainly borne by the general public. Moreover, traffic produces other external costs not borne by those responsible, such as costs arising from noise, damage to the environment and congestion. The toll based on kilometre performance, due to be introduced in Austria in 2002, represents a first concrete step towards the internalisation of infrastructure costs and can also be seen as a measure to promote decoupling as well as transport avoidance and transport management.

When the new Government came to power in Austria, road and rail construction and planning became the joint responsibility of a single department for the first time. I shall use this to have an integrated, multimodal federal infrastructure plan drawn up. It will then be possible to adopt a strategic outlook, to rank traffic infrastructure projects, and to carry out an assessment on the basis of such criteria as social and environmental impact, road safety and feasibility. This will guarantee economic efficiency and thus optimal allocation of – even in Austria – scarce financial resources and ensure that budgetary restrictions are observed. I also believe that there is an urgent need – this is a challenge to our expertise – to move away from the hitherto exclusively territorial cost-benefit assessment to a more global evaluation when considering infrastructure projects. This would lead to different economic calculations and thus to different ways of funding.

At this point I would like to make an appeal to my colleagues to the effect that there should be no repetition of past mistakes while the Union is being enlarged. In particular, this means making the preconditions in the applicant countries – still very favourable as far as railways are concerned (relatively high number of trains in modal split) – even more stringent. This chiefly involves setting a further priority that will encourage the extension of rail infrastructure.

I mentioned at the beginning that expertise was an indispensable aid to policymakers in drawing up and demonstrating possible solutions. In this respect, the ECMT forum and this Symposium in particular offer an ideal platform for discussion of specialised transport issues and policies. For that reason amongst others, and because of the impressive number of full Members, the ECMT now plays a very important role in giving a new impetus to pan-European transport policy.

On this note, I would like to wish the 15th Symposium, its organisers, and you, Ladies and Gentlemen, a most successful future. Thank you for your attention.

Address by Mr. G. Aurbach

Ministers,
Colleagues,
Ladies and Gentlemen,

With the opening of its 15th International Symposium on Theory and Practice in Transport Economics, the ECMT is continuing a tradition that goes back 35 years, to 1965, when it held its first such Symposium in Strasbourg. That Symposium marked the beginning of all our Conference's research activities and was, in those days, a unique forum for discussions between policymakers, professionals and researchers in the transport sector.

After a commitment of thirty-five years to transport economics research, the scientific basis of its policy activities, the ECMT can no longer claim to be the only body allocating a share of its resources to transport economics research. Numerous conferences on transport economics research are now held in Europe and throughout the world. So, why keep on holding a Symposium every three years as well as Round Tables and Research Seminars?

The first reason that comes to mind is that symposia are events at which all of the stakeholders in the transport sector – academics, policymakers, employee representatives, transport authorities, government administrations and international bodies – gather to exchange ideas on research and take part in discussions centring on key issues for the future of transport that are currently the focus of intense debate. This is reflected in the main theme of this Symposium, "Key Issues for Transport Beyond 2000", and in the topics that have been selected for the working sessions.

The second reason is something that makes the ECMT's symposia unique among most other congresses on transport research economics, and that is its policy of putting discussion among participants first. While at most congresses, participants have hardly any opportunity to contribute to discussions and have to confine themselves to just sitting and listening to a series of oral presentations of which they have received no copy, the introductory reports for our symposia are primarily designed as a starting point for discussion. This policy of putting the exchange of views by participants first is reflected in our practice of circulating the papers to be presented at the symposium to all participants several weeks in advance. This means that we can limit the formal presentation of the reports by their authors to the strict minimum. It is also reflected by the fact that there are no parallel sessions and that discussions are systematically arranged as part of the plenary sessions, with a view to creating a more "informal" atmosphere and, if I may say so, a symbiosis between participants. All of this gives the Symposium a genuinely different atmosphere, to which the numerous social events arranged by our generous hosts also contribute. I should also mention one last thing that helps to make these symposia unique, particularly compared with all the largely commercial events – which is our policy of keeping registration fees low. Again, this was made possible by substantial contributions from the local organisers and has undoubtedly made it easier for representatives from all over Europe, including our new Member countries, to attend, ensuring a broad-based audience.

Another reason that the ECMT continues this tradition as the basis of its research activities, is that it draws on its symposia for the best innovative ideas that fuel its policy activities. Research steers policy activities along the optimal path, to use an analogy borrowed from economics. Research invariably switches on the "hazard warning lights" and gets policymakers' attention. It can establish what steps are necessary to improve the situation. Of course, there are often different schools of thought in research, but it seems that the differences are being resolved now and that some "watchwords", such as sustainability, efficiency and equity, are no longer in question. I would just add that these are the topics for the final Round Table that will close your discussions.

Before then – while I am on the subject of the agenda for the Symposium – at your first working session you will be discussing the basic inputs for both policy work and research work: data collection and scenario design. Next, you will be addressing technological change – arguably the future is wide open in this field – and the economic and institutional changes that will be needed to support the "new economy" that is now emerging. This new economy looks set to do away with borders or, at any rate, to make distances irrelevant. This is precisely the issue that you will be examining during the third working session. How can we ensure that the same values operate throughout Europe and that all of Europe benefits equally from the gains of economic growth? A very challenging topic, this one. Through the ideas it generates, this Symposium should help us to make the transition to the new millennium.

Before you begin your discussions this afternoon, there is one more duty that it is my honour and my great pleasure to perform and that is to convey the thanks of the Secretariat to all those who have supported this Symposium, ensured its standing and smooth functioning. My thanks, first and foremost, to our host country for this Symposium and, of course, to you Minister, for paying us the great honour of attending, and to all your staff at the Ministry. My special thanks to the Steering Committee team and to the staff of the Aristotelian University of Thessaloniki, for their hospitality and all of the events that they have laid on for us. They proposed this Symposium and played a large part in organising it. I would also like to thank all of those who will be taking a more active part in the Symposium: the panel chairmen and members and the rapporteurs and, lastly, all of you for doing us the great honour of attending. Together, I am certain that you will make this Symposium a success.

With these closing remarks, it only remains for me to thank you for your attention.

Address by Mr. M. Papadopoulos

Dear Ministers,
Dear Participants,
Ladies and Gentlemen,

It is my great pleasure, as Rector of the Aristotle University of Thessaloniki, to welcome the 15th International Symposium of the European Conference of Ministers of Transport (ECMT). This prestigious Symposium, which takes place every three years, has become a reference point for transport economists, planners, engineers and policymakers alike, due to the high quality not only of the documents presented and the discussions, but also of the resulting recommendations.

I believe that what makes the ECMT's symposia unique in their field is the very nature of the Conference itself, as it combines the active participation of policymakers and day-to-day (transport) system managers with academic and research community work. This mix of well-documented and substantiated research work, carried out by the ECMT's Economic Research Division, and the policy formulation and orientation work elaborated in the Council of Ministers' or their Deputies' meetings, has produced a number of important Resolutions and other documents which have undoubtedly benefited European transport over the last 47 years of the ECMT's life.

For us here in Greece, during the years of the cold war and before our accession to the then European Community, the ECMT provided a vital forum for co-operation and understanding with our neighbouring countries who, at the time, belonged to a completely different world. At the same time, we could discuss solutions to our problems of regional isolation and find answers in ECMT Resolutions such as those concerning transport in transit, etc. More recently, when eastern Europe changed its economic and political orientation and started the process of integration with the rest of the European family, the ECMT was also there to play a vital role in helping those countries in transition to change their structures and transport organisation so that they could successfully compete, and modernise their infrastructure. Again, Greece -- which had by then become a full Member of the European Union and was suddenly in the centre of developments in this area of Europe -- found in the ECMT, with its extended membership of 39 nations, the proper forum to foster new links and co-operation in the field of transport.

It is not the first time that the Aristotle University has hosted an ECMT function. In 1980, an ECMT International Round Table was hosted here for two days, organised by our Transport Section in the Civil Engineering Department. Also, for two substantial periods, one in 1975-81 and at the present time, Professors from our University have held the position of ECMT Deputy to the Greek Minister of Transport.

This year's Symposium coincides with the turn of a century and a new millennium. There is something mystical about the year 2000. For many years now, we have referred to it with awe as both a deadline and a beginning for new things to come, for new ideas and technologies to take root. So now that we are on the brink of the 21st century, I find the subject of this Symposium particularly apt and rewarding for those who will attend: "Key Issues for Transport Beyond 2000" ... and what could provide a more appropriate forum for such discussions than the ECMT?

I am therefore fully confident that the results of your deliberations in this Conference will be very positive and long-lasting. I am sure that they will further enlighten transport policymakers to promote a coherent, common transport policy covering all the European countries.

On behalf of the Aristotle University and the Organising Committee, I extend to you once again our warmest welcome, and I thank you for choosing Thessaloniki and this University for such an important event. I also wish you the best of success in your work and a happy stay in our city and country.

Address by Mr. V. Papageorgopoulos

Ladies and Gentlemen,

It gives us immense joy and pleasure to welcome you here to Thessaloniki, a city at the crossroads of many different peoples down through the ages, three continents and countless hopes, here where the European North meets the Mediterranean South; honoured delegates and distinguished rapporteurs to the 15th International Symposium of the European Conference of Ministers of Transport, the City of Thessaloniki bids you welcome.

The Conference's decision to hold its 15th International Symposium in Thessaloniki underlines not only the historical importance of our city but also, and more particularly, its geographically and economically strategic location and the promising outlook for the role that our city will be called upon to play in the region as a whole as we stand on the threshold of a new era, the dawn of a new millennium.

We know that in this new environment the challenges facing the international transport sector are as enormous as they are pressing.

The answer to the economic development of Europe and its partners is to build theoretical analytical models and to adopt a far-sighted strategy towards the practical measures needed to organise and modernise the transport sector to ensure that progress in terms of the quality, safety and efficiency of transport networks is made by great leaps forward rather than incrementally.

The International Symposium organised by the Conference is an influential event which every three years gains greater breadth and which, by opening new chapters in collaboration and constructive dialogue, provides support for development both within and outside the European arena.

Together with the other important events and activities due to be held in our city this year, I am sure that the work of the Conference during its stay in Thessaloniki will send out positive signals and prove of value to each and every one of you, to all Europeans and not just those living in cities who have high expectations of their Ministers of Transport and of their collaboration, co-operation and deliberations.

We are pleased to have an opportunity to show that Thessaloniki has the ability to meet the challenges of peace and enter the front line of the peace process as an urban centre which, by virtue of its geographical location, historical development, culture and spirit, is close to the other countries in the Balkans.

Thessaloniki in the 21st century is not simply a crossroads for flows of goods in transit, telecommunications, energy and tourists, but also for other vectors of development such as new technology and economic and financial networks.

Thessaloniki is building bridges of friendship and co-operation designed not only to capitalise on its position, role and lengthy experience, but also and above all to enhance its future prospects of becoming a port that will promote the development of South-East Europe as a whole.

Obviously, we are talking here about a city which offers the possibility of such encounters, and in particular a city which, by building on its results, can provide added value.

The laudable initiative taken by the Aristotle University of Thessaloniki in offering to host this Symposium shows that the forces which will eventually emerge as the leading actors on this new stage will be transport operators and citizens, as well as local communities and their relevant departments, provided that the authorities are prepared to trust and make full use of them.

The municipality of Thessaloniki supports innovative projects and has already started work on a project that is both beneficial and effective; a project as bold and visionary as this is not only worthwhile but also needed and merited by our city.

For that reason, we have given our fullest support to the organisers of this Symposium out of our firm conviction that our city can make a substantial contribution to meeting the Conference's objective, namely, to give renewed impetus to the transport sector, with the aim of improving services, through the provision of infrastructure that is disruptive neither to man nor the environment.

For the same reason we have planned our projects in stages in order to accommodate the wider problem with traffic flows in our region.

We are moving ahead with our own projects while at the same time lobbying for implementation of other major projects which we hope will lighten the burden on the inhabitants of Thessaloniki and on visitors to our city, projects ranging from the Athens/Thessaloniki/Black Sea highway and the Via Egnatia, to the METRO, sub-sea traffic artery, large-scale network of car parks, etc.

We are working to build a new European gateway that will be part of your overall transport plan, a dynamic and successful European springboard in which an autonomous local government will be in the vanguard of an indispensable joint undertaking.

The task for all of us, as part of our efforts to foster co-operation between nations, peripheral regions in Europe, cities, transport operators and citizens, must be to promote friendship, trust and progress.

The city of Thessaloniki, which will be your home for the next three days, guarantees you that this joint endeavour will be crowned with success.

I sincerely wish you every success in your discussions and the strength and resolve with which to meet your objectives and continue to make further progress.

Address by Mr. G. Pashalidis

Ladies and Gentlemen,

As is the case with all complex systems, the transport sector presents an inherent contradiction. Its development constitutes a prerequisite for any modern competitive economy, but the costs involved in its development are invariably high.

New technologies, however, can provide efficient and rational management for this system.

The "Key Issues for Transport Beyond 2000" on which this Symposium will focus, along with its very timing at the beginning of the new millennium, increase our expectations in this direction.

Developing a regional transport infrastructure network in the southern Balkans that will be compatible with the Trans-European Networks will contribute towards achieving regional development as well as European integration targets. Developing such a network has become imperative because of the deterioration in transport systems caused by the war in Yugoslavia.

Results to this day can be considered satisfactory: I could mention that Trans-European Transport Network in the European Union, the ten European Corridors, the Areas of European Interest (PETRAs) proposed at the European Transport Conferences of Crete and Helsinki, the TRACECA project, the planned ring road around the Black Sea (as formulated at a meeting of experts from the Black Sea Economic Co-operation Council in Athens in April 1996) and finally the South-Eastern Europe Co-operation Initiative (SECI).

Of particular importance in linking up existing and planned transport infrastructure are two road axes within the Trans-European Transport Network which have been designated as high priority projects. They are the PATHE Motorway linking the port of Patras in south-western Greece with Thessaloniki and the border to FYROM; and the Via Egnatia, whose construction is currently being completed.

This latter axis can provide a useful linking up of the Black Sea region with Italy and western and central Europe.

One should also underscore the fact that road infrastructure in Greece offers the added advantage of linking up major and fully modern ports such as Alexandroupolis, Kavala and Thessaloniki in northern Greece, Igoumenitsa and Patras in western Greece, Volos in central Greece and the Port of Piraeus.

These ports, together with the Port of Iraklion on the Isle of Crete, offer possibilities for combined transport and links with all points in the Mediterranean.

However, the development of transport infrastructure alone would make no sense if it were not put to intelligent use by the parties concerned.

Thank you.

INTRODUCTORY REPORTS

Topic 1

SCENARIOS, FORECASTS AND DATA COLLECTION: EXPERIENCE AND PROSPECTS

a) Scenarios, forecasts: Experience and prospects

PAN-EUROPEAN BORDER CROSSING TRANSPORT

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SUMMARY

Sandvika, August 1999

1. MORE COUNTRIES AND LESS DATA

Data on cross-border transport on a comprehensive Pan-European scale are hard to come by. Moreover, as past data tend to lag so far behind the current year, their significance for policy orientation, scenarios and forecasting may be very limited.

This report aims to:

- Put forward consistent and persuasive arguments in favour of a concerted action by ECMT Member countries to produce pan-European origin/destination (O/D) matrices by transport mode for some selected reference years in the past,

- Propose some methods to bring reference matrices as close to the current year as possible,

- Present tentative O/D matrices for border-crossing goods and passenger transport in Europe, both for some past and future years and discuss the development patterns which the matrices disclose.

For various policy reasons several European countries try to curb transport growth. Normally this does not pertain to international trade, transport and tourism. On the contrary, policies such as the creation of the Single Market in the European Union (EU) from 1993 aim to stimulate international exchange and thereby hopefully accelerate growth rates in the economy of European countries and as a consequence increase transport volumes.

Given this situation one might have expected that consistent statistical information on international transport, such as O/D matrices, would be produced on a regular base by international organisations based on national contributions. However, it is sad to say that this is not the case, and there are obvious reasons why this is so.

Up to the end of the eighties there were 19 Member countries in the ECMT. The fall of the Iron Curtain in 1989 created a completely new situation. In 1999 the ECMT comprised 39 full Member countries. Quite a number of the new Member countries have no tradition of producing transport statistics on a comprehensive, consistent and regular scale. Such a tradition would in normal situations take some years to establish. In this respect the nineties have been far from normal.

The breaking up of the former Soviet Union, the reunion of Germany, the partition of Czechoslovakia and the dismemberment of Yugoslavia have created enormous problems of data compilation, for both the consistency in past time series and current comprehensiveness. The Single Market since 1993 has led to the scrapping of previous routines and traditions of collecting international transport data. The scale of data compilation has been reduced. Then there is the disturbing fact that enterprises more and more tend to consider transport data as sensitive in a commercial sense and are less willing to provide transport data even for statistical purposes.

It seems that transport statistics have been particularly vulnerable to the impact of the changes described above both in terms of data quantity and quality. This is a problem if transport planning and policy is to be reliable.

However, if the task of relevant data compilation is given sufficient priority in an international organisation and its member countries, it is surprising what results concerted actions can produce. The recent publication by ECMT (1999), *Investment in Transport Infrastructure 1985-1995*, testifies to this. The publication presents consistent investment data for 18 old Member countries (Yugoslavia was a member in the eighties, but is not a member any more) and 11 new Member countries. At the time when the publication was in planning, there were 33 contact addresses in the ECMT files.

It is surprising that in the Framework Programmes of the EU no substantial research has been devoted to creating Pan-European O/D matrices by transport modes taking into consideration the significance put on the Trans-European Transport Network (TEN-T). The European Council is regularly briefed on the development of TENT-T, see as an example *Trans-European Transport Network. Fact sheets. State of progress of the 14 priority projects*, presented to the Council meeting in Cardiff, June 1998.

In the Fourth Framework Programme one of the RTD (Research and Technical Development) projects, INFOSTAT, produced what has now become known as ETIS (European Transport Policy Information System). In INFOSTAT (1998), *Final Report for Publication*, indicators and variables are presented in a systematic way relevant for planning and policy issues. Under the heading of Passenger transport demand indicators is found *"Total annual interzonal passenger transport flow by trip purpose, mode (or combination of modes) and type of trip chain."* Similarly under the heading of "Goods transport demand indicators" is found *"Total annual interzonal goods transport flow by commodity group, mode (or combination of modes) and type of transport chain."* Both indicator groups are to be specified on a relevant O/D base and have been given the highest priority (Fundamental in the terminology of the Report).

The high priority put on O/D based transport concepts is closely linked to transport planning needs. In the comprehensive and integrated four-stage transport-planning model the two first stages deal with transport generation/attraction and its distribution between zones before transport mode distribution and transport route assignment are treated.

In the meantime while we wait for ETIS to materialise, comprehensive international transport planning employing some form of a four-stage-transport model must assemble the necessary O/D data more or less from scratch each time. This is both a costly and time-consuming process that could have been substantially eased by the availability of some basic matrices at a reasonable geographic specification level.

One might be tempted to sum up the current data situation in the following way:

The need for relevant international transport O/D data is steadily increasing both for scientific and for policy purposes, but at the same time the relevant database is rotting away.

2. CONCEPTUAL ISSUES

ECMT regularly publishes elements of O/D matrices for goods transport between Member countries with the help of national correspondents. They give information on elements in O/D matrices on a country to country level. In the context of this report this is what is meant by Pan-European border crossing transport. In matrices and surveys the concept Inter-European is used in the same way.

National correspondents to the ECMT database report both tonnes received from each of the other Member countries and tonnes sent to each of the other Member countries by transport mode. Therefore two sets of O/D matrices can be established, one from the goods loaded point of view and one from the goods unloaded point of view. Although the two data sets are concerned with the same reality, there are for some countries traditionally great differences between the two approaches. The need for transit and transport chains represents a main source for differences between the two sets of matrices by transport mode. Often such complicated transport is necessary for landlocked countries. Then there might exist peculiarities in the reporting system of the various countries.

Correspondents are requested to base their reports on trade data, but if no such data exist, then transport data are to be used. In some cases the secretariat of the ECMT estimates matrix elements. There are gaps preventing any smooth registration of complete O/D matrices by all ECMT Member countries and transport modes. Some sort of guesswork and interpolation between known data is still called for. This has also been done in the present report.

The comprehensiveness of reporting differs by transport mode. For this reason the following strategy for goods transport was adopted:

- O/D matrices by rail and inland waterways have been calculated according to goods unloaded;
- O/D matrices by road and short sea shipping have been calculated according to goods loaded.

Air freight and transport in pipelines are left out, and this is also the case for those data that ECMT reports in the current publication *Statistical Trends in Transport,* and denotes as international transport of wagons and accompanied or unaccompanied road freight vehicles by maritime vessels.

It is not obvious how much double counting will be made if rail wagon transport and road vehicle transport by ferries (roll on-roll off, ro/ro) were included as a separate or additional transport mode. These data reported to the ECMT are also very far from being complete and have therefore been left out in the present report. However, some estimates of probable magnitude are given in the next chapter.

Data on O/D reported to the ECMT is equivalent to the sum of all commodities measured by tonnage (tonnes). Transport work (tonne kilometres), traffic work (vehicle kilometres) and flow data measured in value terms are not available.

With the advent of the Single Market in the European Union (EU) from 1993, the old registration system for foreign trade between Member States of the EU was abolished. Previously all transactions in international trade were reported. From 1993 this is not the case any more. Trade with third countries is, however, registered in the same manner as before. From 1993 even more fundamental changes took place, so that in principle data before and after 1992 are not fully comparable.

The following information is based on Danish foreign trade and publications from Statistics Denmark.

The new registration system - INTRASTAT - is based on samples drawn from a list of major exporters and importers. Every month only a sample of firms reports foreign trade transactions instead of as before all the firms doing international trade transactions. Less information is also compiled in INTRASTAT compared to earlier procedures. Intra-EU trade then suffers from the same problems of quality, scope and scale as domestic transport estimates based on sample surveys. According to Statistics Denmark the quality of data compiled deteriorated as a consequence of this. Some statistical data have also disappeared, in particular data relating to transport statistics.

Basic concepts have changed so that now re-export might be registered in line with goods originating in the country. Separate information on the volume of re-export might not be available any more. The concept *country of origin* must then be replaced by the concept *country of dispatch*. Therefore the usual (previous) distinction of origin/destination no longer seems tenable. For simplicity the denomination O/D is kept in this report, but now in a somewhat new context.

The implications of the conceptual change may be substantial in the case of countries with the potential for much international transit transport such as the Netherlands with overseas trade volumes transhipped at main ports and airports.

According to Statistics Denmark the Single Market may come to have profound influence on trade patterns as it can be expected that imported goods from third countries will be dispatched to those countries with the most efficient customs clearance for later re-export to other countries in the EU. Statistics Denmark maintained that already in 1993 goods from overseas were imported to Denmark as imports from EU countries with major ports, e.g. Belgium, Germany and the Netherlands. Statistics Denmark also points to a neighbouring country effect. Goods from a third country such as Norway may be exported to Denmark to be cleared from Denmark to other EU countries.

All in all, Statistics Denmark found that the value of imports would have increased by 3 per cent and the value of exports by 4 per cent for 1992 if the new reporting system had been implemented for that year instead of 1993.

In the nineties we are witnessing global reorganisation of trade and economic activities on a scale and speed not observed before. Production process integration across national borders and continents has become commonplace. The assembly industry such as the motor car industry, uses components from all over the world based on complex company and logistics strategies. Therefore, O/D matrices do not have the same stable contents and patterns as before.

Foreign trade and transport statistics are based on the transport mode passing the border. This fact creates several statistical problems. An example: Some 15 million tonnes of iron ore are annually transported on the railway line from Sweden to the port of Narvik in North Norway to be transhipped there and sent to e.g. Germany by ship. According to Swedish foreign trade statistics such an export transaction is treated as export by rail to Germany, but according to German import statistics the iron ore arrives on ship. Only transport chain statistics can solve this kind of problem, but today no such transport statistics exists. In this report a compromise was employed, reporting this export transaction as rail based by specifying it as an O/D between Sweden and Norway.

The total transport chain may not be known to the transacting parties. If goods are sold FOB (free on board) and the chain is complex, the seller will have only limited knowledge of the total chain. The same may apply to the buyer if transaction is carried out on a CIF (cost, insurance, freight) base. Transport may even be carried out by intermodal transport organisers without this fact being known either to the seller or the buyer. Goods in swap bodies may be taken by truck to a port, loaded on to a ferry, unloaded at the port of call and taken to the destination by another truck. Therefore, there is no easy solution to the problem about how to treat the case of seller and buyer reporting different transport modes for the same foreign trade transaction.

Foreign trade statistics report net weight while transport statistics report gross weight, which includes tare weight. The weight might even be measured on a gross-gross base, which means that e.g. a road vehicle carrying goods in a container on a ferry will be measured with its total weight. Probably the end result in international transport statistics is a mixture.

In the report volumes by each specified transport mode have been summed to give an estimate for all modes. No specification for commodity groups is presented. In principle it is a single mode approach. No estimates of the scale of intermodal transport or transport chains are presented.

Intermodal transport can be given various interpretations. The definition given by Eurostat, UN/ECE, ECMT (1998) in the *Glossary for Transport Statistics Second edition* is *"Movement of goods (in one and the same loading unit or a vehicle) by successive modes of transport without handling of the goods themselves when changing modes."* The authors of this report did not come across comprehensive and consistent Pan-European O/D matrices on intermodal goods transport.

For Pan-European passenger O/D vastly fewer data exist than for goods transport. So far, astonishingly little international research and technical development (RTD) seems to have been devoted to producing such data. One project within the EU Fourth Framework Programme (MYSTIC) is currently trying to come up with proposals for a methodology that will enable international organisations to produce some relevant O/D matrices in the future. The prospect of seeing Pan-European passenger O/D matrices for all transport modes in a foreseeable future looks very bleak indeed. In this document matrices for railway passenger transport are presented and some possible alternatives for progress in the subject matter are discussed.

The introduction of the single market from 1993 created a breach in time series on foreign trade between the EU Member States.

3. PAN-EUROPEAN BORDER CROSSING GOODS TRANSPORT

The ECMT has regularly updated its information on elements of Pan-European O/D flows. At intervals older data have been revised. In a publication the author of this report has made for Agder Research Foundation for the Fourth Framework RTD project INFOSTAT *(International Intra-European Goods Transport*, June 1997) O/D matrices were presented for the years 1989-1992. Since then ECMT has published O/D flow elements up to 1994 and revised data back to 1992. At the time of preparing this presentation to the 15th ECMT symposium (summer 1999*) Statistical Trends in Transport 1965-1994* was still the most recent document available. Some method enabling the updating of past matrices to a more current year is evidently called for.

The Agder report is, as far as 1992 matrices are concerned, based on preliminary data from ECMT. These data have been revised for this presentation by the use of *Statistical Trends in Transport 1965-1994.* It was found that changes have been very moderate and this lends credit to the stability of the reporting system. The overall change for the intra-EEA, CH area (European Economic Area and Switzerland) has been (per cent change in most recent data as compared with previous data):

Rail	- 2.4
Inland waterways	+ 0.3
Road	+ 0.7
Short sea shipping	+ 2.1
All goods transport	+ 0.8

To obtain an estimate of ro/ro and rail wagon ferry transport ECMT transport flow data have been used to estimate as far as possible Pan-European O/D matrices by such ferry transport for 1992. Intra-EEA ro/ro ferry transport accounted for 11-12 per cent of intra-EEA, CH road goods transport that year and intra-EEA rail wagon transport by ferries accounted for 7 per cent of intra-EEA, CH rail goods transport. Such transport has consequently some volume and should not be neglected. However, it has not, for this report, been possible to include such transport in addition to the other O/D flows.

Although O/D data from countries within EU have lost some of their reliability with the creation of the Single Market in 1993, the case is not so for the other ECMT Member countries. Therefore, Pan-European goods transport O/D matrices by transport mode have also been made for 1994 by the author of this report for the EU RTD project MYSTIC. So all in all there are matrices approximating Pan-European border crossing goods transport for the years 1989, 1990, 1991, 1992 and 1994. The adjustments and additions that have to be made to the original ECMT data are not commented upon in this report.

To produce matrices for a more recent year than 1994 there is need for some method for producing synthetic information. The following procedure has been adopted for this report:

1. Foreign trade (exports and imports) in each country measured in tonnes are assumed to be closely related to gross domestic product (GDP) of the country. At the time of writing this report, only GDP data information for 1997 was available and the year 1997 was therefore selected for this report. The procedure has created row and column sums by country (vectors) for 1997.

2. Row and column sums in each of the 1994 transport mode matrices have been extrapolated to 1997 by the observed tendencies between 1991 and 1994. This assumption has made possible the establishment of row and column vectors for 1997.

3. In principle each matrix element in the 1994 matrices have been adjusted to the new 1997 sum constraints. The adjustment procedures can be quite lengthy, but for this report simplified procedures were adopted since the exercise has an exploratory purpose.

4. Finally the sum of the transport mode matrices from stages 2 and 3 was compared with the matrix produced on the basis of the assumed relationship between foreign trade and GDP of a country (stage 1). Another iteration can harmonise data from the two procedures. For this report the overall fit was found so close that no such iteration was carried out.

Of course, other methods for calculating O/D matrices exist, all depending on the problems at hand and available statistical information. We may refer to the *OD-ESTIM Final Report for Publication*. The procedures described above may be reasonable alternatives to bring matrices close to the current year.

In the appendix the 1997 matrices presented are the result of steps 2 and 3 described above. The export and import volumes per million GDP are presented below. Data for 1997 are implicit according to stages 2 and 3 described above. Data for 2010 are commented upon in chapter 5. The country abbreviations are those normally used. ECU means the European Currency Unit. The appendix shows how many countries are included in the summations.

	Export volume 1) in relation to Gross Domestic Product (GDP). Tonnes per million GDP (ECU, 1995 prices and exchange rates)				Import volume 2) in relation to Gross Domestic Product (GDP). Tonnes per million GDP (ECU, 1995 prices and exchange rates)			
	1989	**1991**	**1992**	**1994**	**1989**	**1991**	**1992**	**1994**
A	133	136	127	145	181	216	225	217
B,L	737	693	792	785	707	723	693	724
CH	42	52	52	49	151	144	141	139
D	126	115	115	119	151	159	170	176
DK	165	183	198	229	253	250	258	297
F	132	120	125	128	128	129	134	139
FIN	228	280	305	356	253	231	239	283
GR	147	86	82	76	118	136	152	159
I	71	73	73	79	105	108	118	130
N	657	790	875	959	390	309	311	331
NL	898	881	848	840	613	589	570	549
P,E	90	96	98	101	98	113	125	134
S	295	286	299	354	249	232	238	288
IRL,UK	124	155	157	173	179	165	165	177
EEA, CH	**183**	**183**	**189**	**199**	**189**	**190**	**196**	**205**

1) Export volumes from EEA, CH countries to both EEA, CH countries and CEEC countries.

2) Import volumes to EEA, CH countries from both EEA, CH countries and CEEC countries.

	Export volume 1) in relation to Gross Domestic Product (GDP). Tonnes per million GDP, (ECU, 1994 prices and exchange rates)			Import volume 2) in relation to Gross Domestic Product (GDP). Tonnes per million GDP, (ECU, 1994 prices and exchange rates)		
	1994	**1997**	**2010**	**1994**	**1997**	**2010**
A	155	161	194	232	234	250
B,L	819	841	877	755	716	723
CH	52	49	50	148	139	134
CZ	1 196	1 409	1 441	949	985	971
D	125	126	131	185	195	226
DK	240	267	305	312	339	371
F	132	136	158	142	151	153
FIN	396	386	427	315	313	312
GR	79	86	104	165	170	190
H	342	373	446	353	522	508
HR	370	360	374	207	202	207
I	74	85	103	123	146	187
N	1 002	1 086	1 080	346	355	380
NL	881	818	831	575	537	507
P,E	105	106	122	139	148	176
PL	663	620	588	280	320	340
RO,MD	258	305	326	120	116	139
S	363	399	506	295	337	387
SK	1 364	1 463	1 497	1 052	1 046	1 013
SLO	645	689	703	500	438	478
TR	79	95	115	133	145	166
IRL,UK	165	187	208	170	188	222
EEA, CH	**202**	**213**	**236**	**208**	**219**	**244**
CEEC	**450**	**470**	**484**	**319**	**341**	**358**

1) Export volumes from each country to both EEA, CH countries and CEEC countries.
2) Import volumes to each country from both EEA, CH countries and CEEC countries.

GDP data for the years 1989-1995 have been taken from the ECMT publication **Investment in Transport Infrastructure 1985-1995,** table 8.3a. Data for 1997 have been extrapolated from statistics published by IMF (International Monetary Fund) and have been linked to GDP data for 1994 according to the ECMT publication.

To highlight implications of the matrix calculations for the years 1989, 1990, 1991, 1992, 1994 and 1997 tonnes have been summed to four levels and presented below:

- Intra-EEA, CH area;
- Intra-CEEC (Central and Eastern European countries);
- Deliveries from EEA, CH to CEEC;
- Deliveries from CEEC to EEA, CH.

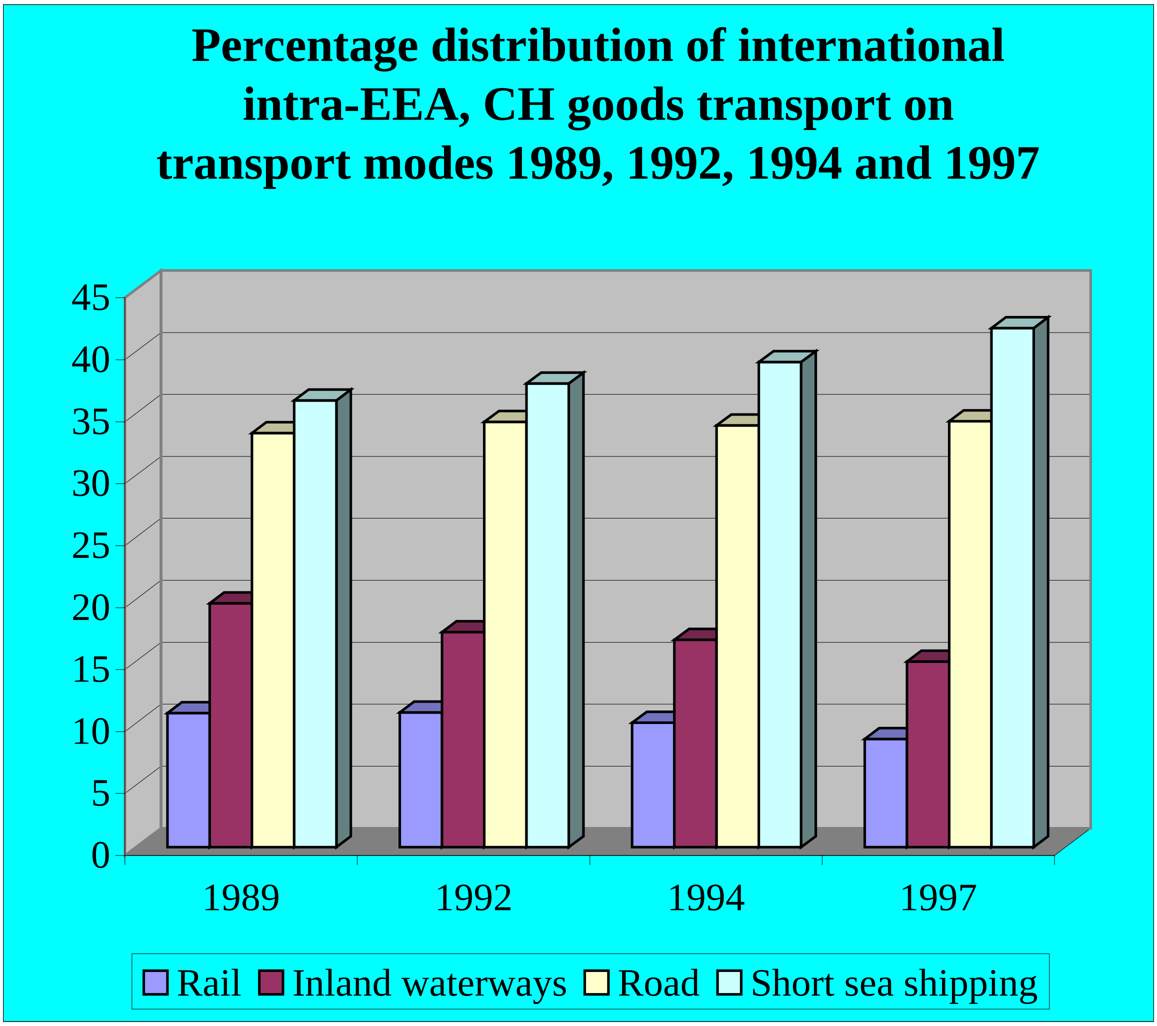
Intra-European rail goods transport (1000 tonnes)							
		1989	**1990**	**1991**	**1992**	**1994**	**1997**
1	Intra-EEA, CH	118 505	123 504	133 993	128 160	126 462	125 200
2	Intra-CEEC	16 914	16 008	15 750	17 570	34 370	43 447
3	1-2	16 525	16 790	9 409	5 665	8 761	9 921
4	2-1	27 495	24 685	28 587	27 069	36 163	42 364
5	**TOTAL**	179 439	180 987	187 739	178 464	205 756	220 932

Intra-European goods transport on inland waterways (1000 tonnes)							
		1989	**1990**	**1991**	**1992**	**1994**	**1997**
1	Intra-EEA, CH	215 464	212 864	207 705	204 630	210 474	214 568
2	Intra-CEEC	95	63	47	133	119	110
3	1-2	58	62	183	424	883	952
4	2-1	182	2 697	4 279	4 952	6 874	9 563
5	**TOTAL**	215 799	215 686	212 214	210 139	218 350	225 193

Intra-European road goods transport (1000 tonnes)							
		1989	**1990**	**1991**	**1992**	**1994**	**1997**
1	Intra-EEA, CH	365 646	383 775	384 995	404 472	427 627	492 546
2	Intra-CEEC	390	437	876	4 363	9 828	11 894
3	1-2	3 876	5 240	8 386	12 417	21 945	26 970
4	2-1	6 464	12 756	20 350	28 822	27 201	31 863
5	**TOTAL**	376 376	402 208	414 607	450 074	486 601	563 273

Intra-European short sea shipping goods transport (1000 tonnes)							
		1989	**1990**	**1991**	**1992**	**1994**	**1997**
1	Intra-EEA, CH	394 614	397 819	413 613	441 030	491 989	600 151
2	Intra-CEEC	12 114	2 835	1 107	3 022	2 399	3 227
3	1-2	10 835	11 638	18 758	27 242	25 972	35 471
4	2-1	36 809	23 163	22 959	25 619	29 979	37 820
5	TOTAL	454 372	435 455	456 437	496 913	550 339	676 669

All Intra-European goods transport (1000 tonnes)							
		1989	**1990**	**1991**	**1992**	**1994**	**1997**
1	Intra-EEA, CH	1 094 229	1 117 962	1 140 306	1 178 292	1 256 552	1 432 465
2	Intra-CEEC	29 513	19 343	17 780	25 088	46 716	58 678
3	1-2	31 294	33 730	36 736	45 748	57 561	73 314
4	2-1	70 950	63 301	76 175	86 462	100 217	121 610
5	**TOTAL**	1 225 986	1 234 336	1 270 997	1 335 590	1 461 046	1 686 067



The surveys reveal the important role of transport between countries in the EEA, CH area. Gross domestic product (GDP) in this area grew at a decreasing rate between 1989 and 1992 while the level of tonnes transported between the countries was maintained and even grew much more than GDP between 1991 and 1992. Average elasticity between tonnes and GDP was about 1.5 in these years.

Between 1992 and 1994 growth in tonnes was above 3 per cent per year and growth in GDP just above 1 per cent per year. Even though growth in tonnes might have been somewhat overvalued in 1994, as has been indicated in chapter 2, growth in tonnes has to be down by 1.5 per cent if the implicit elasticity is as low as that observed for 1989-1992. The most likely conclusion seems to be that overall growth in goods transport between countries in the EEA, CH area was still higher than growth in the overall GDP.

Between 1994 and 1997 transport volumes in trade between countries in the EEA, CH area accelerated compared to 1992-1994. However, the growth rate of GDP also accelerated and was on average 2 per cent per year between 1994 and 1997. The implied elasticity between tonnes and GDP was 2.25 in the period.

Elasticities such as the ones commented upon above, are most meaningful in the longer time perspective. Transport variations from one year to another can be influenced by many factors other than GDP. When we consider the whole period 1989-1997 transport growth was on average 3.4 per cent per year, while GDP increased by 2.3 per cent per year. This gives an elasticity of nearly 1.5.

Bjørnland (1993) presents estimates for the elasticity for selected periods between 1962 and 1990. For all these periods the elasticity varied between 1.15 and 1.50.

Trade between CEEC countries decreased for some years after 1989, but seems now to be increasing. The same tendency has applied to exports from the CEEC countries to countries in the EEA, CH area. Exports from the EEA, CH area to the CEEC countries may have grown all the time, but the level is less than imports from the CEEC countries. Road transport has grown very fast in foreign trade among CEEC countries or between these countries and the EEA, CH area.

The relative transport mode distribution in the EEA, CH area is shown in the graph above. It confirms trends observed for a long time: Decreasing shares for rail and inland waterways and mostly increasing shares for road and short sea shipping.

A reflection from the surveys presented above:

Trade between the two blocks EEA, CH and CEEC are still very small but are rapidly growing. Under stable political conditions in future there must be scope for economic integration and persisting growth in trade and transport. Trade between the CEEC countries is small, but whether it will increase substantially will probably depend on the geographic direction of trade in the various countries. The likely effect on the EEA,CH area is probably growth impetus on their foreign trade on the Pan-European level.

4. PAN-EUROPEAN CROSS-BORDER PASSENGER TRANSPORT

As mentioned at the end of Chapter 2, very little international RTD seems to have been devoted to producing Pan-European passenger O/D in spite of its significance for planning and policy purposes.

In a project for the Swedish State Railways (SJ) the author of this presentation wrote a report in 1992, *Intra European Rail Passenger Transport. Past Achievement and Future Options*. In the report Pan-European rail passenger transport matrices for the years 1979, 1982 and 1988 were presented for those countries that existed at that time.

The matrices were constructed on the basis of *Statistiques du Trafic International des Voyageurs - Trafic ferroviaire de Réseau à Réseau* from the Union Internationale des Chemins de Fer (UIC). The UIC data were based on passenger ticket sales for to the period 1 October till 30 September the next year. Since the change from one year to the next normally would be small, no adjustments were made for the periods not being calendar years.

Since the two flows between any country-pair normally match well, the UIC publications present the sum of the two flows. Therefore the matrices form a triangle.

For certain categories of journeys the information had to be based on counts and for some minor groups of journeys the statistical treatment of information was left to the discretion of the railway companies. From time to time major changes in coverage occurred.

The UIC data were compared with the statistics on international rail passenger traffic published by the ECMT and the EU. The UIC and the ECMT published somewhat different statistics and in most cases the ECMT gave higher figures. Compared with the transport statistics for the EU, there was virtually no difference at all.

For this report it has been considered useful to estimate as in the case of goods transport, a matrix for 1997. For this year no detailed statistics has been found and a synthetic method is called for. The following procedure was adopted for producing the 1997 matrix.

1. UIC statistics have been used to calculate Pan-European cross-border passenger transport for 1991. By then some of the effects of the fall of the Iron Curtain in 1989 had been absorbed in the new data.

2. Indicators for row and column sums were estimated by means of available statistics so that constraints on sums could be established for 1997. Matrix elements from 1991 were adjusted to 1997 through a simplified process in which each element was multiplied by the row and column indicators. The average of the two estimates was then used and no further adjustment was carried out.

The 1997 matrix is presented in the appendix (Readers interested in the coverage of countries are referred to the appendix). The following survey shows some of the macro results.

Between 1979 and 1988 transport volumes for the Intra-EEA, CH area grew at an average rate of 0.5 per cent per year. Between 1991 and 1997 the exploratory matrix calculation indicates an average annual growth rate of 1.9 per cent per year. Compared to Intra-EEA, CH volumes Intra-CEEC volumes are small but increasing. So are rail passenger volumes between the EEA, CH area and CEEC countries.

It is difficult to judge whether the growth in railway passenger transport has been overvalued in the survey between 1991 and 1997 since there are presently no statistics to compare. Domestic passenger-km in the old ECMT Member countries increased by 6 per cent in those years and decreased by some 60 per cent in CEEC countries.

Intra-European rail passenger transport (1000 passengers)				
	1979	**1988**	**1991**	**1997**
1 Intra-EEA, CH	34 608	36 140	36 269	40 485
2 Intra-CEEC	-	-	2 362	4 996
3 EEA, CH-CEEC	-	-	2 986	5 147
4 TOTAL	-	-	41 617	50 628

For 1979 and 1988, transport volumes relating to CEEC are not shown in the survey mainly due to the fact that the former East Germany was treated as part of the CEEC at that time. Recalculation of the basic matrix flows was considered outside the scope of the present report.

It is possible to produce air transport matrices similar to rail transport matrices since relevant data are compiled by international organisations. The author of this report has, however, not been able to acquire such information.

The planning issue is how to proceed if the perspective is Pan-European comprising all transport modes. As long as European wide travel surveys do not exist, one reasonable way to calculate O/D matrices for the sum of all modes or for particular modes may be the one sketched below. Norwegian information is used by way of illustration.

The volume of trips over the Norwegian border in 1997 was equivalent to a travel frequency of 6.06 trips per inhabitant with the following frequencies (trips per inhabitant) per transport mode:

3.11	Road transport
1.62	Air transport
1.31	Water transport
0.02	Rail transport.

Cross-border rail transport was by 1997 insignificant and the volume had decreased for years. This development can easily be understood since no significant measures have been adopted in post war years to promote rail passenger transport across the Norwegian border.

In Norway travel surveys have been carried out regularly since the eighties. The most recent Norwegian travel survey relates to 1998. In this survey the sample is considered so reliable that distributions on the following main foreign markets are specified.

- Sweden;
- Denmark;
- Great Britain;
- Rest of Northern and Central Europe;
- Southern Europe;
- Other areas.

Such geographic distributions are given for each transport mode.

The volume of trips outside Europe seems to be less than 20 per cent of total trip generation. Since trips to and from the main markets are known, the distribution of the remaining country pairs in the matrices could be produced by the help of a model such as the gravity model.

Norway belongs to a group of European countries with reasonably good transport statistics. If information for such countries could have been processed along the lines sketched above, my guess would be that as much of one third of all matrix elements could be statistically estimated with reasonably accuracy.

As already mentioned, international air transport organisations could actually supply the necessary information for the whole air transport matrix (at least an airport to airport distribution). For sea-born transport the co-operation of the major shipping lines would suffice.

For road transport relevant information through travel surveys may be lacking for several countries. Still there are options that might give reasonably good results. Road traffic counts at border points combined with comparisons with countries having travel surveys would probably be sufficient for many of the road matrix elements to be filled in. Qualified guesswork for the remaining unknown elements does not pose greater problems than planners are faced with in normal model calibration situations.

A reflection from the information presented above:

Cross-border rail passenger transport is small in Europe. The travel frequency for border crossing rail trips in the EEA, CH area was about 0.12 in 1997 (trips per inhabitant per year). With such a low travel frequency the scope for expansion ought to be significant on the basis of concerted policy and industry actions aiming at satisfying customer needs.

5. SCENARIOS FOR 2010

Modelling competence and capabilities have increased tremendously over the years and textbooks grow in volume. An example of one of the more recent and comprehensive textbooks is Ortúzar and Willumsen (1998). As part of the intellectual development, knowledge of advanced scenario writing, delphi studies and modelling and forecasting has become widespread.

Computer technology allows for steadily more complicated computations. The number of documented case studies also increases, while the general availability of meaningful data shrink.

The pan-European rail matrices presented in Bjørnland (1992, 1 and 2) depend partly on available forecasts at that time. These were dependent in particular on the impact of major construction projects such as the Øresund fixed link, the rail tunnel under the English Channel, high-speed railway links and potential fixed links such as the link across the Fehmarn Belt. Likely effects of the fall of the Iron Curtain and the German reunion were also widely studied. A proactive view was taken on the potential of the railways if measures advocated by countries as well as international organisations were adopted. The rapid growth of high-speed passenger trains was anticipated, as was the growth in intermodal goods transport by trains.

Looking back at the nineties on the basis of the information presented in this report, there seems to be time for some reflection. The expansion in railway transport still seems to belong to the future as data in this report portray. Total Pan-European cross-border goods transport continues to grow rapidly supported by short sea shipping and road transport in spite of what is planned or hoped for politically. Some reasons why this is so is not difficult to find.

The dynamic aspects of the international economy, internationalisation of enterprises and global logistics favour above all road transport and shipping. For the strength of globalisation, see the book edited by Donald Waters, *Global Logistics and Distribution Planning*. International transport policy that is very much focused on how to get more traffic on to rail or inland waterways, still has some way to go before substantial growth materialises.

The following two surveys show the macro implications of the rail scenarios in Bjørnland (1992, 1 and 2).

The scenario for all intra-European goods transport in 2010 has been made experimentally for this report on the basis of assumptions on how the relations between foreign trade of a country and its GDP will develop. The International Monetary Fund has so far presented statistics for the development up to 1997 in its *World Economic Outlook* and forecasts for the remainder of the decade. For this report the view has been taken that GDP will grow between 2000 to 2010 with the same rate as in the nineties. In chapter 3 is presented the assumptions on how exports and imports in tonnes per unit of GDP will develop.

The surveys imply some interesting features. Overall growth in border crossing goods transport within the EEA, CH area will on average grow by 2.8 per cent per between 1997 and 2010. As GDP is assumed to grow by 2.1 per cent per year, the elasticity will be about 1.3. This is less than between 1989 and 1997. Saturation will of course occur at some time in future, but it is hard to see any abrupt changes in the years ahead.

If goods transport really get on to rail as is implied in the rail scenario, the relative rail share will only have increased to 11 per cent by 2010. Such a share and even much higher ones was achieved by the railways in the past, but it does not look very likely that it will be attained by 2010.

Looking at rail passenger share what might have looked as an attainable growth rate in the light of statistics from the 1980s looks more than optimistic seen from the end of the nineties.

Intra-European rail goods transport (1000 tonnes)		
	1997	**2010**
1 Intra-EEA, CH	125 200	234 058
2 Intra-CEEC	43 447	-
3 1-2	9 921	34 883
4 2-1	42 364	61 142
5 TOTAL	**220 932**	**-**

All Intra-European goods transport (1000 tonnes)		
	1997	**2010**
1 Intra-EEA, CH	1 432 465	2 063 884
2 Intra-CEEC	58 678	88 224
3 1-2	73 314	115 219
4 2-1	121 610	184 298
5 TOTAL	**1 686 067**	**2 451 625**

Intra-European rail passenger transport (1 000 passengers)		
	1997	**2010**
1 Intra-EEA, CH	40 485	112 084
2 Intra-CEEC	4 996	-
3 EEA, CH - CEEC	5 147	19 788
4 TOTAL	**50 628**	**-**

A final reflection:

Overall, Pan-European cross-border transport will continue to grow beyond 2010. Sustained and high growth rates are most likely in goods transport. Road transport and short sea shipping will continue to be the backbone in Pan-European goods transport.

It is more than difficult to find evidence that rail transport, for either goods or passenger transport, will reach levels forecast for 2010 in the rail-optimistic early years of the 1990s.

6. BIBLIOGRAPHY

Bjørnland, Dag (1992, 1), Intra European Rail Freight Transport. Present levels and Future Options. IDeforum as.

Bjørnland, Dag (1992, 2), Intra European Rail Passenger Transport. Past Achievement and Future Options. IDeforum as.

Bjørnland, Dag (1993), European Railways in Transition. IDeforum as, Asker. ID(93)4.

Bjørnland, Dag (1997), International Intra-European Goods Transport. IDeforum as, ID(97)2.

ECMT, Eurostat, UN/ECE (1998), *Glossary for Transport Statistics*, Second edition, Geneva.
European Commission (1998), Trans-European Transport Network. Fact Sheets.

ECMT, *Statistical Trends in Transport* (Regular editions), Paris.

ECMT, *Trends in the Transport Sector* (Annual edition), Paris.

ECMT (1999), *Investment in Transport Infrastructure 1989-1995*, Volume 1, and country studies, Paris. ISBN 92-821-1242-X.

INFOSTAT (1998), Final Report for Publication, Rijswijk. ST-96-AM.101.

International Monetary Fund, *World Economic Outlook* (May 1999 edition), Washington. ISBN 1-55775-809-3.

MYSTIC (1998), Inception Report, London. ST-97-SC.2101.

OD ESTIM (1998), Final Report for Publication, Rijswijk. OD-ESTIM ST-96-SC-103.

Ortúzar, J. de D., L. G. Willumsen (1998), *Modelling Transport*, John Wiley & Sons, England. ISBN 0-471-96534-0.

Rideng, Arne (1998), Transportytelser i Norge, Oslo. TØI rapport 397/1998.

Stangeby, Ingunn, Jan Vidar Haukeland and Arne Skogli (1999), Reisevaner i Norge 1998. Oslo, TØI report 418/1999.

UN/ECE (1997), *Census of Motor Traffic on Main International Traffic Arteries 1995. Spain*. ISBN 92-1-016325-7.

Union Internationale des Chemins de Fer, *Trafic ferroviaire de Réseau à Réseau* (Regular edition), Paris.

Waters, Donald (Ed.) (1999), *Global Logistics and Distribution Planning*, London. ISBN 0 7494 2779 5.

ANNEX

Intra European rail goods transport in 1 000 tonnes (unloaded): 1997 — 7a

To : / From :	A	B, L	BG	CH	CZ	D	DK	F	FIN	GR	H	HR	I	N	NL	P, E	PL	RO, MD	S	SK	SLO	TR	IRL, UK	EEA, CH	CEEC	TOTAL
A	0	344	18	338	824	5368	83	272	0	15	2754	157	4278	0	198	34	104	13	126	237	726	1	75	11131	4835	15965
B,L	390	4313	0	1169	13	3428	46	3813	0	2	30	3	2411	4	2068	83	51	2	210	26	7	0	1	17939	133	18071
BG	3	0	0	1	2	3	0	1	0	197	27	2	0	0	0	0	1	128	0	0	0	95	0	204	254	458
CH	121	157	2	0	0	1179	22	189	0	1	16	9	2633	2	259	5	6	1	26	0	10	1	35	4629	45	4674
CZ	7289	43	44	0	0	9290	13	130	0	47	5955	397	469	5	33	1	1593	29	100	9144	369	4	0	17419	17535	34955
D	6236	2974	9	2445	1318	0	867	2643	8	26	600	74	9273	80	776	440	1199	12	1308	0	210	2	75	27151	3425	30576
DK	23	11	0	45	0	964	0	30	0	0	2	2	681	24	10	0	0	0	490	0	1	0	0	2278	5	2283
F	358	4161	3	921	14	2946	163	0	13	1	59	16	6510	17	119	646	20	3	209	7	14	0	342	16406	136	16542
FIN	5	0	0	26	0	9	17	30	0	0	0	0	5	67	0	0	0	1	163	0	0	0	0	322	1	323
GR	2	0	8	0	0	3	0	0	0	0	5	0	0	0	0	0	0	35	0	0	0	1	0	5	49	54
H	1965	25	80	52	639	382	1	22	0	8	0	343	657	1	38	10	102	232	11	512	396	7	0	3173	2310	5484
HR	285	1	1	0	27	18	0	5	0	0	605	0	836	0	0	0	8	1	1	4	197	0	0	1146	844	1990
I	834	1641	1	1129	33	4652	572	1362	3	2	461	90	0	48	804	66	183	20	220	21	126	0	69	11401	936	12336
N	22	0	0	14	0	162	15	22	1	0	0	0	37	0	1	0	0	0	809	0	0	0	0	1083	0	1083
NL	805	921	0	287	14	3967	19	1232	0	1	46	5	910	4	0	16	0	0	115	7	7	0	40	8315	78	8394
P,E	48	254	0	59	0	625	1	389	1	0	9	1	185	9	28	764	20	48	33	14	0	0	0	2397	92	2490
PL	1576	32	2	11	3809	11499	7	59	0	1	624	32	232	7	617	0	0	16	167	1560	1	0	0	14208	6044	20252
RO,MD	39	3	457	3	26	41	0	24	4	7	1055	3	0	1	2	6	5	206	8	0	5	4	0	137	1760	1897
S	342	290	0	147	25	2462	1152	569	68	0	43	2	1188	15185	166	3	104	2	0	3	1	0	0	21573	180	21753
SK	1359	10	10	0	11554	1157	7	75	0	13	1618	118	121	0	187	0	481	31	44	0	126	0	0	2972	13938	16911
SLO	1258	3	0	7	8	177	3	0	0	0	494	232	1642	0	0	1	0	1	9	0	0	0	0	3101	735	3836
TR	0	0	14	0	2	0	0	0	0	1	8	0	0	1	0	0	0	2	0	0	0	0	0	2	26	28
IRL,UK	6	19	0	41	3	92	0	94	0	0	3	0	215	3	0	96	0	0	5	0	1	0	0	571	7	578
EEA, CH	9190	15086	41	6621	2244	25857	2958	10646	94	47	4028	361	28324	15441	4429	2154	1689	136	3716	315	1103	4	637	125200	9921	135121
CEEC	13774	118	607	73	16068	22566	32	316	4	274	10386	1127	3957	15	877	19	2190	645	340	11220	1093	109	0	42364	43447	85811
TOTAL	22964	15204	649	6694	18312	48423	2990	10962	99	321	14414	1487	32281	15457	5306	2172	3879	782	4056	11535	2196	114	637	167564	53368	220932

Intra European goods transport by inland waterways in 1 000 tonnes (unloaded): 1997 — 7b

To : / From :	A	B,L	BG	CH	CZ	D	DK	F	FIN	GR	H	HR	I	N	NL	P, E	PL	RO, MD	S	SK	SLO	TR	IRL, UK	EEA, CH	CEEC	TOTAL
A	0	3	0	20	0	657	0	0	0	0	112	0	0	0	49	0	0	0	0	0	0	0	0	730	112	842
B,L	85	126	0	930	6	10738	0	3395	8	0	0	0	0	0	16807	0	1	0	0	0	0	0	0	32089	7	32096
BG	14	0	0	5	0	15	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0	0	0	34	6	41
CH	0	112	0	0	0	499	0	39	0	0	0	0	0	0	248	0	0	0	0	0	0	0	0	899	0	899
CZ	0	0	0	19	0	1348	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1367	0	1367
D	324	12763	5	2671	340	0	0	2199	33	0	177	0	0	0	24869	0	173	0	0	31	0	0	0	42859	727	43586
DK	0	0	0	0	0	117	0	0	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	204	0	204
F	0	2755	0	840	0	8255	0	0	0	0	0	0	0	0	3521	0	0	0	0	0	0	0	0	15370	0	15370
FIN	0	0	0	17	0	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	0	81
GR	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
H	1348	0	0	1	0	1239	0	0	0	0	0	0	0	0	60	0	0	0	0	6	0	0	0	2648	6	2654
HR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	13
N	0	0	0	31	0	238	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	272	0	272
NL	902	39057	0	1426	102	74256	0	5284	101	0	0	0	0	0	0	0	3	0	0	0	0	0	0	121025	105	121130
P,E	0	0	0	97	0	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	206	0	206
PL	0	0	0	7	0	3813	0	0	83	0	0	0	0	0	50	0	0	0	0	0	0	0	0	3954	0	3954
RO,MD	194	0	4	0	0	26	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	220	7	228
S	0	0	0	37	0	73	0	0	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	149	0	149
SK	1287	0	6	6	0	0	0	0	0	0	85	0	0	0	0	0	0	0	0	0	0	0	0	1294	91	1384
SLO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	0	0	0	0	0	0	43	0	43
TR	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3
IRL,UK	0	0	0	287	0	372	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	672	0	672
EEA, CH	1311	54815	5	6369	449	95377	0	10918	283	0	289	0	0	0	45494	0	177	0	0	31	0	0	0	214568	952	215520
CEEC	2843	0	10	41	0	6442	0	0	83	0	88	0	0	0	153	0	0	5	0	7	0	0	0	9563	110	9673
TOTAL	4154	54815	15	6410	449	101819	0	10918	366	0	378	0	0	0	45648	0	177	5	0	39	0	0	0	224131	1062	225193

Intra European road goods transport in 1 000 tonnes (loaded): 1997 7c

To: From:	A	B,L	BG	CH	CZ	D	DK	F	FIN	GR	H	HR	I	N	NL	P, E	PL	RO, MD	S	SK	SLO	TR	IRL, UK	EEA, CH	CEEC	TOTAL
A	0	224	8	1246	301	5025	45	398	15	37	286	115	4512	14	347	134	69	4	76	33	207	12	131	12205	1034	13239
B,L	599	0	0	849	273	22101	733	44131	214	165	734	0	4256	0	20040	2328	454	37	392	0	17	104	2720	98528	1618	100146
BG	18	0	0	0	12	0	0	29	7	147	16	4	0	1	18	0	0	0	6	0	0	77	0	226	109	335
CH	546	229	0	0	79	2100	95	933	34	0	65	3	1244	10	350	194	0	0	56	0	0	27	257	6047	174	6221
CZ	223	284	79	39	0	4921	190	350	25	20	259	27	196	12	443	159	1842	36	15	2076	80	21	155	7033	4421	11453
D	8169	21498	129	6678	9877	0	5047	20021	552	44	1314	137	12640	207	18705	4355	1879	48	1632	857	363	479	2858	102405	15084	117489
DK	48	318	0	262	112	5014	0	512	199	4	44	5	769	226	517	53	69	0	1399	0	0	9	579	9898	239	10137
F	575	16529	47	4974	181	21133	722	0	316	349	194	28	11653	154	4861	12453	277	53	523	0	177	158	946	75189	1114	76303
FIN	61	67	16	65	38	826	306	222	0	4	91	1	163	549	127	82	96	1	2109	18	3	4	150	4730	269	4999
GR	38	3	1063	4	35	222	5	11	0	0	76	3	499	0	10	1	71	74	3	11	3	25	22	817	1360	2177
H	1375	114	31	53	534	1340	37	123	26	18	0	368	634	9	194	34	193	174	56	0	342	25	116	4128	1667	5795
HR	110	1	2	6	15	67	2	2	0	0	46	0	213	0	15	0	10	2	1	14	970	0	0	419	1059	1478
I	2552	3411	49	4260	210	11597	843	8858	156	108	556	200	0	59	1966	2807	503	207	295	130	905	240	2137	39051	3000	42051
N	13	23	0	6	8	193	181	73	260	14	9	1	101	0	30	30	26	1	1623	1	1	2	57	2605	49	2653
NL	1010	20040	95	1081	57	31085	1135	9470	501	239	402	0	3447	502	0	2403	975	73	1477	0	0	191	4671	77061	1793	78854
P,E	82	309	0	230	3	2484	76	8779	84	27	38	2	2104	66	1686	9345	109	5	231	0	6	11	1140	26641	175	26816
PL	179	184	25	0	656	11606	117	417	42	5	166	8	467	33	591	50	0	0	218	0	12	11	126	14035	878	14913
RO,MD	17	0	6	0	80	235	0	59	3	20	104	3	212	1	59	0	0	0	6	0	3	63	16	628	259	887
S	175	513	13	128	79	2004	2421	378	2419	15	109	20	298	3242	753	211	295	10	0	13	10	20	992	13550	567	14116
SK	195	0	0	0	1760	0	0	90	4	1	0	22	228	2	0	3	0	0	14	0	12	6	0		1800	2337
SLO	373	35	9	15	109	600	4	127	3	1	119	972	1951	3	91	18	15	3	16	14	0	4	315	3553	1246	4799
TR	64	123	186	79	22	536	11	81	1	70	25	9	181	2	61	15	38	158	11	7	10	0	67	1304	455	1759
IRL,UK	94	6819	0	283	177	353	538	7438	105	1	84	9	1293	54	2521	1140	131	8	604	0	0	85	2577	23819	495	24314
EEA, CH	13962	69982	1420	20066	11430	104136	12147	101223	4855	1006	4001	525	42978	5084	51912	35536	4954	521	10421	1061	1692	1366	19237	492546	26970	519516
CEEC	2554	740	338	193	3188	19304	362	1280	113	283	734	1413	4083	63	1472	277	2098	372	344	2110	1431	207	795	31863	11894	43756
TOTAL	16516	70722	1759	20259	14618	123441	12508	102502	4967	1289	4736	1938	47062	5147	53385	35813	7051	894	10766	3172	3123	1573	20032	524409	38864	563272

Intra European short sea shipping in 1 000 tonnes (loaded): 1997 — 7d

To: / From:	A	B, L	BG	CH	CZ	D	DK	F	FIN	GR	H	HR	I	N	NL	P, E	PL	RO, MD	S	SK	SLO	TR	IRL, UK	EEA, CH	CEEC	TOTAL
A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B, L	0	0	0	0	0	1147	316	3078	1458	254	0	0	2643	4390	177	2215	5352	0	1662	0	0	5738	16184	33525	11090	44614
BG	0	0	0	0	0	28	0	16	0	47	0	0	211	0	262	291	0	9	0	0	275	8	169	1025	292	1317
CH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	0	1176	16	0	0	0	7261	2542	5052	511	0	22	626	3023	3608	2030	752	7	11660	0	0	1534	7818	45305	2331	47637
DK	0	142	3	0	0	6955	0	485	1838	79	0	4	675	2737	1524	476	171	3	6177	0	1	121	3747	24834	303	25137
F	0	1460	7	0	0	1412	327	0	243	1416	0	17	6810	401	2452	5459	328	119	260	0	0	815	35838	56078	1285	57363
FIN	0	2470	0	0	0	10273	1533	1168	0	286	0	10	523	753	4425	1120	1249	29	6243	0	8	195	5186	33978	1491	35469
GR	0	0	52	0	0	85	377	12	13	0	0	0	855	846	157	2774	0	0	0	0	0	475	82	5202	527	5729
H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HR	0	21	0	0	0	96	0	154	0	34	0	0	2159	0	0	340	0	0	0	0	27	45	0	2804	72	2876
I	0	866	87	0	0	258	50	2634	50	5220	0	0	0	190	657	3499	0	381	267	0	0	2087	1434	15126	2555	17680
N	0	4573	7	0	0	23441	6897	14220	6953	192	0	0	4551	0	22768	1383	2624	13	11403	0	68	33	29895	126278	2745	129023
NL	0	590	0	0	0	6040	1550	2280	2012	1312	0	0	1282	2491	0	3704	2864	0	2616	0	0	2958	26174	50051	5821	55873
P, E	0	2072	17	0	0	1984	422	2917	363	1067	0	52	3732	840	4056	1579	80	380	504	0	2	548	6474	26009	1078	27087
PL	0	782	0	0	0	4665	3827	1120	507	0	0	0	496	368	1296	536	0	0	1442	0	0	389	4194	19234	389	19623
RO,MD	0	0	0	0	0	8	10	339	0	746	0	0	1388	0	0	991	0	0	0	0	0	1633	202	3683	1633	5316
S	0	1046	0	0	0	6549	7705	1804	4623	277	0	0	1830	2068	2364	890	302	0	0	0	0	427	7276	36432	729	37161
SK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SLO	0	0	78	0	0	0	0	3	0	32	0	19	53	0	0	19	0	0	0	0	0	70	0	107	168	274
TR	0	365	199	0	0	176	13	723	8	1323	0	0	5065	270	671	1788	12	461	152	0	0	0	415	10969	672	11641
IRL, UK	0	9662	33	0	0	32891	2099	26062	4526	1296	0	0	11970	4454	24815	11841	3781	93	4687	0	0	1608	13030	147333	5515	152848
EEA, CH	0	24057	222	0	0	91035	28537	57203	27130	11910	0	104	35497	22193	67002	36971	17504	1024	45480	0	79	16539	153138	600151	35471	635622
CEEC	0	1168	277	0	0	4973	3850	2356	515	2182	0	19	9372	638	2228	3965	12	470	1595	0	301	2146	4979	37820	3227	41047
TOTAL	0	25225	499	0	0	96007	32386	59558	27645	14092	0	123	44869	22831	69231	40936	17516	1494	47074	0	380	18685	158118	637971	38698	676669

All Intra European goods transport in 1 000 tonnes (rail and inland waterways unloaded), (short sea shipping and road loaded): 1997 — 7e

To: / From:	A	B, L	BG	CH	CZ	D	DK	F	FIN	GR	H	HR	I	N	NL	P, E	PL	RO, MD	S	SK	SLO	TR	IRL, UK	EEA, CH	CEEC	TOTAL
A	0	571	26	1604	1125	11050	129	670	15	52	3152	273	8789	14	594	168	173	18	202	270	933	12	206	24065	5981	30046
B, L	1074	4439	0	2948	292	37413	1095	54417	1680	421	764	3	9311	4393	39093	4626	5859	39	2265	26	24	5842	18905	182080	12848	194928
BG	35	0	0	6	15	46	0	46	7	390	43	5	211	1	280	291	1	142	6	1	275	180	169	1489	662	2151
CH	667	499	2	0	79	3778	117	1162	34	1	81	12	3876	12	857	199	6	1	82	0	10	28	292	11574	219	11793
CZ	7512	327	123	58	0	15559	203	479	25	67	6214	425	665	18	476	160	3435	65	115	11220	449	26	155	25819	21956	47775
D	14729	38412	159	11794	11536	0	13175	27405	5645	581	2091	233	22539	3310	47957	6825	4004	67	14600	888	573	2016	10751	217721	21567	239288
DK	70	470	3	307	112	13049	0	1027	2123	83	45	11	2124	2987	2050	529	240	3	8066	0	2	131	4327	37213	547	37760
F	933	24905	57	6734	194	33746	1213	0	572	1765	253	61	24974	572	10954	18558	625	175	993	7	191	972	37126	163043	2535	165579
FIN	66	2537	16	108	38	11171	1855	1421	0	289	91	11	690	1369	4552	1201	1345	31	8516	18	11	199	5336	39111	1760	40871
GR	40	3	1124	5	35	310	382	23	13	0	81	3	1354	846	166	2776	71	109	3	11	3	500	104	6025	1936	7961
H	4688	139	111	107	1173	2961	38	145	26	27	0	711	1291	10	291	44	295	406	68	518	738	32	116	9950	3983	13933
HR	395	23	3	6	42	181	2	161	0	34	651	0	3209	0	15	340	19	3	2	18	1194	45	0	4368	1975	6344
I	3387	5917	137	5402	244	16508	1465	12854	209	5330	1017	290	0	298	3427	6371	686	607	782	151	1031	2327	3640	65590	6491	72081
N	35	4596	7	51	8	24035	7094	14315	7216	206	9	1	4689	0	22799	1414	2650	14	13836	1	69	35	29952	130237	2794	133032
NL	2716	60607	95	2794	173	115349	2704	18266	2613	1551	448	5	5639	2997	0	6123	3841	73	4208	7	7	3148	30885	256453	7798	264251
P, E	130	2635	17	386	3	5201	499	12085	448	1094	47	56	6021	914	5769	11689	209	433	768	14	8	559	7613	55253	1345	56598
PL	1755	998	27	17	4465	31583	3951	1597	633	6	790	40	1195	408	2554	586	0	16	1828	1560	13	400	4319	51431	7311	58742
RO,MD	250	3	467	3	106	310	10	422	7	773	1162	6	1600	2	61	997	5	206	14	0	8	1700	218	4668	3660	8328
S	517	1850	13	312	104	11088	11278	2751	7150	292	151	22	3315	20495	3283	1104	701	12	0	16	11	447	8269	71704	1476	73180
SK	2841	10	16	6	13314	1157	7	165	4	14	1703	140	349	2	187	3	481	31	57	0	138	6	0	4803	15829	20632
SLO	1631	38	87	22	118	777	8	131	3	33	613	1223	3646	3	134	38	15	4	26	14	0	74	315	6804	2148	8953
TR	64	488	399	82	24	712	23	804	9	1395	33	9	5246	273	731	1803	50	621	164	7	10	0	482	12278	1153	13431
IRL, UK	100	16500	33	610	180	33707	2637	33595	4643	1297	87	9	13478	4511	27336	13077	3912	101	5296	0	1	1693	15607	172394	6017	178411
EEA, CH	24464	163940	1689	33055	14123	316405	43641	179989	32362	12962	8319	989	106799	42719	168838	74660	24323	1681	59617	1408	2873	17908	173013	1432464	73314	1505778
CEEC	19171	2026	1233	308	19257	53285	4243	3951	715	2739	11209	2559	17412	716	4731	4261	4301	1493	2278	13338	2826	2463	5774	121610	58678	180288
TOTAL	43635	165966	2922	33363	33379	369690	47884	183940	33077	15701	19527	3548	124211	43435	173569	78921	28624	3175	61896	14745	5699	20371	178787	1554074	131991	1686066

All Intra European goods transport in 1 000 tonnes (rail and inland waterways unloaded), (short sea shipping and road loaded): 2010 **7f**

To: From:	A	B, L	BG	CH	CZ	D	DK	F	FIN	GR	H	HR	I	N	NL	P, E	PL	RO, MD	S	SK	SLO	TR	IRL, UK	EEA, CH	CEEC	TOTAL
A	0	851	41	1986	1776	18479	211	991	22	85	4846	426	14551	23	885	298	312	31	316	414	1560	23	353	39051	9430	48481
B, L	1442	5692	0	3036	400	54774	1564	69085	2130	605	1016	4	13475	6306	50068	7260	9364	61	3070	35	35	9572	28435	246942	20486	267428
BG	51	0	0	7	22	72	0	64	10	603	61	8	327	1	389	488	2	239	8	2	432	315	273	2295	1080	3375
CH	863	615	2	0	104	5346	161	1418	41	1	103	16	5420	16	1056	302	10	1	107	0	14	44	425	15770	295	16066
CZ	10869	453	180	66	0	24393	311	658	35	104	8903	619	1031	27	660	268	5847	108	167	16062	704	45	249	39291	32467	71758
D	20119	50129	220	12415	16082	0	19126	35418	7285	847	2827	320	33134	4826	62517	10866	6491	108	20119	1200	852	3349	16417	293218	31449	324667
DK	104	668	4	359	169	20917	0	1446	2987	130	67	16	3370	4702	2911	904	418	4	12051	0	3	233	7109	57658	914	58572
F	1336	34147	83	7534	284	52405	1841	0	775	2692	358	88	38363	872	15003	30773	1054	291	1434	10	297	1680	59143	246319	4144	250463
FIN	94	3426	23	119	54	17117	2777	1900	0	435	128	15	1046	2058	6140	1967	2242	51	12120	25	16	340	8389	57588	2895	60483
GR	61	4	1725	6	55	508	613	33	19	0	122	4	2197	1363	242	4842	126	190	4	16	4	907	175	10066	3149	13215
H	7976	228	191	148	2029	5397	68	236	42	48	0	1216	2332	18	477	85	577	785	116	873	1345	63	215	17386	7079	24466
HR	565	31	4	7	61	280	4	219	0	52	923	0	4927	0	21	563	31	5	3	25	1854	78	0	6672	2982	9654
I	4819	8059	197	5993	353	25484	2210	17343	281	8078	1433	416	0	451	4663	10507	1152	1005	1122	212	1592	3998	5766	94776	10359	105135
N	48	6057	10	55	11	36045	10389	18684	9405	304	12	2	6953	0	30013	2269	4331	22	19242	1	104	59	46121	185583	4551	190134
NL	3701	78871	131	2931	241	171085	3915	23539	3363	2257	605	7	8269	4359	0	9726	6212	117	5784	9	11	5219	47048	364848	12551	377399
P, E	200	3899	26	473	5	8643	812	17730	656	1787	72	86	9903	1493	8529	20653	376	767	1193	21	12	1026	12955	88927	2393	91319
PL	2299	1246	36	17	5973	45177	5513	1973	781	8	1023	53	1689	572	3186	900	0	25	2415	2019	19	642	6352	72127	9788	81915
RO,MD	360	4	681	3	155	484	15	577	10	1186	1659	9	2474	3	84	1663	8	344	20	0	13	2953	349	7233	5824	13057
S	770	2638	20	366	158	17833	17741	3889	10096	462	223	33	5276	32371	4678	1892	1221	20	0	23	17	796	13630	111643	2511	114153
SK	4177	14	24	7	19948	1841	11	231	6	22	2480	207	549	4	263	4	830	53	85	0	220	11	0	7214	23771	30986
SLO	2346	53	127	25	173	1212	11	179	4	50	873	1771	5624	4	185	63	25	7	38	19	0	129	504	10296	3124	13420
TR	109	792	679	113	42	1285	41	1295	15	2478	56	15	9378	484	1185	3443	97	1189	277	11	18	0	890	21784	2106	23890
IRL, UK	142	22486	48	678	262	52066	3980	45358	6260	1967	123	13	20592	6839	37214	21577	6568	168	7603	0	1	2910	24733	251495	10093	261588
EEA, CH	33698	217542	2530	35951	19954	480702	65339	236834	43320	19651	11934	1446	162548	65679	223918	123838	39876	2837	84166	1967	4520	30155	270698	2063884	115219	2179103
CEEC	28752	2821	1921	393	28402	80140	5975	5432	903	4551	15978	3898	28331	1113	6450	7477	7417	2755	3130	19011	4605	4236	8831	184298	88224	272522
TOTAL	62450	220363	4451	36344	48357	560841	71314	242266	44223	24201	27912	5344	190879	66792	230368	131315	47294	5592	87296	20978	9124	34391	279530	2248182	203443	2451625

Intra European freight transport in 1 000 tonnes by rail: 2010 — 7g

To: / From:	A	B,L	DK	SF	F	D-W	GR	I	NL	N	P, E	S	CH	IRL, UK	BG, RO	CS	D-E	H	PL	YU	TOTAL
A		442	143	17	646	5274	48	3568	328	46	32	318	804	200	387	835	1511	2322	1896	2407	21224
B,L	436	10852	135	13	10047	6051	89	3598	4843	21	80	183	3500	280	52	61	722	68	80	64	41175
DK	38	38		44	82	844		417	21	48	4	297	141	10		7	622	6	3	4	2626
SF	4		67		4	6		3	2	61	6	154	271	8	49	10	6	112	10		773
F	482	9430	242	27		5440	15	12660	1378	42	1363	360	2731	1705	123	106	2095	116	243	215	38773
D-W	7087	8992	1199	253	7068		97	11027	2216	134	598	2453	3810	1594	1524	7168	40615	4522	3922	3166	107445
GR	19	49			11	41		2	6			2	4		182	6	66	1	3	1892	2284
I	1317	1570	375	40	4307	3888	34		884	53	105	252	2495	1362	166	182	951	258	177	909	19325
NL	699	1946	17	6	2847	7662	31	1199		6	19	128	1016	280	61	46	1589	122	112	85	17871
N	2	2	27	5	13	53		28	8		4	745	32			3	39		7		968
P,E	38	141	15		343	433		72	38	23	1220	40	164	1354	3	116	2943	13	6	6	6968
S	370	269	1079	124	720	2625		785	246	10000	44		383		66	148	1934	142	247	10	19192
CH	364	276	63	25	896	1602	4	5369	360	8	6	40		80	17	126	205	142	17	99	9699
IRL,UK	15	280			1705	1594		1362	280	100	683	50	130		4		478	3	3	25	6712
BG,RO	140	7	4	42	414	5018		284	55	1		47	12								6024
CS	5313	107	97	5	353	17412	5	329	63	8	16	216	200								24124
D-E	3804	1396	883	186	3792	33785	36	752	307	99	126	1807	855	478							48306
H	5590	15	4	10	125	1986	12	1626	21	4	4	22	363								9782
PL	5438	40	18	12	159	4613	6	210	8	10	12	501	22								11049
YU	4394	41	15	5	185	2468	776	2102	34	10	4	48	77	4							10163
TOTAL	35550	35893	4383	814	33717	100795	1153	45393	11098	10674	4326	7663	17010	7355	2634	8814	53776	7827	6726	8882	404483

Intra European rail passenger transport in 1 000 passengers (both directions taken together): 1997 7h

To: From:	A	B, L	BG	CH	CZ	D	DK	F	FIN	GR	H	HR	I	N	NL	P, E	PL	RO, MD	S	SK	SLO	TR	IRL, UK	EEA, CH	CEEC	TOTAL
A		90	6	688	304	3195	21	210	2	11	454	128	946	1	217	5	81	13	10	580	118	32	23	5420	1714	7135
B,L		672		266	9	930	29	4258	3		6		376	1	2538	38	7		7	25			418	9535	47	9582
BG					3	14		3		7	19						15			13		62		25	112	137
CH					34	2443	16	2819	3	1	23	48	2708	1	186	65	4	2	8	66	47		30	8280	225	8505
CZ						563	13	28		2	458	9	34	1	10	3	782	8	10		9	4	3	667	1269	1936
D							949	2572	10	42	208	111	1645	8	1564	50	368	26	143		105	33	167	7150	851	8000
DK								54	17		3		24	11	36	1	2		352				11	507	4	511
F								0	7	4	14	30	4359	2	1208	1633	23	6	14		27	7	1063	8290	107	8397
FIN													4	13	2	1	1		62				4	86	1	87
GR											6	15	128				1	2			15	27		128	65	194
H												83	44		3		339	300	15		78	7	2	64	807	871
HR													13				2							13	2	15
I														1	80	89	18	5	4			3	69	243	27	270
N															1				202					202	0	202
NL																80	13		8				318	407	13	419
P,E																221			1				12	233	0	233
PL																		7	1		5	3	3	4	15	19
RO,MD																						4		0	4	4
S																							1	1	0	1
SK						1149	30	40			994	21	64		16	0	1747	11	14			13	7	1320	2786	4106
SLO																								0	0	0
TR																								0	0	0
IRL,UK																							2	2	0	2
EEA, CH	0	762	6	954	346	6568	1015	9913	42	58	713	332	10190	36	5833	2184	518	54	810	671	312	103	2119	40485	3054	43538
CEEC	0	0	0	0	3	1726	43	72	0	9	1471	112	155	1	29	3	2885	326	40	13	92	92	15	2093	4996	7088
TOTAL	0	762	6	954	350	8294	1058	9985	42	67	2184	444	10345	37	5862	2186	3403	380	850	684	404	195	2135	42577	8049	50627

Intra European rail passenger transport in 1 000 passengers (both directions taken together): 2010 7i

To: From:	A	B,L	DK	SF	F	D	GR	I	NL	N	P, E	S	CH	IRL,UK	BG, RO	CS	D-E	H	PL	YU	TOTAL
A		147	61	5	356	6906	81	1734	332	3	23	18	1392	357	36	365		2557	498	1002	15873
B,L		887	27	2	5648	1821	1	700	3078	2	64	14	665	3227		13		24	33	14	16220
DK				22	168	3604	2	84	95	133	3	4848	50	136	2	144		85	15	7	9398
SF					9	28		9	5	7	1	170	11	55		4		6	4		309
F						4706	8	8439	1462	9	3347	51	6065	11574	15	125		87	208	173	36269
D							282	5452	3936	67	279	404	9393	3554	245	3255		1621	5383	1102	34973
GR								237	2	1	3	9	4	20	26	14		56	13	148	533
I									162	4	289	27	8729	670	17	75		209	60	459	10701
NL										2	57	24	354	3051		26		20	55	14	3603
N											1	947	5	5		7		2	3	2	972
P,E											478	5	291	196		3		1	3	1	978
S													24	60	2	57		134	11	12	300
CH														408	7	72		190	20	861	1558
IRL, UK																60		40	60	25	185
BG, RO																175		479	198	42	894
CS																		1277	761	76	2114
D-E																					0
H																			1040	218	1258
PL																				83	83
YU																					0
TOTAL	0	1034	88	29	6181	17065	374	16655	9072	228	4545	6517	26983	23313	350	4395	0	6788	8365	4239	136221

EUROPEAN INLAND FREIGHT TRANSPORT SCENARIOS FOR 2020 AND SOME RELATED POLICY IMPLICATIONS

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ABSTRACT

The purpose of this paper is to discuss the prospects of freight transport in Europe for the coming first two decades of the new century. First, the current situation is analysed and presented in the light of current trends and events that are likely to have an impact on the future. It is noted that structural changes in the past are taking place in “cycles”, that are characterised by a prevailing policy, trend, or technology. The future changes are also likely to be the result of such prevailing trends or technologies, and the paper proceeds to consistently see what these could be. The quantitative and qualitative outlook of future freight transport is then discussed in terms of expected developments and policy implications in interurban, urban, and rural freight transport. The most likely “enabling factors” are the new telematics based systems and applications, and the advances in Logistics and supply management techniques. Also more integration in the field of telecommunications usually referred to by the name of “convergence”, and of course the form and extent to which policy makers will resolve the still outstanding related institutional and legal issues. All these “factors” are presented and discussed together with estimates of the likely timing for their (market) implementation in the future.

1. INTRODUCTION

Forecasting future trends and developments in the transport field has never been an easy task. It is a sector that is sensitive to all those parameters affecting the trip making “desires” such as economic development, social trends habits, etc, and where major periodic “jumps” in technological or regulatory regimes may change the “scene” completely. In considering, therefore, the prospects and scenarios in the field of inland freight Transport, for the 21st century we clearly need to make some assumptions about the broad parameters that are likely to be present at the economic, policy, and technological levels.

Structural changes are taking place in “cycles”, almost in an “epochal” fashion, that is characterised by a prevailing policy, trend, or technology and which influence directly the Transport scene, or the political, cultural and economic environment in which Transport operates.

There are first, long – term cycles which are due to major “jumps” in the technology, or the political or social environment. Examples of such cycles are, the coming of the railways, the emergence of private motorised transport, the take-off in commercial aviation, and the recent dawn of the Information age. These were primarily “technical” revolutions but there are also examples of “revolutions” in the political or socio-economic fields which started major long term cycles of change. The creation of the European Economic Community (originally) and later the European Union is certainly one of them, as also is the abolition of Communism and the change of the Eastern European countries to market economies, or (perhaps of a smaller magnitude) the recent wars in South Eastern Europe.

On top of these long-term cycles, there are superimposed identifiable short-term ones. If we just take the past twenty years, for example, one can identify the ‘70s as the age of energy and environmental consciousness, the 80s as the age of “Regulatory Reform”, and the 90s as the “Decade of Infrastructure Issues”. The years 2000 are sure to be characterised as the years of telematics and the society of information. The information revolution cycle is only beginning and is likely to proceed with lightning speed all through the 2000s and 2010s. Already, technologies that now seem antiquated are less than 15 years old (e.g. the Fax) while others which have taken hold of the market and seem to be our daily way of handling things are less than 5 years old (e.g. EDI, and the Internet).

From a forecasting perspective, the problem is therefore essentially one of predicting *turning points and then identifying the changes that a particular cycle will bring.* As already mentioned it is not difficult to identify the cycle that we are currently entering. It is the cycle of information technology and telematics. Thus, the main attempt of this paper will be to try and see what will be the likely impacts on freight transport in Europe in the face of these new technologies taking hold of the market. In doing so we will also look into other elements of change that are not necessarily of a technology nature (e.g. changes in policy). In doing so, our “target” horizon of 2020 seems well justified since the “short term” cycles of change (at all levels) that are now only beginning to show, will by 2020 have matured and taken full effect.

During the last decade the author has been involved in two major attempts at “forecasting” the future, in the field of Transport. The first, was the work of the scientific network NECTAR of the European Science Foundation (ESF) under the name ***Europe 2020 group*** co-chaired by this author and published in Giannopoulos and Gillespie (1993) [also part of that overall effort was the work of another group of the ESF for ***Scenarios*** published in Masser *et al.* (1992)]. The second is the work that ended in December 1999, co-ordinated by the author, for the development of a ten-year Master Plan of research in the field of transport in Greece, and published in TRUTh *et al*. (1999).

2. THE CURRENT CONTEXT FOR TRANSPORT AS WE ENTER THE 21ST CENTURY

2.1. Major trends and events

Our previous remarks about repeated failures in the past to predict coming cycles of change, do not erase the fact that the future (especially the short to medium term) is never independent of the present, nor of the past, and ongoing changes which are taking place will inevitably have carry-through effects.

So, as we enter the 21st century, it is appropriate to start with the consideration of the trends and developments of the present and recent past, and use these in order to specify those aspects of the background within which to consider the future.

We can start with the main "elements" that generally influence the **demand** for Transport (not freight transport in particular). These are:

- **The current socio-political environment**: the last decade or so has seen an increasing reliance upon market forces as a means of regulating the supply and demand of transport services. In a period of rapid technological change, the market mechanism is clearly recognised to possess many advantages as a means of deciding between competing options. This author is of the opinion that in the long term, the unfettered action of market forces may very well lead to the re-establishment of private monopolies in the transport field, requiring re-regulation. So, competition within markets as one of the principal forms of decisionmaking within the Transport field will necessitate a permanent mechanism for monitoring the proper functioning of the market, and corrective policy decisions if needed.

- **The prevailing value systems**: shifts in societal value systems seem to be occurring which put greater emphasis on the satisfaction of individual rather than collective desires. Such a shift, if continued through, obviously has direct implications for all kinds of transport, in terms of the proliferation of "lifestyle choices" and the growth of new forms of consumption and leisure. At the same time, there is also evidence of growth in environmental or "green" value systems, the generalisation of which will also have profound implications for future Transport.

- **New methods of production organisation**: new forms of flexible, lean, 'just-in-time' production are been implemented, to meet changing customer requirements and expectations. These are taking place a1ongside a clear trend towards "globalisation", which in the European context is expressed by the formation of a single European-wide production system. These new forms of production organisation impose quantitatively and qualitatively different requirements upon the freight transport system, with genera1 increases in the frequencies of movement, in the distance over which movement takes place, and in the required reliability of transport systems.

- **New forms of spatial organisation**: developments in transport and communications have, facilitated the emergence of complex forms of spatial organisation, in which much greater integration across space has taken place. Such integration can be seen at a variety of scales, including cities and rura1 areas, cores, and peripheries within national territories, and between countries at the European scale. More than 80 per cent of the European population now lives in medium to large sized urban areas.

On the **supply** side, the efforts to satisfy demand are focused primarily on two areas:

1. **Development of a coherent network of a European–wide transport infrastructure**. The notion of the Trans European–Transport Networks (TEN-Ts) that incorporates European wide Road, Rail (both high-speed and conventional), maritime, inland water, and Intermodal networks, is the leading effort at the level of the European Union, in developing such infrastructure. Other countries are following. The process of development is slow and requires funding far beyond what can be available by governments alone. So, relatively "new" forms of financing through private, or public – private partnerships are being tested.
2. **New technological possibilities:** These, affect primarily the "supply" but may also affect the "demand" for transport. The use of **telematics,** i.e. the use of telecommunications and computing, is perhaps the major element of these possibilities. The "informatisation" of transport (especially freight) as a result of the application of telematics, is transforming the

scene and has facilitated possibilities for greater integration as witnessed in the development of advanced logistics systems, and "network service" providers, etc. These, as already mentioned, will be the focus of this paper.

Coupled with the above "elements" at work today, and partly because of them, corrective changes are expected to the **Transport Policies** adopted by European governments. These are characterised by the on-going "full and unconditional" *liberalisation process* in European transport markets. At the EU level, the move towards the EMU and an enlarged Single Europe, has resulted in a number of concrete steps at liberalising the Transport Market, which within the next two to three years will have eliminated practically all restrictions and transport-related barriers. As new countries become candidates for adhesion, and other are aspiring to do so, in the first decade of 2000, the geographical limits of application of these policies will extend beyond the boundaries of the existing membership of the Union.

To mention the most important such liberalisation measures that are going to take full effect, within EU countries, and produce wide-ranging impacts all over Europe by the turn of the century, we can list the following:

- Frontier checks for road freight, crossing from one member state to another were abolished in 1993.
- All quota restrictions for road freight transport were removed with the exception of the eco-points system which is maintained for environmental reasons.
- Restrictions on cabotage on all modes of transport have gradually been removed from 1998 onwards and are expected to be completely abolished in all modes and countries by 2004.
- Entrance to the profession for road transport has been liberalised.
- Separation of rail infrastructure from railway services operation has been already introduced in the legislation of all EU countries.
- Promotion of the concept of the Trans European Rail Freight Freeways (TERFFs).
- Price controls on air fares have been lifted.
- Revenue sharing agreements removed in air transport.
- Common licensing and safety standards established in air transport.
- National quota restrictions removed in maritime transport.
- Controls at EU frontiers for inland waterways and cabotage removed.

Coupled with the significant changes in international (primarily EU) transport policy, are on-going policy reforms **at the national level**. Practically every European government, has a pronounced policy towards privatisation of supply, liberalisation of markets and decentralisation of decision making. A central point of concern is always the **environmental costs** of transport. This point has kept for a number of years (perhaps decades) the discussion going for a variety of measures such as **road pricing** and other policies. Some of these measures represent EU or OECD-wide initiatives while others are national or regional in their origin. In any case, the process remains very slow and cautious and it is still doubtful that the many regulations and policy decisions needed for road pricing implementation on a wide scale, will be finally introduced.

At the organisational level, significant changes are occurring in the way Transport companies are organised and develop at corporate level. Various co-operations, mergers, and acquisitions are increasingly seen as important ways of minimising the costs of transport supply, and increasing profit margins. As a result, the international transport supply industry is becoming "globalised" and the "mega-carriers", which are large multinationals operating in all modes of transport, at every country of Europe, are emerging in both freight and passenger transport.

2.2. Some assumptions about the context of Europe

So if the above are some of the most notable current trends and "events", how can we derive the future? This can only be based on some assumptions about the overall context of Europe, i.e. which kind of Europe is envisaged. This may look a bit far reached question to ask, in the context of this paper, but after the rapid changes in Eastern Europe over the early nineties, and the Balkan wars of the last four years, no question could be more appropriate but also more difficult to answer.

Without being too specific, a few general assumptions are therefore necessary and these are presented here. Their presentation serves mainly as a reminder of the importance and relevance of the wider political and socio-economic context of change without which no discussion as to the shape of the future of Transport, can be meaningful:

Assumption I:

- *By 2020 the "European Union" will be larger than the current EU.* Most likely most or all of the eastern European countries and the countries now forming EFTA will have joined the EU, and the European Union will encompass between 400 and 500 million people, more than twice as many as the USA or the Asia/Pacific countries.

Assumption II:

- *By the same year (2020) there will be a stronger European Government with the means to impose and safeguard a European Transport policy.* This means that although each country will have its own legislation, jurisdiction and government, European Institutions will have decisive powers over certain sectors of the economy such as International Trade and Industry, Research and Technology, Environment, Transport, and Telecommunications.

Assumption III:

- *In the coming years until 2020 (and hopefully far beyond it) there will be peace in Europe.* The events of '99 in South Eastern Europe have brought some parts of this region back many decades in terms of Transport (and other infrastructure) as well as on almost all issues of socioeconomic development. So it may look as an obvious assumption to make, but it is very important to remember that all forecasts, by "default", are based on the assumption of peace and co-operation.

Assumption IV:

- *European or national government policies will continue to be formed by a process of "balancing" the concerns for "growth", "equity", and the "environment".* "Growth", would call for a high-tech and market economy scenario with as little state intervention as possible. "Equity", would give emphasis on policies that primarily try to reduce inequalities in society both in social and spatial terms, while the "environment" would give the emphasis on the quality of life and environmental aspects. The process of formulating policy, is likely to continue in the future to be a stepwise one, that moves by successively focusing in one of these three basic concerns.

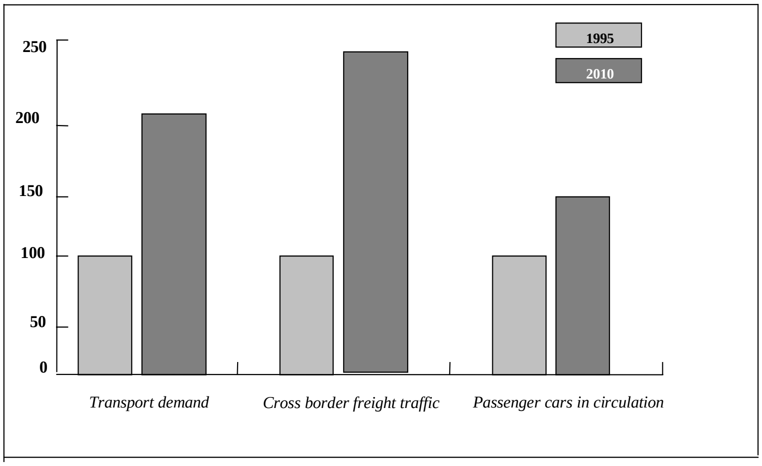
3. CHANGES TO THE QUANTITY OF FREIGHT TRANSPORT

3.1. Overall transport volumes and modal shares

In terms of volumes of transport that are likely to materialise in the coming decades, all indications point to the fact that economic, social, organisational and spatial trends are bringing about a highly mobile society. In such a society, the movement of goods and people (as well as information) has in the past, and will continue in the future to increase.

By some EU estimates, characteristically used in support of the TEN-T policies, (CEC, 1997) transport demand as a whole is expected to nearly double by 2010 as compared to 1995 (see Figure 1). Cross-border traffic is expected to grow by 2-3 per cent per year. By 2010 there will be approximately 30 per cent more passenger cars and 20 per cent more trucks in circulation.

Figure 1: **Estimates of future transport in the 15 EU countries (base year =1980)**



The relative share of transport modes in the total inland transport work, is a point of debate. Over the last 20 years or so, policies have failed to halt the “onslaught” of road transport in dominating both freight and passenger transport. The current trends show that, in EU countries, over the last 20 years road transport has increased its share (in total inland ton-kms**)** from 50 per cent to 70 per cent in Freight, and from 76 per cent to 80 per cent in Passenger transport. These increases have been made to the detriment of rail and inland waterways, the first reduced from 28 per cent to 15 per cent in freight and from 10 per cent to 7 per cent in passenger volumes, and the second accordingly (see Figures 2 and 3). These figures do not include Short Sea Shipping (SSS) which if added, will change these percentages somewhat but not the overall picture.

There is very little indication of the magnitude of Intermodal transport in the statistics, a fact that reflects their relative low magnitude in the overall inland transport work, today. The actual figures are "impeded" in the above ones, but a safe estimate would be that intermodal (in the true sense of the word, i.e. as defined in the existing EU legislation) accounts for a mere 2-3 per cent in freight transport, and even less for passenger.

Figure 2. **Relative shares by mode of freight transport in the EU**

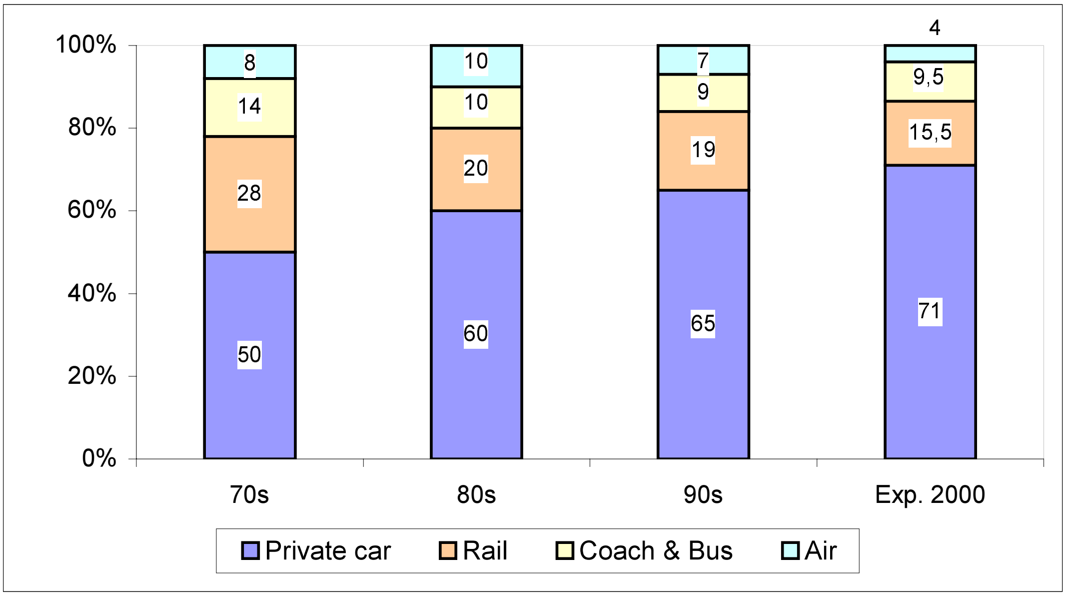
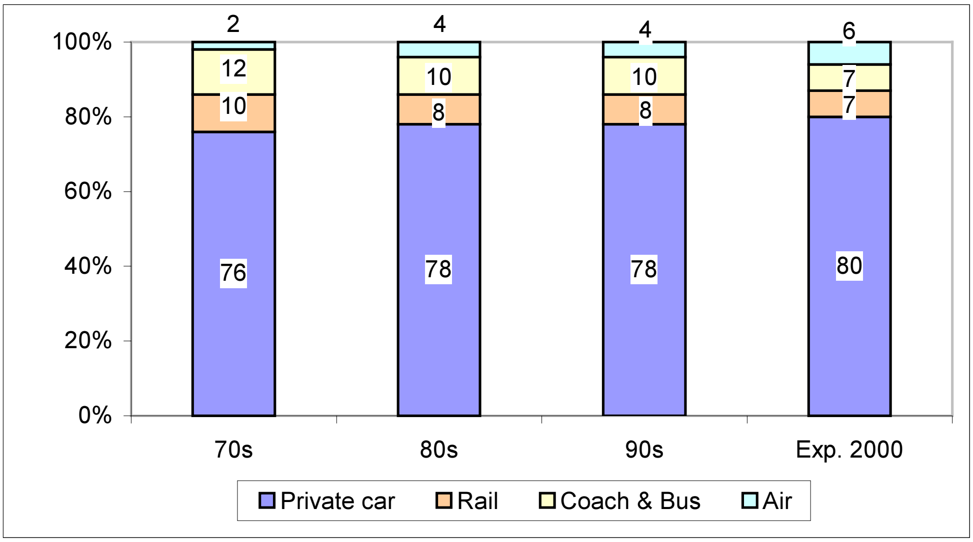


Figure 3. **Relative shares by mode of passenger transport in the EU**



As we are moving in the future in terms of the alternative policy focuses discussed above, i.e. from “growth”, to “equity”, and the “environment”, the efforts to increase the share of intermodal transport, and at the same increase the share of rail and inland waterways will be gradually intensified.

It would be reasonable to assume even a partial success of these efforts, which perhaps by 2010, but almost certainly by 2020, will probably bring a decline to the share of road transport in both passenger and freight to the benefit of intermodal. This will be more pronounced over certain major transport corridors that will be properly equipped to offer the convincing alternative to road transport.

A different view to the above, was expressed in a recent book by Christian Gerondeau (Gerondeau, 1997). Using well documented arguments, and adopting clearly a “road oriented” perspective, Gerondeau challenges all “conventional” arguments against road and in favour of rail and other “green” modes. According to his view, the future is still “Road oriented” in both freight and passenger. The inefficiencies built into rail transport through decades of monopolistic inefficiency are hard to be overcome, and produce a credible alternative to road transport. If this line of arguments holds true, it may well be that the future modal shares will continue to look more or less as today and perhaps even more road oriented.

3.2. Changes in the geographic distribution of (freight) flows

Besides the overall magnitude of (freight) transport flows, their geographic distribution is also subject to change. The main reason will be the different rates of GDP growth across the different regions of Europe. As was shown in Meersman and Van de Voorde (1997), an important factor in generating freight transport demand is GDP and the level of industrial production. These two factors do not always develop concurrently, because in a number of European countries economic growth is stimulated by the service sector and not by the industrial one.

Thus, as the prospects for industrial development of the less developed European regions of today are increasing, the relative growth rate in some Western European countries is likely to be lower than that of the others. As a result, the volume of (freight) transport will also develop at stronger rates along certain axes. The geographic location of these “new” axes of increased movement of freight, can be forecasted by referring to the past and (expected in the) future indicators for GDP and Industrial Production across Europe. These are shown in Table 1. As shown there, towards 2010, and perhaps further beyond, higher growth rates of GDP and Industrial Production are expected in Southern and Eastern European countries as compared to the Western ones. Therefore, the rates of increase of freight transport flows are likely to be much higher in these areas of Europe than elsewhere, thus “moving” the bulk of inland freight, geographically, from Western to a central, and south, south – easterly direction.

At the same time, a shift is likely to occur in the logistics chain which today brings most of the raw materials and containers that support industrial production and consumption, through the large ports of western Europe (Antwerp, Rotterdam, Hamburg, Le Havre). More and more of these materials in the future may well reach their final destinations via the southern – south-eastern ports, such as Gioia Tauro, Taranto, Pireaus, Thessaloniki or the main ports of the Black Sea. This will result in an additional shift in the connecting of inland freight transport towards these areas.

Along the same line of argument, we should note that between 1990 and 1996, the former eastern European bloc countries became the third most important trading partner of the European Union, after Asia and North America. Between 1991 and 1995, exports of goods from the EU to eastern European countries and the former Soviet Union countries increased by almost 50 per cent in value, while during the same period the total exports of the EU increased by only 11 per cent and imports by 5 per cent (Meersman and Van de Voorde, 1997). Similarly, during the same period, the former eastern bloc has become very dependent on western Europe, with 70 per cent of all its imports and 60 per cent of all its exports directed to western European countries (WTO, 1995). In the second half of the 90s, these trends were somewhat distorted mainly due to the events in Yugoslavia and the downturn of the economy in Russia. However, these events are of a temporary nature and should not confuse us as to the overall trends and prospects noted earlier.

Table 1. **Industrial production (IP) and GDP indicators in European regions (1970=100)**

	IP				GDP			
	1980	**1985**	**1995**	**2010**	**1980**	**1985**	**1995**	**2010**
Western Europe	126	133	158	180	132	143	175	190
Eastern Europe	130	140	90	170	120	130	105	160
Southern Europe	173	192	215	245	153	167	225	260
Europe (W+S)	129	137	165	200	134	145	175	200
USA	139	159	198	250	132	151	190	215

Note: "Eastern" Europe means the countries of former Eastern European block. "Southern" Europe means the southern countries of EU (Portugal, Spain, Italy, Greece), "Western" Europe means the non southern countries of EU.

Source: Compiled by the author from a number of sources such as : Table 11 in Meersman, Van de Voorde 1997, OECD's statistics on main economic indicators (November 1998), and WTO statistics and projections.

4. EXPECTED IMPACTS ON THE QUALITY OF FREIGHT TRANSPORT

4.1. Interurban freight

From the on-going discussion, it is evident that the quantity of long-distance freight transport will increase in Europe over the next two decades, and the bulk of this increase will move geographically, towards the developing Southern and Eastern regions of the continent.

As the level of traffic flows goes up, so will the demands for more "quality". There are a number of reasons that point in that direction:

1. The need for more "quality" in freight transportation, goes hand-in-hand with the evolving changes in production methods and organisation mentioned at the beginning.
2. The realisation that transport infrastructure provision will practically never catch up with demand, thus leaving a lot to be improved via other means namely, demand and traffic management actions, or wider application of new technologies, more integrated logistics chains management, and other "soft" rather than "hard" types of actions.

3. The wider application and observance of environmental controls and restrictions in the operation of freight transport by land.

The process by which freight transport services will evolve to their future state (in terms of quality and quantity) will be characterised by the series of (short-term) cycles mentioned before, i.e.:

- “growth”, represented by increased volumes of transport, but also increased use of new technological infrastructure in telematics and new technologies, new organisation methods and advanced logistics, and to some extend development of new physical infrastructure;
- “equity”, i.e. wider availability and use of the higher quality services by an ever increasing number of small and medium sized “users”; and
- “environmental” awareness, with environmental restrictions, incentives for higher use of intermodal transport, and “green” types of vehicles and modes.

The overall result of these “cycles”, as we move towards the horizon of 2020, is likely to be a European inter-urban inland freight transport system that is:

- more multi-modal;
- “heavy” user of transport telematics;
- producing more market induced quality ;
- widely available to small and medium sized users; and
- more environmentally compatible.

To correspond to these quality “dimensions” the transport providers of the future, will have to turn to new forms of organisation and commercial practices. A rather pioneering European research project called EUROFRET (EUROFRET Consortium, 1993) assigned by the EU Commission’s DGXIII in the framework of the 3rd R&D programme at the beginning of the nineties, examined the prospects and potential policies for European inland freight transport especially in view of the application of new technologies. It was suggested there, that the following four types of (freight) Transport providers will be able to fulfil the increased demands for quality and competition, and eventually “survive” in the long term in Europe:

- Large size and scale “mega” carriers or `network firms' that will be able to offer competitive integrated transport and logistics services to a wide range of end users.
- “Subcontractors”, that will survive with direct connections and “life support” through subcontracting by the Mega–carriers,
- “Co-operatives”, i.e. small and medium sized operators that will “co-operate” in any sense of the word in order to withstand the competition, and finally
- “Specialists”, i.e. firms that specialise in certain types of services that cannot be “mass produced” by the mega carriers.

Seven years later, the above views still stand valid, having been partially justified by the developments and trends of the past. It is expected that competition in the service provision, will be the driving force behind the above developments in the organisation of service provision. Since competition and other market factors are likely to press tariffs down, the main thrust for competitive advantage will be given, by all four of the above types of operators, in the domain of increasing the quality of service provision.

This is likely to happen via two major developments in the freight transport business environment of the coming decades:

a. Higher integration of the transport provider into the whole supply logistics chain. Supply chain management will be the higher order level of management into which transport will be integrated as one of a series of other supply chain management functions such as order management, inventory control, warehouse control, etc.
b. Closer co-operation and "integration" with the customer. This will necessitate more intensive use of information and telecommunications technologies in order to support the large amounts of information flows movement that will be needed between firms and spatially diffused customers. It is clear that with the relocation of service and manufacturing activities in space, that is expected in the new and enlarged Europe of the future (as per our previous discussion and assumptions), freight transport firms will need a constant flow of information, both horizontally (i.e. between firms and customers) and vertically (i.e. within the company).

So, the most compelling forms of policy action that would follow from the above, would be:

- Support on the development of advanced **international** transport infrastructure and data communications networks, to support the operation of the future freight (as well as other) transport system. The importance of national territorial transport infrastructure systems will gradually dissolve in the future.
- Adoption of competition rules and guidelines, both within one mode and between modes of transport, so as to avoid distortions to competition and monopolistic situations. The foreseen types of operator companies discussed above, that would in any case be compatible with market mechanisms, should be "protected" and "accepted" within the overall transport policy.
- Facilitation of the development of integrated Logistics services that take account of all modes of transport and thus give multimodal transport a fair chance of being selected.
- Greater concern and "promotion" of the interests of the final, end-user, in the freight transport service provision.

In later sections of this paper we examine in more detail the new applications that are to be expected in the future in the fields of telematics and logistics.

4.2. Urban freight transport and distribution

The increase of long distance, inter city, freight movement will be accompanied, by an increase in short-distance final product movement, mainly in urban areas. As products, from production sites are moved more frequently and in greater quantities to storage centres, and from there to the final market, more need will arise for short distance, more accurate and more "just in time" physical movement of freight vehicles. Globalisation of markets will strengthen this phenomenon, augmenting the spatial distribution of final products and thus their physical movements in urban areas.

As the funds and space for more urban transport infrastructure become scarcer, urban freight transport in the Europe of the future will have to rely more and more on three areas of improvement:

- The development of electronic aids to help improve the operation and exploitation of the freight transport and distribution networks,
- Urban traffic management systems to help optimise the urban traffic flow, and

- The development of new means and modes of urban freight transport (e.g. new electrical vehicles and pipelines).

The first of the above areas of improvement corresponds to the new telematics and advanced logistics concepts outlined above for inter-urban transport, since it will form the end parts of the integrated logistics chains mentioned there. As such, our discussion in the previous section, and the presentation of the expected advances in Logistics and telematics fields that will follow, covers also urban freight.

Technologies for dynamic, on-line **Urban Traffic Management (UTM)** are likely to see widespread application in urban areas across Europe as early as the middle of the next decade. Urban freight transport will benefit from the creation of a whole new 'environment' in which the urban traffic system is expected to operate in the future. It will aim to ensure the most efficient and productive use of the available space for the movement of people and goods. This new UTM system will be central to the concept of *Integrated Urban Road Transport Environment (IRTE)*, i.e. a series of interlinked and co-operating telematics systems and data bases that will allow on-line optimisation of traffic flows, dynamic information to the urban travellers, route choice and guidance options, and other functions.

Application of some sort of *demand management* actions, within UTM, to help reduce the load of private trip making in the congested urban space is also expected by the 2010 year horizon. *Interactive route guidance (IRG)* and *automatic debiting* which have until now developed separately, will soon see unified application and this will open new possibilities for efficient integrated demand management that will greatly shape the future of urban freight and distribution. The related issue of *road pricing*, i.e. paying for the use of road space in congested urban areas, is one that will also be of influence to the future shape of urban freight transport. Its principles, have been discussed for several years now but agreement on a common attitude is far from being reached. In this author's view, some form of road pricing seems inevitable that it will be at least partially in operation in Europe by the turn of the next decade (2010). This will be helped by the current development of integrated electronic toll payment systems that go now through a period of intense technological and regulatory development.

Other aspects of urban freight management such as *Automatic Vehicle Location (AVL)* for tracking and tracing as well as optimisation of the distribution process, are examined under the section on telematics.

As regards the possibility of **new modes of urban freight transport** one can see two major developments. The first, has really to do with alternative forms of vehicle propulsion and is not, strictly speaking, new mode. For example new *electrically driven vehicles* with battery autonomy of more than 150 kms. These new forms of propulsion, are likely to be on considerable use in European urban areas, by the next 8 to 10 years, but their full and widespread use is likely to take place in the second decade and towards 2020. The main incentive for this turn to new, cleaner types of fuels, will be environmental concerns and the visible (by then) future depletion of fossil fuels. Current encouraging technological developments in the field of electrical storage (batteries), and alternative fuels are the basis for these assumptions.

The second expected development, is the increased use of *pipelines* for the movement of freight (especially) in urban areas. Already plans exist and in some cases projects are in the implementation, to develop underground channels for the movement of freight via pipelines. A well known example, which is in an advanced stage of materialisation, is the pipeline planned to be constructed for movement of freight to and from the airport of Schiphol in the Netherlands. Projects like this will be more and more politically and economically feasible as the urban areas become more and more congested. Our estimate is that pipelines will form a small but sizeable part of the urban freight transport market by the year 2020 and beyond.

4.3. Freight "mobility" in rural areas

On the whole, the socioeconomic and spatial development of rural regions in Western Europe will be to a diminishing extent based on the economic activities of these areas, and increasingly so to the role of the countryside as a "compensation" area for urbanised society. It will be the provider of "milieux" for housing, leisure and tourism and will be utilised as a reserve of both natural and cultural landscape. Consequently, rural areas will increasingly become destinations of more and more freight transport movements, and will acquire more and more the needs of urbanised areas as far as the distribution of goods and freight transport services.

The potential for improving freight transport services to rural areas, in the future, will be posed much more strongly than today. Any improvements there will be materialised alongside with improvements to freight transport services for urban and inter-urban areas.

There are two distinctive differences between rural and other areas, as regards their potential for improving freight transport.

1. The quality of rural telecommunications networks is generally far behind of that of urban areas or of the networks that connect them (inter-urban). Improvement therefore of the rural telecommunication networks is a necessary precondition for the utilisation of the rural areas' potential in development.

2. In rural areas, "upgrading" demand is an essential element in successful implementation of comprehensive freight transport services. In rural areas, the end users are even more "critical" to the operation of the whole system. Thus improvements in social infrastructure, especially in "education" to help individual end–users become more and more acquainted with the modern technologies that are (to be) employed by freight transport, is an important factor.

Considering the wider socioeconomic importance of keeping our rural areas "alive" and "attractive" for people to live there, away from the big urban areas, the above points take up special importance. Thus, improving the service to these areas by high quality freight transport, alongside with the urban and inter-urban areas, should well be the primary goal of policies to be followed in the next two decades.

5. ENABLING TECHNOLOGIES AND SYSTEMS

In this chapter we consider the most critical "enabling" factors for the development of the freight transport services of the future. These are first, the new computer and telecommunication technologies (Internet-based or other) and their related applications - referred to by the single name of "*telematics*".

Secondly, the group of organisational and management applications that form the new field of *logistics* and *supply chain or distribution management* and third, the *convergence* between the technologies and systems in telecommunications, information technology, the Internet and consumer electronics.

5.1. Freight transport telematics applications

Over the last ten years we have witnessed a "revolution", that is still unfolding. It concerns the application, in the various forms of transport activity, of the new telecommunications technologies and computing known as transport *telematics*. Prominent among these technologies are the Internet, and the satellite or cellular telecommunications (GSM) based methods of transmitting data, as well as other technologies like smart cards, electronic payment systems, tracking and tracing and so on. There is an ongoing "revolution" at the moment as far as use of these technologies and systems is concerned, that will change the form and content of freight transport within the coming two decades. In the following, we refer to these new systems in a structured way so that we obtain a common point of reference.

5.1.1. Systems and technologies

The various transport telematics technologies and systems that affect freight transport operation can be presented in terms of the three main areas of their application, i.e. *systems for the vehicles* (on-board the vehicle), *for the network* and *infrastructure* and for *the office* (management of operations).

This distinction is primarily used for the purposes of presentation and discussion in this paper. Obviously all systems interact and co-operate to produce integrated applications. Also the distinction between applications for freight or for other types of transport is not always clear or meaningful and there are a lot of systems, especially the infrastructure used, that are in common.

A. Systems for the vehicle

These are principally based on-board the vehicle, and monitor the condition of the driver (also assisting him in his driving), of the vehicle, and of the freight. There are numerous technologies and systems that support the availability and use of distributed intelligence on-board the vehicle.

They can be distinguished into systems for:

- monitoring the functioning of the vehicle itself or its equipment (i.e. monitoring of vital functions such as brakes, tyre pressure, steering, etc.), as well as remote diagnostics and maintenance;
- the "intelligent" load (i.e. monitoring temperature, pressure, disturbances from bumpy road or driving, etc.);
- aiding the driver in his (her) driving tasks. Here are systems that range from relatively simple driver aids such as emergency warning, navigation and traffic information provision and vision enhancement, to more comprehensive and far-reaching ones such as automated vehicle guidance, cruising, intersection negotiation, lane change, lane keeping, stop & go functions, etc.; and finally,
- automatic electronic coupling of freight vehicles (especially for railways).

These will operate under the various high-frequency communication–high-speed image processing technologies, and their interconnection with available open wide area networks of communication. These technologies connect the vehicle with a control centre, at company headquarters.

B. Systems for intelligent network infrastructure and management

In this area, there are various applications that deal with the provision and functioning of intelligent transport infrastructure and its management. They generally concern all types of traffic, but there are some exclusively for freight (e.g. weight in motion).

The principal individual systems, most relevant to freight transport, include:

Intelligent, integrated urban (and inter-urban) traffic management systems. These have been mentioned already before. Considerable work is still to be carried out to test in practice the new systems and for setting pan-European standards for integrated traffic management especially for interurban traffic. The possibility of using systems such as *Interactive Route Guidance (IRG), User Fee-Financed Infrastructure (UFFI)*, as well as other services within an intelligent traffic management environment will open the door to a series of major applications. Agreement on standards for the USC (Unified Short-range Channel link) that will enable such advances has been in the past perhaps the most difficult task. As there are already systems available, a unification will come eventually, but it may be for the next generation of systems, i.e. in the 2010 horizon.

Of direct relation to the intelligent traffic management systems (or perhaps an eventual part of them) will be the potential application of systems to improve environmental performance at specific, sensitive, parts of the European road network. Such systems are of direct relevance to freight transport operation. In an *environmentally–led automated access control*, or "gating" system, specific actions and measures can be activated at pollution alert thresholds. In the ultimate stage of its development, such an environmentally oriented system of traffic management and control will be measuring precisely the emissions and noise for all means of (road) transport and will provide reliable data for environmental condition monitoring and public air quality information. This will mean that weather conditions monitoring coupled with a GIS-based forecasting of atmospheric pollution levels (perhaps linked with the monitoring of environmental vehicle parameters by on-board systems), will provide the basis of the fully *integrated environmental and traffic management* systems of the future. Such systems are likely to materialise beyond 2010 towards the 2020 horizon.

The establishment of a comprehensive and global *system for positioning, communication, and guidance/navigation,* of vehicles will be another very important development that will influence a series of major advances in freight transport and distribution. These advances include universal and affordable systems of positioning and guidance that can be used by all types of transport vehicles and providing alternatives for a free and competitive market-oriented system operation. The *Global Navigation Satellite System (GNSS 1 & 2)* is one such example that is under development. The 2010 time horizon seems a reasonable time horizon for the full implementation of such systems.

On the contrary, *real time, interactive travel and traffic information* services, to help drivers (and passengers) make the best choices concerning their travel, are expected to be in widespread use within the next five years. The communications networks, together with the equipment needed for user interaction, will develop in the near future along an independent path, derived from existing technologies such as ISDN, wireless GSM, and similar. End-user facilities for trip planning can be provided without difficulty by a series of different service providers. Widespread realisation of such services is foreseen before 2010. What is needed is the choice of a communications medium that is widely available and standards, as well as a reliable and well-established network of databases. As regards the communication medium and standards, the selection of the *Groupe Speciale Mobile* (GSM) system for pan-European application has not so far acted as a catalyst, as originally expected. However, once the basic communication needs covered by GSM are fully met, improvements to the GSM technology and infrastructure are expected to open the way for comprehensive traveller information systems. Market forces are already strong enough to generate products with attractive cost-benefit characteristics in this domain. For freight transport, additional effort is needed to make the best use of the options available in the GSM specification for data transfer and manipulation.

For driver assistance and co-operative driving systems and their major functions of *Intelligent Cruise Control (ICC), Co-operative Detection and Ranging (CODAR), and Interactive Route Guidance (IRG),* the following can be observed.

Intelligent Cruise Control offers great improvements in safety, efficiency, environment and comfort in driving, that already many of the automobile companies or their suppliers are engaged in developing it for commercial use. For commercial vehicle operations, its major field of application will be on interurban travel. The early implementation of *ICC* will require choice of the method and technology for detection and range finding. The “co-operative” nature of today’s feasible solutions leads to the conclusion that an early agreement, on a European scale, between all the interested actors is less feasible in the near- to medium-term future. On the other hand, *Interactive Route Guidance (IRG)* can be envisaged in the near future especially for dense and congested urban road networks. As regards *Co-operative Detection and Ranging (CODAR)*, a common European approach to a suitable implementation path is still to be established. Arrangements at European level for a common frequency band (e.g. the 80 GHz) may take several years, making it likely to happen by the year 2010 horizon with wider commercial applications well after it.

Finally, integrated end to end applications of new technologies and systems such as the above, are on the drawing board or in advanced stages of planning and pilot implementation in Europe or the US. Examples of such applications are given in 5.1.2.

C. Systems for the office

These systems include the so-called office “front-end” telematics applications. They are applications that deal with the “soft” side of the business. They aim at sorting out tasks such as freight handling and management, connection with the various telematics applications outside the office, connections to the clients’ systems and applications, integration with the so-called “back office” applications (internal organisational and managerial tasks), etc.

There is a variety of such systems, currently in full development that are gaining at the moment acceptance and commercial success. Principal among them, are the following:

1. EDI applications to interconnect the office with the clients and end-users (shippers) for freight order processing and monitoring as well as other tasks.

2. Enterprise Resource Planning (ERP) software for financial–economic planning tasks.

3. Internet applications for on-line load status information to the clients, and other customer interactive applications.

4. Freight Resource Management applications, i.e. decision support systems that help intermodal transport operators to allocate freight to different transport modes under constraints of time, capacity and cost.

5. Systems that connect the central office with the monitoring of the position and status of vehicles and loads, and inform the clients (mobile EDI or Internet-based applications).

6. Various applications for (pre-)clearance with authorities at customs, border crossings, ports and other similar points.

7. Applications for finding and booking of freight capacity, such as (electronic) “freight stock market”, or communicating with other modes of transport for booking space (e.g. ferries).

8. Special applications for hazardous goods management, e.g. handling, clearance with authorities, monitoring, etc.

Most of these systems are still in the development stage and are applied only in pilot applications. However, some applications such as EDI for freight handling and interaction with the clients, are now reaching their “critical mass” that will allow them to operate under full market conditions (Stage 4 in Figure 4). Others such as the various freight resource management tools, are still in an experimental and pilot stage.

It is generally thought that the various “freight office” applications will develop fully within the first five years of the new decade, maturing fully by 2010. The speed that characterises the development and market acceptance of certain technologies such as the Internet (see next section) will also characterise the development and market acceptance of their related “soft” systems for the “front office”.

5.1.2. Examples of two European end-to-end applications

By end-to-end applications, are usually meant complete systems that incorporate a number of technologies and offer end-users, at both ends, a full and reliable service. Such applications are only now beginning to be discussed, planned, or are under prototype or pilot implementation. It will take perhaps the best part of the first decade before we see any actual commercial implementations, but these applications are certainly along the lines of the integrated systems that we will see more and more in the future and that will characterise the 2020s.

Two examples are mentioned in the following.

1. ***European International Commercial Vehicle Administration and Monitoring System*** (indicative name suggested by the author). This application envisions an integrated system that will achieve a seamless movement of freight vehicles in Europe through monitoring, management, controlling and disseminating information about international road freight on the national and international road network. The functions involved in such a system would comprise :

   – *Public Administration function:*

     - Vehicle registration data;
     - Driver registration data;
     - Other vehicles and drivers information (e.g. driving penalties, point system, etc.);
     - Commercial vehicle safety data (for dangerous goods);

- Fees and taxation data (e.g. in connection with transit fees where applicable, road pricing, etc.);
- Border crossing information (where applicable).

– *Roadside functions:*

- *Roadside* weigh-in-motion;
- Citation and accident electronic recording;
- Roadside or border crossing electronic screening for vehicle and goods identification and other data exchange;
- Safety inspections as regards mechanical functions of vehicles.

– *In-vehicle systems:*

- On-board cargo monitoring;
- On-board vehicle mechanical functions monitoring;
- Cargo and vehicle identification data;
- Trip monitoring system (mobile EDI, tracking and tracing).

– *Company headquarters functions:*

- Freight administration and management;
- Fleet management;
- Hazardous goods management;
- Vehicle maintenance management;
- Fleet taxation and credentials records.

Between the above four subsystems there will be telecommunications and data transfer links based on various appropriate technologies such as EDI and/or wireless or dedicated short-range communications (DSRC). For example, between:

– Public Administration/Roadside systems:	Wireless or wire connection & EDI
– Roadside/In-vehicl:	DSRC or wireless
– Public Administration/Company:	EDI
– Company/In-vehicle:	Wireless (mobile EDI), DSRC.

Application of such a system on a European-wide scale is perfectly within the possibilities of the current technology and mainly needs political initiatives and acceptance. It would enable the seamless, non-stop movement of commercial vehicles on the European road network, with minimum (or zero) delays at border crossings or other control points. At the same time, all data concerning the cargo, the vehicle and the trip would be available to the administration, the company and the end-user. A system like this could be in application in the countries of the EU by 2005 at the earliest but, given the fact that no initiative exists so far and the necessary political agreements between the member countries take time, a more likely date would be 2010. For the rest of the countries of Europe to join, it would take a few more years, probably by 2015.

On the contrary, in the US a system that comprises almost all of the above elements is already being tested on a pilot basis. It is the Commercial Vehicle Information Systems and Networks (CVISN) programme of the US DoT and the Federal Highway Administration. A number of research institutes and consulting companies provide the architectural and technical input to the programme. More than thirty states are participating in the prototype and pilot application of CVISN, and many motor carrier companies. Full deployment is foreseen for 2005.

2. ***Multimodal Mobility Centres.*** The idea here is to provide comprehensive information and services for multimodal transportation chains, i.e. the combined use of more than one mode for providing attractive and competitive end-to-end transport services to users.

   The first stage of development would comprise the creation of telematics-based "*modal mobility centres*" i.e. for each mode of transport. These would interconnect various sources of information concerning the particular mode, in order to provide "one-stop" information to users. The types of information that would be available would include: schedule and tariff information, traffic management conditions and information, capacity availability, freight search functions (freight exchange), other travel information. These modal mobility centres would be based on ports, airports, highways, railway terminals, etc., and would be linked via Internet to offices and information provision centres, or via mobile EDI to the vehicles themselves.

   At a second stage, the "modal mobility centres" will be interlinked to support the interoperability of the various modes, and to create the future *integrated multimodal mobility centres*. The promotion of intermodality and the logistics applications mentioned at later sections will be greatly helped by these developments, whose time scale, however, must be realistically placed in the period 2005 to 2010.

5.1.3. The timing and process of innovation application

The time scale for a wider, commercial application of these new technologies and systems will depend on a number of obstacles that have to be overcome. Already some estimates based on the author's experience and judgement have been given. The deciding factor for market acceptance will primarily be the user's perception of costs and benefits, or more precisely "value for money" for the particular technology or its various applications into systems.

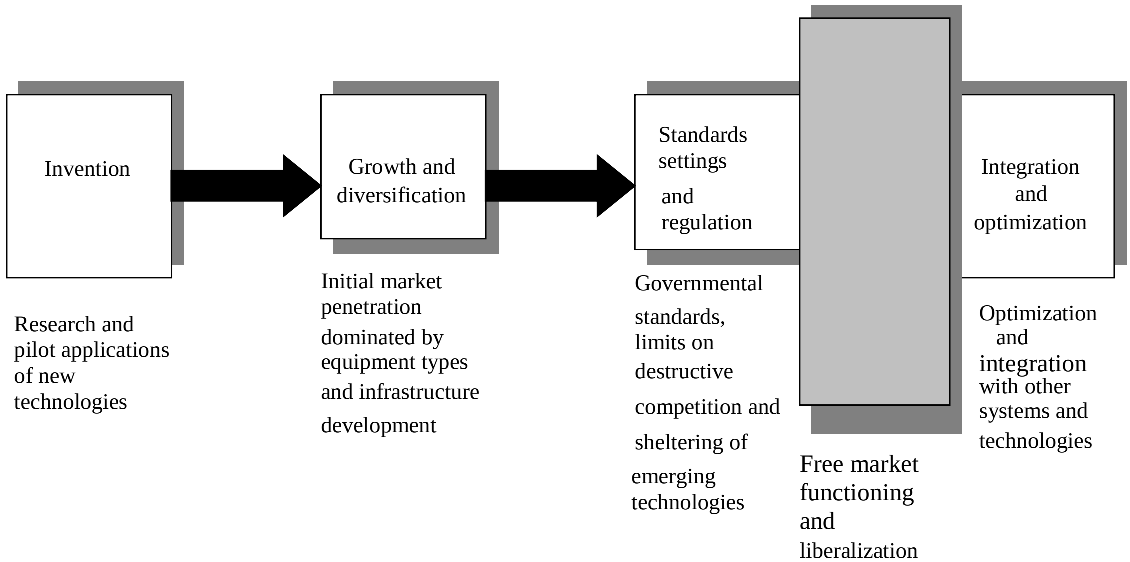
For the past decade, the attitude of the users was characterised by considerable distrust and hesitation towards investing in new technologies and systems. For the great majority of freight transport operators the attitude has so far been to look at these new systems as little more than fancy gadgets for scientists to play with, and not for the "real world". This attitude is rapidly changing, and it is certain that once a "critical mass" of users chooses to install and use one system then its wider application is substantially enhanced.

The process through which a novel system or technology catches on and becomes a marketable product is depicted in Figure 4.

At the beginning, there is (pre-competitive) research and development characteristically mentioned as "Invention" in Figure 4. This is typically supported by government or private (industry) sponsored research. The EU's Advanced Transport Telematics (ATT) programme in the 4th and 5th FP, is a typical example. This phase is followed by a stage of initial commercial growth and diversification in which market systems are developed and promoted in commercial applications. Concurrently with this phase but as a distinct process, and as a "critical mass" of users is achieved, the setting of rules and regulations for the orderly function of the market, takes place. Then as the number of users increases, full market functioning and "liberalisation" is achieved.

The final stage is the full optimisation and integration of systems and services to achieve highest user satisfaction and acceptance. The whole cycle, from “invention” to full market integration and optimisation, may take anything from five to twenty years or more, depending on the type of technology, its cost, market appeal and other factors.

Figure 4: **The process for the development and market penetration of new technologies and systems** (adapted from ENO, 1998).



It is perhaps realistic to say that the coming two decades will be the time when most of the various transport telematics systems will mature and achieve wider market acceptance and integration until the right end of Figure 4. As a general observation, one can note that applications at the office, i.e. the ones that have to do with the management of the (freight transport) functions, will be the ones to proceed faster in achieving integrated commercial applications within the first half of the decade.

The same can be said about the applications that are based primarily on telecommunications and the Internet (e.g. tracking and tracing, booking, EDI - mobile or not, etc.). Others, that require more substantial (intelligent) infrastructure development, such as automatic vehicle guidance, cruising, intersection negotiation, etc., will take longer periods to mature, perhaps further than 2020.

One last observation regarding timing estimates. In the decade of the 90s we have witnessed implementations and market penetrations of new technologies and systems at tremendous speeds. In a recent Financial Times survey (FT, 1998), A. Waller of the Cranfield Centre for Logistics was quoted as saying that “Technology is driving change 20 times faster than 100 years ago.” It took the telephone 35 years to reach 100 million subscribers but it took the Internet only two years to reach the same number. Similar speeds were experienced by the earlier technological novelties of the Fax (in the second half of the 80s), or the e-mail of the early 90s.

So, if anything, the time scales mentioned in this and the previous section as possible implementation dates and horizons could materialise earlier if the reaction of the market to products based on the new technologies is similar to the one experienced so far.

5.2. The outlook in logistics: supply and distribution chain management

Of equal importance and significance as the new telematics applications for the future shape of freight transport in Europe, will be the advance of logistics as the ultimate "tool" for managing the whole supply or distribution chain. Freight transport will eventually be fully integrated in this "chain" management concept and its control and management functions will be greatly influenced by the whole "science" of logistics.

Supply chain management was defined in a recent overview by investment bankers Morgan Stanley Dean Witter (FT, 1998) as "the integration of the flow of materials, documents, information and finance, which optimises individual shipments." Correspondingly, delivery chain management is a similar procedure but for delivering final products to retailers and final customers. There are also the dynamic aspects of supply chain management which require information from the retailer on daily sales of particular products to be transmitted back to the manufacturer to influence decisions on design, sourcing and production volumes.

Managing a supply or distribution chain brings together all parts of the supply or distribution process, transportation being one of them, which were previously regarded as separate. **Enterprise Resource Planning** (ERP) is a relatively new concept that was defined in order to help do exactly that. ERP software is already available to pull such information, and the various tasks, together but its full acceptance by the market is expected to take its time until maturity, sometime into the first half of the coming decade.

Application of advanced logistics and supply or distribution chain management techniques are revolutionising the way freight transport is conceived and organised. They are likely to form the primary basis for the way that goods are moved around in the coming century. Already, application of advanced logistics concepts in the last 10 to 15 years have reduced costs, such as administration, inventory, warehousing and transport, for the large companies who apply such systems, to 7.5 per cent of revenues in 1998, from 14.3 per cent in 1987. Something of the order of 6 per cent would be the absolute minimum to be expected by 2005. Also cycle time reductions were down from 27 days in 1987 to 12 days in 1998, and these are also levelling out with only three more days expected to be taken out of delivery lead times by 2003 (FT, 1998).

New concepts are being developed which are expected to be the new "catchwords" of logistics in the coming decade, and consequently have an important impact on freight transport and the way it is executed and organised. For example:

- "Agility" and "leanness" are the concepts that will characterise the next stage in supply chain logistics;
- Customised packaging, labelling and pricing, and increasing exchanges of personnel with customers is also a novel idea expected to catch on in the first decade of the new century;
- On the technology front, increased use of barcodes or electronic tags (if they become, as expected, cheap enough) to track products through the system and increased sales through the Internet are to be expected;
- "Postponement" is a key concept with products customised at the end of the delivery chain for particular markets and individual customers to minimise the need for stock-holding. The boundaries of manufacturing and distribution are becoming blurred. Delaying the finishing process reduces inventory;

- The need to tailor products for the individual customer is spreading from high-value fields such as cars to more mundane, lower-value articles. This process, known as **"***mass customisation***"**, puts further pressure on the supply chain. Mass customisation attempts to deliver a tailored product for the same price as a mass-produced one.
- Home shopping, primarily via the Internet, is being introduced gradually and is expected to become a major form of shopping by the year 2010 and beyond.

The implications of these developments which will penetrate the market gradually over the greater part of the 2010s, maturing towards 2005, are far-reaching not only for the way we view freight transport today, but also for the manufacturers and retailers as well as for the third-party logistics suppliers themselves.

The global market for logistics and related services is expected to increase tremendously over the coming years. Estimates of its size for 1996 are shown in Table 2. The change of approximately 20 per cent between 1992 and 1996 is expected to more than double between 2000 and 2005.

What exactly the effect will be in practice on freight transport of the widespread application of the above new concepts and ideas, is hard to predict. The quantity of freight travel may be affected upwards or downwards by some of the new concepts but certainly the quality of freight transport services will have to increase.

For example, the need to provide cost–effective, reliable home delivery and/or collection facilities, as part of the "home shopping" (teleshopping) trend via the Internet, can have mixed impacts on freight transport. It may, on the one hand, reduce the number of journeys as individual shopping trips by car are replaced by a smaller number of van trips, but at the same time, if centralised distribution centres are utilised, the number of lorries delivering to local stores will fall. The study of the potential impacts on freight transport (and transport in general) of the full introduction in practice of advanced Logistics, is a fascinating subject for study, like the investigation of the potential impacts of teleworking, and in this respect the coming decades may bring revolutionary changes.

Table 2: **The global market for logistics (FT, 1998)**

	GDP ($m)	Logistics ($m)	Logistics / GDP %
North America			
Canada	585 105	70 191	12.00
Mexico	334 726	49 753	14.86
US	7 576 100	795 265	10.50
Sub-total	8 495 931	915 209	10.77
Europe			
Belgium/Luxembourg	286 383	32 573	11.37
Denmark	174 237	22 440	12.86
France	1 537 582	171 230	11.14
Germany	2 352 472	306 264	13.02
Greece	122 870	15 269	12.43
Ireland	67 392	9 611	14.26
Italy	1 214 272	137 027	11.28
Netherlands	392 550	44 495	11.33
Portugal	101 182	12 871	12.72
Spain	581 565	67 022	11.52
UK	1 151 348	122 344	10.63
Sub-total	7 961 853	941 141	11.79
Asia/Pacific			
Hong Kong	153 068	20 992	13.71
Japan	4 599 706	522 982	11.37
Korea	484 777	59 764	12.33
Singapore	94 063	13 074	13.90
Taiwan	273 440	35 686	13.05
Sub-total	5 605 054	652 498	11.64
Remaining other countries	7 080 122	916 168	12.94
1996 global size	29 162 960	3 425 021	11.74
Estimated 1992 global size	23 743 432	2 894 092	12.19
% change 1992-1996 ($m)	23	18	3.6

Source: **FT survey on supply chain logistics, 1998.**

5.3. "Convergence" in the telecommunication technologies

Perhaps the most powerful enabling technology for freight transport is becoming the Internet and its related telecommunications technologies. In just over two years, Internet-based applications for freight transport have moved from 1st generation applications of simple presentations of the transport providing companies and their services, to the 2nd and 3rd generation of dynamic, interactive applications in which the end-user can plan, book and follow the progress of his (her) transport. These applications are penetrating a surprisingly large number of users very fast (in fact as fast as the Internet penetrates the market). They can be seen to become widespread within the next three years or so.

Here too, the trend is towards the integration and interoperability of the various telecommunications technologies that are promoted now all over Europe. The term that has come to encompass this trend in the telecommunication technologies, is **convergence**. This is defined as the union of telecommunications, information technology, the Internet and consumer electronics. Its influence will be manifested by an entirely new generation of products and services generated from the cross-pollination of these disparate industries. If the speed by which the Internet sized the business world is an indication, *convergence* is expected to take root and generate a whole number of new applications no later than the middle of the new decade. This development will facilitate the materialisation of the freight transport systems and services that were anticipated earlier and which are in close relation to users' needs.

When we think of *convergence*, we should think of the convergence of today's personal computer and the Internet to the point that the Internet will be the computer. In the not-too-distant future, the information stored on each of the individual computers will instead reside on the Internet. Thus, the Internet becomes a storage medium for both data and applications as well as a communications medium, distributing virtually unlimited computing power to anyone with a low cost, high-performance Internet access device. Two or three years from now, the new technological breakthroughs of *convergence* will be possible because the pipes used to transmit digital information are already evolving into "broadband".

The impacts of these developments on the way that freight transport will operate in the coming decade will be very substantial. Applications such as full electronic transfer of documents, on-line connection to the various government agencies for customs and border crossing clearance and other services, on-line tracing of the goods by the customer, booking services, electronic "freight exchange", intelligent freight planners, etc., will become possible on a mass scale, reaching, inexpensively, even the small- and medium-size users.

6. SOME KEY HORIZONTAL AND POLICY ISSUES

Policies to facilitate innovation and to resolve some of the contradictions and sustainability questions that arise in the evolution from the "Invention" to the "Integration-Optimisation" phase of Figure 4, will always be necessary. In this technology-led (r)evolution of a market-driven freight transport operation in Europe, national and international governmental policies should focus primarily on a number of horizontal issues that will form the necessary guiding paths of development, and will make sure that the interests of the final users are secured. These are presented in the following.

The continuous push for integration

As already indicated, technology trends are such that within the first decade of the new century, advanced information systems will expand from networks within individual companies to open networks, and that the quality of the information processed in such a network will improve tremendously. It is also expected that such systems will expand from within a particular industry to large community systems and to international information systems. Many companies have already created world-wide information networks that facilitate the flow of information necessary to control the new logistics applications.

There is an obvious need, therefore, to push for truly integrated freight transport services that will take advantage of the tremendous possibilities offered by *convergence* and the new information transfer networks.

Integration has to take place at the geographical, technological and modal levels. At a geographical level, we are referring primarily to services that are truly international. Technological integration calls for all standards problems to be overcome, both in the telecommunications and transport arenas, in order for genuinely borderless infrastructures to be developed. At the modal level, integration of modes means truly multimodal systems, i.e. offering the user the optimal combination of modes according to commonly accepted socioeconomic criteria.

The continuous push for more integrated systems and services that will benefit the end-user (shipper) should therefore continue to be a very important policy objective to pursue in the short- to medium-term future until the market itself makes the provision of such systems self-supporting and evident. It can even be said that the strength and success of the development of transport and related telecommunications infrastructure in Europe in the future will be related to the degree of implementation of the above three levels of integration *in both* the transportation and telecommunication systems.

The continuous push for pan-European and world standards

Many of the developments in telecommunications and information technology and their applications in freight transport and logistics will emerge in different ways, at different times and at different speeds. Trying to control these developments in a top-down approach will cause inflexibility and inefficiency and is not advisable.

However, the proliferation of all kinds of systems may also be harmful, and some kind of assistance in the required standardization, or help in achieving horizontal and vertical co-operation among the various systems and technologies, is valuable. This is an important policy task for governmental organisations.

The need for continuous monitoring and some control

All over the world, deregulation and privatisation are emerging as the current basis for policy formulation in almost all aspects of economic activity including, of course, freight transport. It is assumed that these basic economic policies will create possibilities for increased efficiency through competition amongst companies and countries. There is no doubt of the necessity for continuation of these policies and trends. Indeed, it is only within a competitive and carefully deregulated environment that all the changes anticipated in this paper can take place.

There is an important need, however, for policymakers and governments to organise basic monitoring mechanisms to ensure that safety and environmental protection rules are followed, and that monopolistic tendencies will not occur, while the true interests of the end-users are met.

Thus governments should organise permanent market observation mechanisms in order to systematically gather statistics and monitor what is happening in order to take appropriate action if necessary.

Solving the institutional and legal issues

From the preceding analysis, it becomes clear that the new technology-driven systems and infrastructure cannot simply develop from the modernisation of existing physical infrastructure through repair, replacement and optimisation of existing systems. They will also require the technological modernisation of entire systems, including their institutional and social components. Even if we therefore assume that the technical and infrastructural aspects will primarily be materialised as a result of market forces initiatives or their co-operation with public bodies, the institutional and legal aspects should primarily be addressed by the governments.

Examples of such institutional and legal aspects are questions of liability and authentication in EDI, questions of securing privacy and accuracy in electronic booking and payment systems, protecting the commercial interests of companies dealing through the Internet as regards access to confidential information, various fair competition issues, the issues related to the internalisation of the external costs, etc. These issues are not, of course, static and therefore governments should establish permanent procedures to address them and take appropriate actions.

Considering the social and behavioural issues

Freight transport is part of society's overall "mobility package". As such, there are serious questions about the future operation of the freight system that relate to social justice, equity and public acceptance. These questions, or rather their disregard, are usually part and parcel of processes that result in uneven development and consolidation of asymmetrical power relationships between the various regions or geographical areas.

Raising questions of social justice and exclusion may perhaps, at this current phase of the policy framework in Europe, be considered to belong to an outmoded frame of mind. However, absence of these considerations cannot remove the problems of those who are caught in the doldrums of persistent deprivation and perpetual restructuring, and will not prevent these questions from being restated more strongly in the future.

As we therefore look forward to technological breakthroughs that will radically change the way freight transport is performed in the coming 21st century, we should not stop including the social aspects and impacts in our debate and praxis of future mobility systems (freight or other).

Consideration of the externalities

This item is well known and follows most transport policy considerations. In order to achieve optimal usage of scarce resources, all of the costs that society has to pay for (e.g. for the adverse environmental effects) in order to facilitate transport activities, have to be taken into account and, ideally, be paid for by the users of these facilities. Freight transport is no exception. On the contrary, it has been in the past in the centre of debates concerning compensation for external costs, primarily those caused to the environment.

In the coming decade, or just beyond, the same technological breakthroughs that will make the foretold "revolution" in freight transport operation possible, will also make it possible to measure and account for these external effects. The issue will then be primarily a political one. Of course, the internalisation of external costs - also relevant in areas other than transportation and communications - could lead to significant changes in decisionmaking, and therefore will continue to be of the outmost importance in the future.

7. CONCLUSIONS

As we enter the first decade of 2000, and look towards 2020, freight transport in Europe stands at a crossroads of technological development opportunities that will radically change its face, but also of yet unresolved institutional and other policy issues that will determine the range and extent of these changes. As the remaining few restrictions are removed and the liberalisation of freight transport in the European Union countries becomes complete (soon after 2000), freight transport operation at European level will seem to be proceeding at two speeds. One, characterised by high organisational efficiency and free from administrative and other restrictions, led by technological solutions that are now already at various stages of development, and one in the remaining countries of Europe, mainly in the East, continuing to enforce restrictions and lagging behind in technological efficiency. As the EU is enlarged, these disparities will tend to disappear.

The first realisation, concerning future European freight transport, is that its volumes are likely to further increase, both overall and within certain modes. By some forecasts, cross-border traffic is expected to grow by 2-3 per cent per year, while by 2010 some 20 per cent more trucks are expected on the EU roads. It is an open issue whether the current predominance of road transport will continue to exist in the coming decades. This issue is likely to remain open until credible alternatives are presented to the users either in the form of rail or multimodal transport. At the same time, a shift of the freight transport volumes can be foreseen from western European corridors to eastern and southern – eastern ones as development moves at higher rates in these parts of Europe.

As regards the quality of freight transport services, the overall result of a series of expected "cycles" in the focus and priorities of future developments will be a European interurban inland freight transport system with more market-induced quality, and which is:

- more multimodal;
- a "heavy" user of transport telematics;
- widely available to small and medium-sized users; and
- more environmentally compatible.

Consequently, the structure of the freight transport market as regards the types of companies offering services is expected to be defined by:

- Large size and scale "mega" carriers or "network firms" that will be able to offer competitive integrated transport and logistics services to a wide range of end-users;
- "Subcontractors", who will survive with direct connections and "life support" through subcontracting by the mega–carriers;
- "Co-operatives", i.e. small and medium-sized operators who will "co-operate" in every sense of the word in order to withstand the competition; and, finally
- "Specialists", i.e. firms that specialise in certain types of services that cannot be "mass produced" by the mega-carriers.

The interurban freight transport business environment of the coming decades will be characterised by:

a. Higher integration of the transport provider into the whole supply logistics chain. Supply chain management will be the higher order level of management into which transport will be integrated as one of a series of other supply chain management functions.
b. Closer co-operation and "integration" with the customer. This will be achieved through more intensive use of information and telecommunications technologies in order to support the large amounts of information flows and data that will be needed between firms and spatially diffused customers.

Urban freight transport will be dominated by developments in urban traffic management systems and in new fuels or modes of urban freight transport. The first will be the result of the combined implementation and operation of a whole new series of technologies and systems of urban telematics that will form the integrated urban telematics environment of the future. The second will result from the advent and wide use of new fuels and electrical vehicles, as well as of underground pipelines for the transport of urban freight.

At the same time, rural areas will increasingly become destinations of more and more freight transport movements, and will increasingly acquire the needs of urbanised areas as far as the distribution of goods and freight transport services is concerned. The need for improving freight transport services to rural areas will, in the future, be posed much more strongly than today. Any improvements there will be materialised alongside with improvements to freight transport services for urban and interurban areas.

The "enabling" factors for the expected changes in the future freight transport services, will be through three main developments. The full application of the new *transport telematics* technologies and systems, advances in *logistics and supply chain management* techniques and possibilities that will emerge from *convergence*, i.e. the union of telecommunications, information technology, the Internet and consumer electronics, which will give rise to limitless new telecommunications and computing capabilities. The presentation and discussion of all three of these factors in the previous sections of this paper, and of the most prominent of the new systems and applications, revealed a number of possible implications on European freight transport for the coming two decades. It has also indicated a possible timetable for their full market implementation.

According to this analysis, the period between 2005 and 2010 is likely to be the period that will mark the changeover from the current period of prototyping and pilot application for most of the various new systems, to their full market operation and wide user acceptance. Then the years beyond 2010, towards 2020, will see the further optimisation and integration of systems and services and the full implementation of complete end-to-end systems, covering geographically the whole of Europe.

The time scales indicated above are not so much the result of the anticipated speed of implementation of the new technologies and systems (which are likely to mature at very high speeds anyway) but also of the time needed for administrative and legal issues that will have to be resolved. In this respect and even with the assumptions that were made at the beginning of this paper (about the enlargement of the EU, the strengthening of the European institutions, the establishment of peace, etc.), Europe has an added difficulty compared to the US. It is the diversity of national interests and policies that are followed by the various countries, as opposed to the independent but much more uniform approach and policies followed by the United States.

Therefore it is perhaps of equal importance, with the advent of the new technological possibilities, to take into account the crucial horizontal and other policy issues that will go hand in hand with any new developments. A number of these issues were addressed.

- Horizontal and vertical integration of systems and applications. Two characteristic examples were given of such integration in the previous sections. One was the establishment of a *European International Commercial Vehicle Administration and Monitoring System* that would enable seamless movement of freight vehicles in Europe while all monitoring, management, controlling and information dissemination functions would be made electronically. The other was the establishment of *Intermodal Mobility Centres* that would provide users and operators alike with on-line information and data about freight (or passenger) travel by all modes;
- Establishment of new European and international standards to cover the functioning of the new systems;
- Establishment of mechanisms for continuous monitoring of the function of the market and if necessary controlling it, in order to safeguard the interests of the end user;
- Solving some outstanding institutional and legal issues that stand in the way of a wider market implementation of new technological systems. Examples of such issues are questions of liability and authentication in EDI, questions of securing privacy and accuracy in electronic booking and payment systems, protecting the commercial interests of companies dealing through the Internet as regards access to confidential information, various fair competition issues, the issues related to the internalisation of the external costs, etc.;
- Making sure that the implications to society and social justice are addressed and dealt with; and finally,
- Finding ways to bring into the picture the much discussed, in the past, external costs such as the environmental costs associated with freight transport operation of all modes.

The importance of the above policy issues cannot be underestimated. Past experience teaches us that achieving consensus and political agreement is perhaps the most difficult and time-consuming part of implementing technological innovation. Basic economic and social history also teaches us that all human behaviour, preferences and trends have a periodical nature and, as mentioned in the introduction, real life progresses in cycles. So the current period of intense deregulation and privatisation is likely to be followed by some kind of return to regulation and more government involvement. The overriding issues could be the need to preserve the environment, or secure some minimum level of safety, social equity and public service. When this turn in current policies will occur is difficult to predict but it is quite likely to be within the period until 2020 that we examine in this paper.

As we therefore look forward into the 21st century, we can see the market application of a number of technological breakthroughs that will radically change the way freight transport is performed today. At the same time, we hope that the delicate social and political issues associated with these new applications will also be solved soon, and that European policymakers will be able to proceed with the same speed and efficiency as the new technology.

BIBLIOGRAPHY

CEC (1997), *The Development of the TransEuropean Transport Networks TEN-Ts*, informational booklet, Commission of the European Communities, Brussels.

CEC (1994), "The development of guidelines for the TransEuropean Transport Network", report COM (94) 106, Commission of the European Communities, Brussels. These guidelines were set for revision before the end of 1999.

ENO (1997), "Intermodal Freight Transport in Europe and the United States", report of an ENO Foundation Policy Forum, Washington DC, October 30-31.

EUROFRET Consortium (1993), "*Strategies for the development of telematics-based freight transport operation in Europe*", CEC DGXIII DRIVE Programme, Project No. 2018, Final Report.

FT (1998), "Supply chain logistics" by C. Bachelor, *Financial Times* survey report, published 1st December 1998.

Gerondeau, Ch. (1997), *ITS: Transport in Europ*e, Artech House Inc., Boston, London. Reviewed by G.A. Giannopoulos in *Transport Reviews*, 1998.

Giannopoulos, G.A. and A. Gillespie (1993), *Transport and Communications Innovation in Europe*, Belhaven Press, London.

Masser, I., O. Sviden and M. Wegener (1992), *The Geography of Europe's futures*, Belhaven Press, London.

Meersman, H., Van de Voorde, E. (1997), "Is freight transport growth inevitable?", in: *What Changes for Transport in the Next Century?*, Conference proceedings, ECMT International Symposium on Theory and Practice in Transport Economics, Innsbruck.

TNO (1995), *Concepts 2020, Road transport, vehicles and the motor industry into the next century*, International Symposium, 16 November 1995, proceedings.

TRUTh (1999), *Transport research priorities and policy master plan for the decade 2000–2010*, Greek Secretariat for Research and Development, Final report by a consortium led by the TransEuropean Consulting Unit of Thessaloniki SA, December.

World Trade Organisation (1995), *International Trade, Trends and Statistics 1995*, Geneva.

CONSTRUCTING A REFERENCE SCENARIO FOR EUROPE

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SUMMARY

Arcueil, July 1999

INTRODUCTION

The term *scenario* appears to be becoming the new buzz-word in transport analysis and indeed economic analysis in general. There is a danger, however, that it may turn into a vague "catch-all" term unless it is defined more precisely and related directly to a given form of practice. This type of practice is often associated with a second word, *forecast*, which is the theme proposed for the ECMT Symposium. However, the concept of what constitutes a forecast is becoming increasingly nebulous in a world characterised by growing uncertainty and changing trends, in short, in a world on the brink of the Millennium in which "deterministic" models are proving to be powerless to shed light on the future.

Although constructing scenarios and making forecasts are interdependent activities, they represent two very different approaches. Constructing a scenario consists in building up a picture of the future which will be strongly influenced by the assumptions made and which to a greater or lesser extent will require some degree of imagination. It is a kind of "benchmark" marking out a field of possible situations. A forecast, on the other hand, attempts to describe the "most likely" situation, although it may be strongly influenced by the strategies pursued by actors and thus the vision they themselves have of the future.

It is probably in this relationship between scenarios and forecasts that the crux of the problem lies and the key to the success of the concept of scenarios is that the latter is often found to provide a useful means of addressing the many problems that can arise. The aim of this paper is certainly not to propose new definitions of the terms "scenario" and "forecast" to add to the already excessive number of definitions, but to take a practical example from the transport sector to illustrate the interest of an approach that will become a victim of its own success unless properly formalised. The scenarios are accompanied by projections that provide the former with a quantified content which cannot be qualified as a forecast since it makes no reference to the probability of the scenario actually occurring.

By opening up a new area for analysis and research, the construction of scenarios and forecasts looks set to become a particularly rich and promising activity, both from the very general standpoint of the ethical responsibilities which decisionmakers bear for the impact of their actions on the environment, and for highly specific reasons relating to the scope of application of transport systems.

At a time when planning methods no longer meet the requirements for consultation and collaboration, when models have proven to be incapable of accounting for the complexity of events and when market mechanisms provide little insight into the future, the challenge amounts to no less than rehabilitating a prospective approach that allows decisionmakers to accept responsibility for the choices they make. In the transport sector, the need for such an approach makes itself felt at a practical level and on an almost daily basis since the issue at stake is the construction of infrastructure and the planning of land use from a long-term perspective.

The first part of this paper discusses the practical aspects of scenario-building and forecasting in the transport sector over the past 20 years, but is not intended as a comprehensive review of this area;

the examples will largely be taken from the work of the ECMT Group on Trends in International Traffic and infrastructure investment (TTI Group).

The second part of the paper will attempt to construct scenarios for Europe in the horizon year 2020 on the basis of some of the findings of the 4th EU Framework Programme for R&D.

1. CURRENT PRACTICES: MAKING FORECASTS WITHOUT A UNIFORM METHODOLOGICAL FRAMEWORK

In practice, scenarios are not constructed according to a given method. The 4th EU Framework Programme addresses this problem from various standpoints which will be discussed later in this paper.

The term "scenario" is nonetheless frequently used and often embraces a series of assumptions relating to the socioeconomic environment of the transport sector, for example more or less rapid growth in GDP, the opening-up to varying extents of foreign trade, varying degrees of taxation of road transport, which are swiftly qualified as expansion, recession, globalisation, environmental protection scenarios, etc., without any explanation being given of the underlying social and economic mechanisms such as the impact on macroeconomic aggregates, the implications for regional and sectoral development, or the effects on the organisation of transport systems.

The aim is therefore necessarily restricted to describing the overall trends that will serve as benchmarks for the presentation of long-term policies; it is not really possible to speak in terms of "projections" associated with scenarios providing a coherent and comprehensive picture of the transport system.

Whatever the case may be, the situation varies considerably from one country to another, as may be seen from the two successive reports issued by the ECMT TTI Working Group; the comments made in this chapter draw heavily on the work of this Group.

In order to describe practices at the European level, mention must first be made of two aspects which colour the entire approach and its relevance. These aspects relate to the data available with regard to the situation in reality and the models used to project this reality, two aspects that are closely interlinked.

1.1. The pressing problem of transport statistics

All projections and forecasts are based on data and on the many methodologies that have been proposed; they are also based on the assumption that the relevant transport statistics are readily available. However, these statistics either do not exist or, if they are available, remain highly incomplete.

There are several reasons for this dearth of statistics, which the creation of a single market has done nothing to improve at the European level. The situation can only begin slowly to evolve by making fundamental changes to the statistical system in terms of both content (in view of the emergence of new phenomena to be quantified and the identification of variables of greater relevance) and methodology (development of statistical surveying and sampling techniques at an acceptable cost), problems which have also been addressed by research programmes in sections dealing with the information system.

Administrative statistics and economic statistics

The first reason for the lack of statistics is the weight of history, namely, the fact that data are provided by an administrative system designed to regulate the transport sector rather than to monitor it in economic and statistical terms. This system collapsed with market liberalisation and the opening of borders and there are no grounds for restoring the system simply to build a database. Perhaps the best example is that of "customs" data. Customs data within the European Union ceased to exist in 1993, when they were replaced by a system based on information supplied by firms, whose data are far less detailed. From this standpoint, it is clear that attempting to secure a comprehensive data input would be unrealistic in that firms and households are already sufficiently involved in all kinds of other data collection exercises. Hence the use of other approaches and techniques based on sampling, which nonetheless remain cumbersome and take time to put in place at the international level.

Statistics on stocks and flows

A second reason is the difficulty in obtaining data on flows and spatial dynamics. These two parameters, which relate to the mobility of goods and people and acquire a spatial dimension through networks and the supply of services, provide a crucial insight into transport. While admittedly there is considerably more geographical information available as a result of progress with Geographical Information Systems (GIS), little information is collected on trade between regions or even between countries; indeed, there is virtually no information available on passenger traffic. Specific *ad hoc* surveys are sometimes conducted as part of the preliminary work on major projects, but even these *ad hoc* surveys are usually not comparable.

Statistics on demand and supply

A third reason is that very few statistics are available with regard to transport supply. While passengers are occasionally willing to answer questions regarding the reasons for their choice of transport service, it is far harder to get answers from the firms supplying such services. The example provided by railway operators, who have a far more entrepreneurial approach to their operations and who are therefore far more attached to the principle of business confidentiality, is extremely revealing in this respect. Hence the scant information available on costs, prices and services, as shown by several attempts to obtain such information in recent research papers[1].

While it is not our intention to discuss the inadequacies of the current statistical system, to which far too much attention is now belatedly being drawn, at greater length at this point, it is nonetheless a fact that one of the consequences is that it is difficult to compare traffic trends and elasticities with economic aggregates. The elasticity of freight traffic with regard to GDP varies substantially from one country to another and no sufficiently compelling reason has been put forward, either in terms of the structure of trade by product or the morphology of trade networks, to explain why this should be so. In the passenger sector, practically no information is available on short trips, which account for the largest share of car traffic, and there are no data on flows between regions or even between countries. The differences in rates of growth in transport, and the volume of goods transported (tonnes transported per unit of value produced), between countries are often surprising and sometimes hard to understand in comparisons between individual EU Member States and, to an even greater extent, the countries of Central and Eastern Europe; in the latter case, however, the transport sector is probably not the only area where such problems arise and the measurement of economic activity itself as well as GDP continue to arouse considerable debate and controversy.

In a recent European research project[2], the stages in the progression from production in value terms to traffic in terms of tonnage in various countries were examined in detail. One highly critical point remains the assessment of output in tonnes and the conversion from tonnes produced to tonnes transported; the resultant "ratio" (handling factor), like the estimated value of a tonne transported, remains difficult to interpret and compare, which does not detract from the interest of the research undertaken but simply illustrates the difficulty in narrowing the gap between a system for observing production and trade and a system for observing transport. This point lies at the heart of the construction of scenarios relating the socioeconomic environment to transport.

It is against this background that EUROSTAT collects a series of transport datasets which must be supplied to the European Union in accordance with the requirements of directives relating to statistics. Problems over data compatibility still remain between country results but also between different sources within the same country. Besides the results, there are also problems regarding data input methods and the harmonization of methods, notably with regard to passenger and freight transport by road. This is a necessary condition for the comparative analysis of elasticities.

The ECMT regularly produces and analyses a more limited set of traffic indicators which has the advantage of being monitored over a longer period of time and approved by Member countries; the following diagrams reflect the disparities between trends by country and by mode over more than 20 years.

In view of the situation regarding statistics, several approaches have been adopted towards the construction of scenarios.

- The need to "avoid", to the greatest extent possible, the constraints inherent in databases by adopting more qualitative approaches; such approaches are indeed necessary and make it possible to identify parameters which provide an indication of future trends but which are not always listed in the existing statistical system, thus showing that such a system must in any case be capable of evolving.

There are often two opposing approaches adopted to the construction of scenarios: (1) a retrospective[3] approach which provides a prescriptive description of a future state of the transport system on the basis of pre-defined criteria regarding the quality of life and the environment; such an approach places the emphasis on the policy direction needed to achieve this state; and (2) a prospective approach which attempts to project a situation from a base year and which from the onset is far more demanding in terms of data requirements. In either case, however, it still seems difficult to break away from the quantified description of a reference situation showing the scale of the work that lies ahead or the scale of the measures to be applied in order to correct trajectories that are too far removed from the initial objectives.

- The need to "constrain" existing data within a formal logical framework in order to make comparison more systematic by constructing a framework that can impose itself through its consistency rather than by providing a faithful reflection of a given reality.

At this stage, the issue of data production comes back to that of modelling[4]. Many databases on flows, as for example the database on interregional flows in Europe, are based on a model rather than on observation; data are only validated through observation in the case of certain flows or certain overall movements between one country and another. The result obtained imposes itself through the logical links between variables, including, where necessary, assumptions aimed at simplifying the elasticities between industrial output and transport. The strength imparted by consistency, which in fact remains relative in view of the complexity of the phenomena involved, may in some cases even lead to the use of the results of models rather than national data, due to the scale on which fields and methods can vary from one country to another.

Figure 1. **Number of cars per 1 000 inhabitants in comparison with GDP per inhabitant (ECU)**

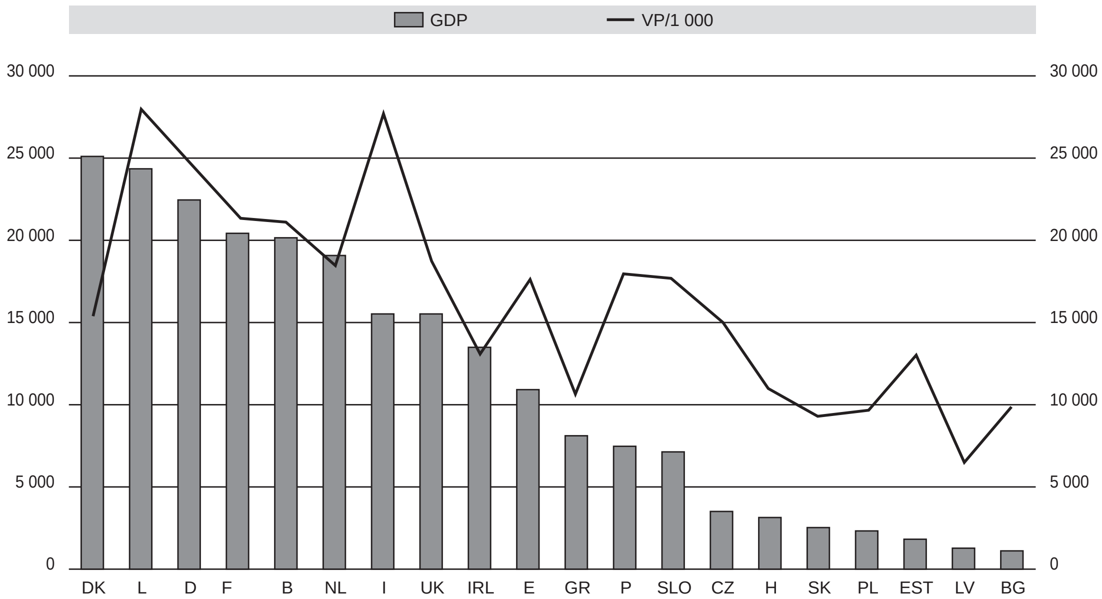


Figure 2. **Passenger-kilometres transported per GDP ECU in the European Union and certain Eastern European countries**

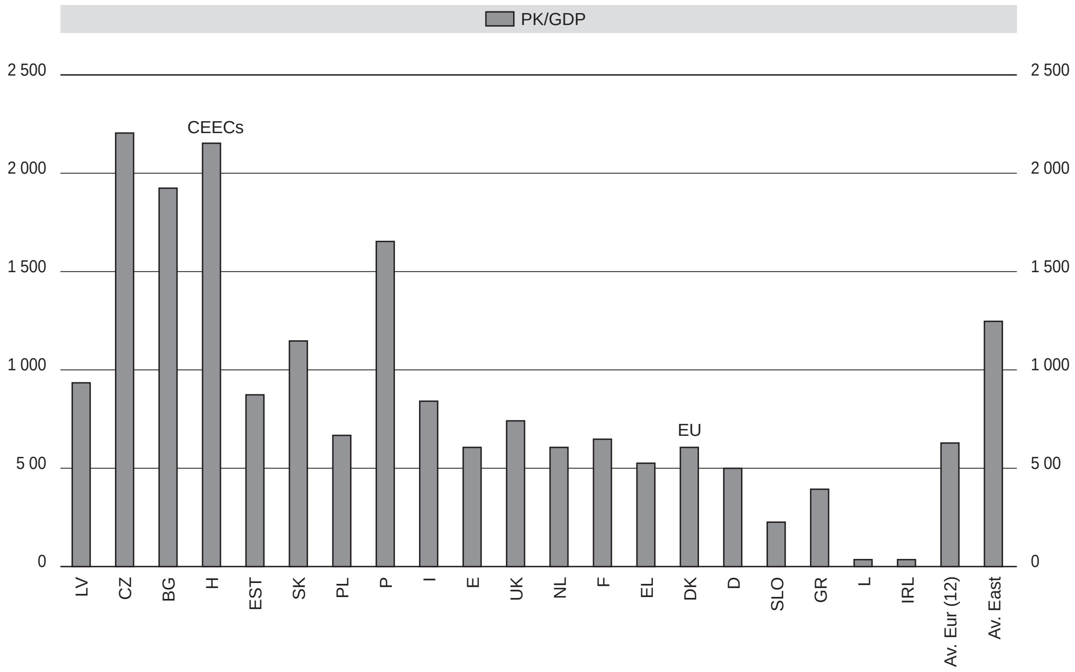
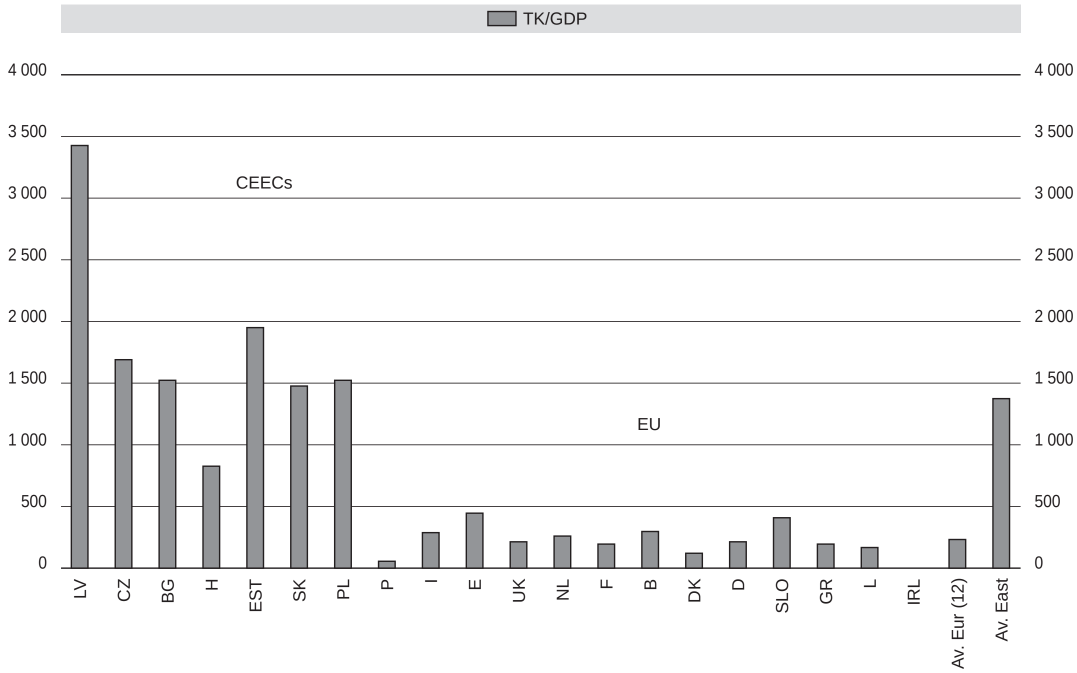


Figure 3. **Tonne-kilometres transported per GDP ECU in the European Union and certain Eastern European countries**



1.2. Scope and limitations of current models

The above analysis clearly suggests that improving the statistical system must not be seen as a prerequisite for developing projection models. There is in fact constant interaction between the production of statistics and the development of models to build transport databases or "information bases". Through the use of models, these bases can readily be applied to either past or future periods and thus be used as tools for prospective analysis.

There are three families of models suitable for use in a prospective approach:

- *Econometric model*. The representation of reality is deduced by the existing statistical system through the interplay of correlation calculations and the calibration of equations. This is the traditional concept of forecasting models in which statistical validation tests play a central role[2].

- *Explanatory model*. The representation of reality is described by the existing statistical system but is also supplemented by a more qualitative analysis that introduces factors considered to have a determining effect on trends or on the understanding of phenomena, factors that are not necessarily described by the statistics. Criteria for relevance help to remove the constraints of existing information.

- *Strategic model*. This model provides a representation of reality and, in addition to the above-mentioned factors, also introduces variables for actions that act as "controls" for the system. At this stage, the model fully represents the role played by actors. Introducing variables for actions does not necessarily mean that these variables will play a determining role; their impact may simply consist in correcting major trends.

Whatever the case may be, factors relating to the description of supply assume an essential role since they constitute a privileged point of intervention: effect on supply of incentive measures introduced by the State, investment and taxation policies, impact of the strategies pursued by firms to improve the quality of service and, in particular, the account taken of interactions between price determination and transport costs.

The system analysis achieves its full potential when it attempts to provide a relevant description of main relationships by introducing the effects of actors. The scenarios studies are not simply "external" scenarios with regard to the transport system, but scenarios that provide a full picture of the situation in the transport sector at a given horizon year[5].

In practice, this distinction between models is rarely made and many of the models used in national scenarios remain at a highly aggregated level.

These simple econometric models linking economic activity and traffic levels usually include a global composite indicator for trends in passenger and freight transport prices, sometimes by mode. They can thereby be used to simulate overall price increases or decreases without actually being genuinely "strategic" models reproducing actor mechanisms more precisely. Their "explanatory" nature is thus reduced. The impact of the various factors constituting infrastructure supply, service quality and taxation policy is not explicit and it remains difficult to distinguish the respective effects of factors in supply and demand on trends in transport.

Lastly, there are still very few comparisons that can be made between the results of existing models other than at an aggregated level of comparison of rates of traffic growth, which in many cases exhibit significant discrepancies for which differences in the assumptions made with regard to the socioeconomic environment or in the fields of analysis covered provide only a very partial explanation.

Besides the problems posed by statistics, there are also three types of conceptual difficulty that should be noted with regard to:

- The segmentation of transport markets, which requires at least a minimum distinction to be made within an initial division between short-haul and long-haul transport for both passengers and freight; however, the way in which the reasons for movements, type of trip, type of product transported and packaging are disaggregated varies considerably.

- The inclusion of data regarding transport supply, the strategic importance of which for the simulation has already been recalled. In the case of passengers, these data consist in modes of tarification and quality of service, the impact[6] of which has been clearly demonstrated in certain studies. In the case of freight, a distinction is rarely made between modes of operation, and in particular complete train load or single-wagon modes of operation in the rail sector, despite the fact that failure to do so leads to highly significant differences in terms of costs and time[7].

- The description of transport networks and the grid size required for analysis of issues relating to accessibility, capacity and congestion. In the case of flows at the interregional level, for example, there are few models that describe networks in sufficient detail, which makes the assignment of flows to routes and consequently the conclusions regarding congestion that are needed for input to the decisionmaking process even harder to predict.

1.3. Limited and specific practices in different countries

After finalising a questionnaire, the ECMT TTI Working Group has analysed these practices on two occasions. The main conclusions of its analysis were submitted to the Conference of Ministers in Annecy and Berlin.

Practices vary as a result of the methodological difficulties mentioned above and also because of the emphasis placed on the prospective approach.

With regard to these practices it is not really possible to talk in terms of developing differentiated scenarios offering genuine alternatives for transport policy. The aim is rather to establish a central forecast or a reference projection, or even guidelines on the basis of which a number of "variants" can be tested without having to consider fundamental structural changes; variants of growth assumptions, on the one hand, and variants of transport policy on the other are the ones that are most frequently analysed.

These variants are based on different assumptions relating in most cases to GDP, pricing policy or levels of taxation.

The central forecasts can subsequently be used for specific projects and in particular for infrastructure projects, as is the case in Germany, France, the United Kingdom and the Netherlands.

These practices make use of increasingly sophisticated models that are more or less disaggregated. The most comprehensive models are those used in Germany and the Netherlands which require analysis of origin-destination movements by region and which describe national infrastructure schemes.

The main conclusions of the ECMT TIT Working Group may be summarised as follows[8]:

1) With regard to growth in GDP, gain a better insight into the growth dynamics of industrial output that are directly related to freight traffic; more generally, improve the representation of structural changes in production arising from the increase in the output of immaterial goods in the economy, which may be explained by the larger share of the economy accounted for by services but also, within the material production sector, the larger share accounted for by high value-added products and the decline in bulk goods.
2) Differences between countries in the elasticity of traffic to GDP or household consumption, which cannot be understood without greater in-depth analysis of the structure of production and trade, land use and lifestyles.
3) In many countries a trend change became apparent in the early 1990s which resulted in higher elasticities for freight transport and lower elasticities for passenger transport.
4) Much stronger growth in international freight traffic, reflecting the greater openness of economies with regard to domestic transport; it should be borne in mind, however, that this simple distinction is not always drawn in national forecasts.
5) The difference between national and international passenger transport does not reflect the same state of affairs; urban and short-distance trips are the dominant components and account for a larger share of the growth in road traffic, even though the volume of long-distance and international trips is rising rapidly in response to growth in tourism.

6) The continued existence of what still constitutes a significant “border” effect that is gradually being eroded by rapid growth in cross-border traffic in both passengers and freight, but whose eventual disappearance in the long-term remains hard to predict.
7) The difficulty in introducing a spatial dynamic both to determine the main points of congestion in networks and the impact of new transport supply, the effects of transfer from one mode to another and from one link to another cannot readily be distinguished from induced traffic growth, and the assessment of investment in infrastructure remains difficult.
8) Failure to take account of logistical operations such as storage, grouping and distribution in the movement of products which have changed profoundly in recent years, with the result that the route followed is not necessarily the most direct route proposed by current models.

Once again, these experiences demonstrate the difficulty in formulating an appropriate description of supply factors and the insufficiently precise depiction of network capacities, resulting in non-negligible errors in the modal splits projected coupled with assumptions that are systematically too optimistic with regard to rail.

The results obtained are only reliable at a highly aggregated level. There exists no “common reference base” for international comparison, a state of affairs that is all the more damaging in that international traffic accounts for a growing share of network traffic and that imports from one country must match exports from another. However, many large-scale projects, and among them the Alpine crossing projects, call for a coherent forecast of the distribution of traffic between the major corridors in Europe.

2. PROSPECTS FOR EUROPE AND THE CONSTRUCTION OF A REFERENCE SCENARIO

An approach towards the construction of a reference scenario for Europe has been proposed under the SCENARIOS project.

This approach is based on a number of fairly simple ideas inspired by many scenarios developed at both the national and European level but rarely combined into a comprehensive whole, ranging from the description of a socioeconomic environment to the assessment of traffic volumes with a view to obtaining a complete overview of the transport system. The level of detail must obviously vary according to the aims pursued.

Before identifying the various stages in the construction of a reference scenario, it is important to stress that the proposed overview, including the socioeconomic environment and the associated transport activity, is not the one most commonly accepted in that in many cases a scenario relates solely to the socioeconomic environment in the transport sector (external scenario) and there is a danger of creating an artificial distinction between the external and internal dynamics of transport. However, this would require the construction of a reference scenario to be combined with the use of a projection technique that does not pre-judge the given type of model.

The notion of a "reference" scenario is therefore distinct from that of an "alternative" scenario constructed in order to meet a transport policy objective and designed to change a given situation or ongoing trend.

In the long-term projection, the "reference" scenario can be chosen to be a "trend" scenario. This choice has the advantage of being uninfluenced by any value-judgement in that it consists in simply reporting trends in progress. This is not always possible, however, particularly when taking account of aspects relating to a given transport policy; transport policy cannot readily be described through the observation of trend indicators. In such cases the description of the trend may become more prescriptive, the aim remaining that of clearly defining a reference "state" for the transport system, in explicit terms for the actors concerned, against which alternative policies will be tested.

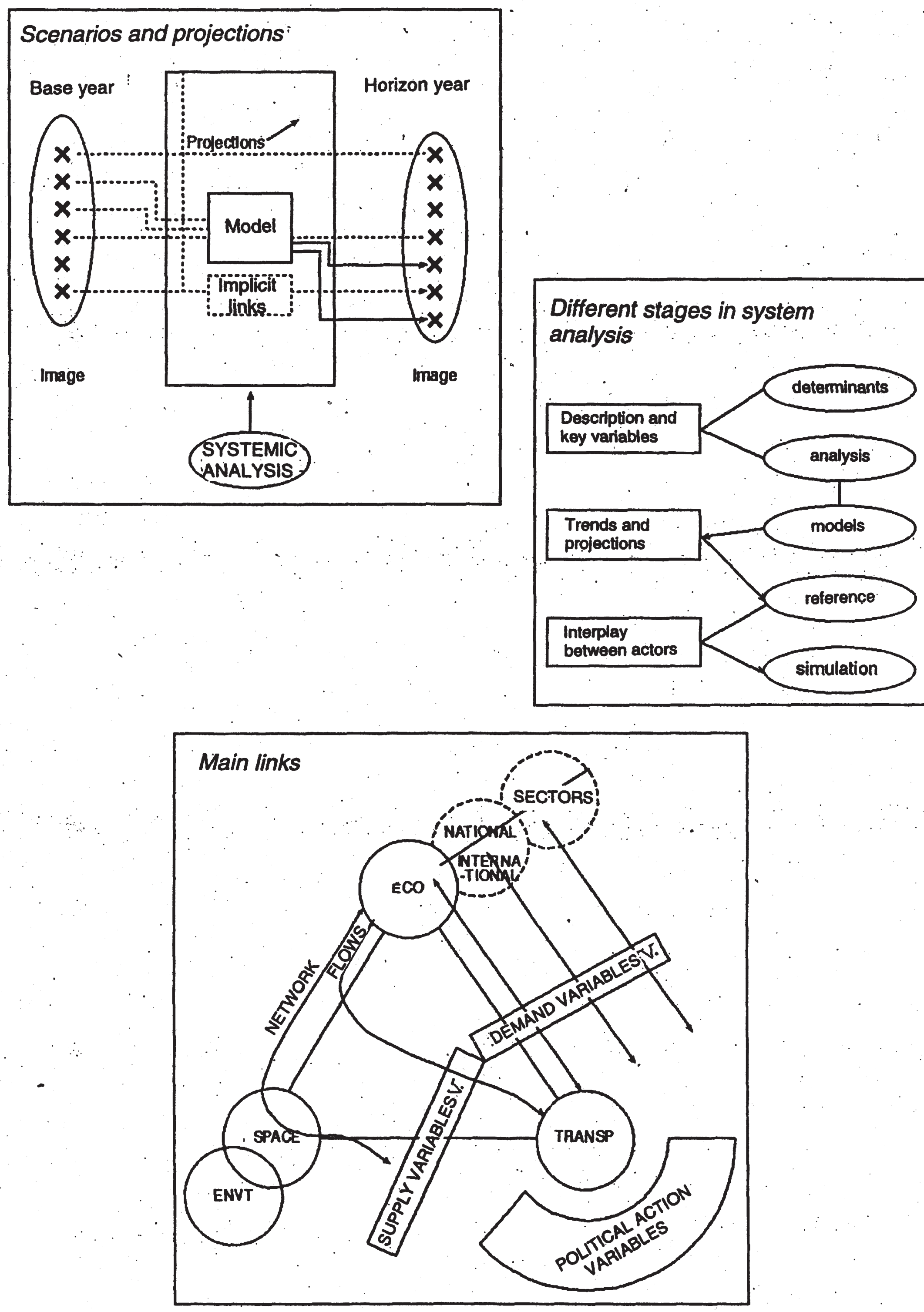
Once these preliminary comments have been noted, the definition of the proposed reference scenario will rest upon the drawing of an initial distinction between three domains:

1) The economic and demographic domain, analysed at the level of a country or group of countries;
2) The spatial and territorial domain which, in the present instance, would require analyses to be made at the regional (or even infra-regional) level;
3) The transport and transport policy domain.

These three domains interact through a series of more or less complex relationships. The first step should therefore be to identify the most significant variables and relations, and then to project them to a given horizon year.

The tool used to formally represent relationships and to project them into the future may consist in an econometric or mathematical model, although this may not necessarily be the case. The following discussion will use the STREA--MS model in tandem with the EUFRANET model for freight traffic. The quality of the estimate of traffic volumes will obviously depend upon the relevance of the models, which can always be improved.

Figure 4. **An approach for the construction of a scenario**



2.1. Impact of the socioeconomic and demographic context

2.1.1. GDP and structural change

National GDP remains a central variable in any scenario. The growth trend observed in Europe may be estimated to amount to around 2.5 per cent a year with rates varying between 2 per cent and 3 per cent according to country.

The most relevant indicator for freight transport is often that of industrial output, which will have to be broken down into major sectors in order to gain a better understanding of the overall trend in traffic in relation to production by making a distinction between bulk goods and high value-added goods.

The situation cannot be analysed in the same way in the case of passenger transport for which the relevant indicator is undoubtedly disposable income. However, the purposes of trips are changing, leisure travel is increasing, social activities are evolving and distances travelled increasing in response to trends in urban development. Even family structures have undergone significant change over the past twenty years. The linkage between economic aggregates and traffic is often highly debatable unless further structural analysis is carried out.

One highly revealing feature of these changes in society is the important role played by demographic structures in the trend in rates of car ownership.

Figure 5. **Annual growth of GDP (1994-2005)**

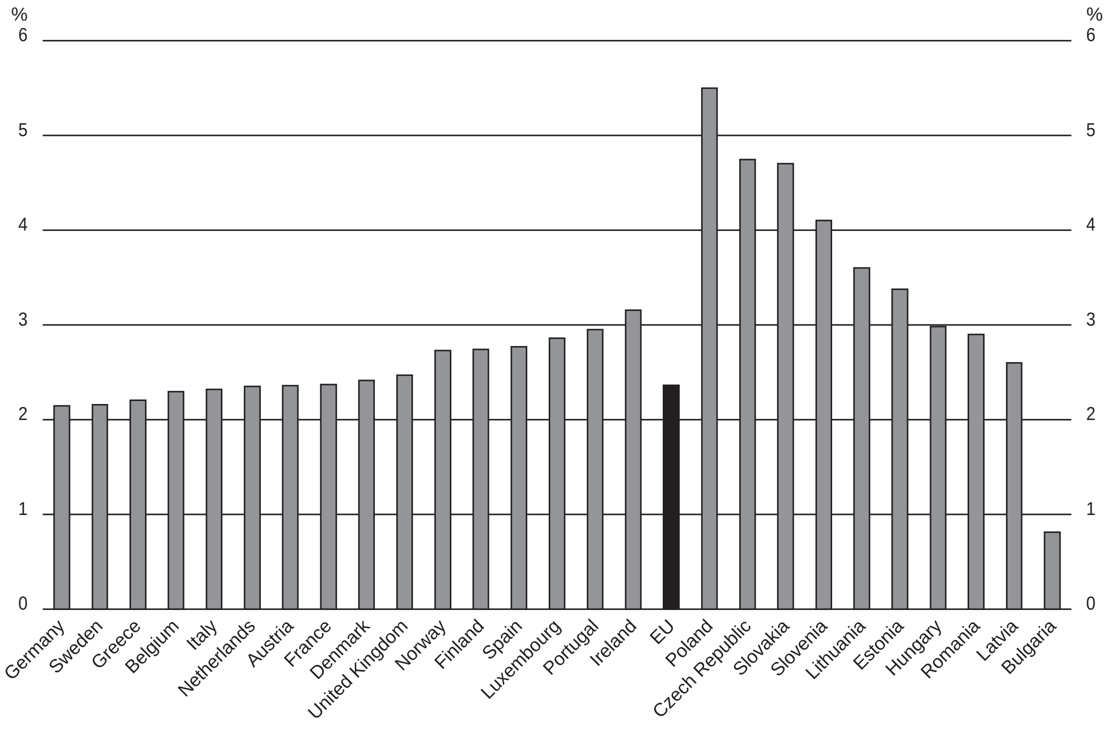


Figure 6. **Annual growth rate of foreign trade**

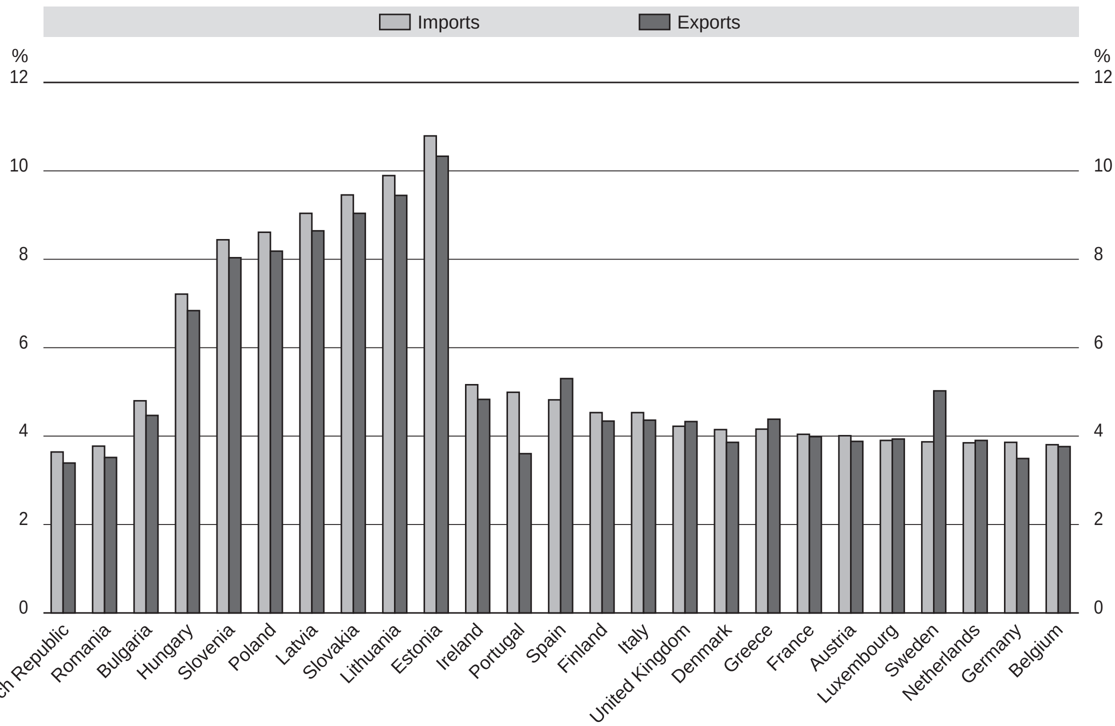


Table 1. **Gross Domestic Product by industry of origin, 1994 and 2005 (billion US$, 1990 prices)**

	Agriculture, forestry & fishing		**Electricity, gas, water**		**Transport, communications**		**Mining, quarrying, construction**		**Manufacturing**		**Services (restaurants, banking, social and personal)**	
	1994	**2005**	**1994**	**2005**	**1994**	**2005**	**1994**	**2005**	**1994**	**2005**	**1994**	**2005**
A	4.7	5.2	4.6	5.8	11.6	16.5	13.36	17.68	42.3	54.6	66.1	89.1
B	4.0	4.8	4.3	5.6	12.7	16.9	10.74	13.43	40.5	52.3	87.7	117.6
DK	5.3	6.7	2.6	3.5	12.1	15.9	7.63	11.44	22.5	28.7	34.2	44.9
SF	7.4	7.1	2.9	4.0	9.8	14.1	7.44	10.85	29.7	42.4	27.2	38
F	40.6	48.2	28.8	40.5	77.1	116.0	63.87	77.98	255.5	311.0	430.0	578.3
D (W)	22.1	25.1	37.4	46.2	92.1	119.2	87.41	101.01	434.5	541.3	591.8	799.8
GR	9.5	10.7	1.9	2.8	5.2	7.6	4.75	6.57	9	11.1	23.7	31.4
IRL	3.7	4.8							16.5	27.4	22.7	30.6
I	37.5	41.1	61.0	79.1	72.5	108.7	58.40	69.90	253	325.9	500.8	665.3
LUX	0.2	0.2	0.2	0.2	0.7	1.0	0.73	0.94	2.4	3.1	4.5	6.2
NL	12.4	16.4	5.1	6.7	20.7	28.6	23.80	27.33	54.5	72.0	114.6	151.4
N	3.5	4.0	3.9	5.2	11.5	15.6	26.08	41.55	15.7	20.1	27.5	34.2
P	3.8	4.6	3.0	4.9	4.4	6.4	3.40	4.60	16.1	21.9	27.5	37.9
E	21.2	25.0	13.1	20.5	27.8	41.5	42.90	64.97	111.6	144.6	233.9	314.3
SE	5.9	6.9	6.0	8.0	13.8	17.5	14.24	18.91	46.3	58.4	68.2	85.5
CH	5.8	6.0	4.9	6.1	13.4	17.0	17.10	20.90	59.1	74.2	130.9	162.6
UK	16.3	18.4	21.3	30.4	79.1	114.1	77.90	109.84	200.5	267.0	405.2	528.8
H	2.4		1.1		3.0		1.98		7.6		9.9	
CZ	n.a.		n.a.		n.a.		n.a.		n.a.		n.a.	
PL	n.a.		n.a.		n.a.		n.a.		n.a.		n.a.	

Source: IWW estimate in Pilot SEA DI (INRETS, 1999).

2.1.2 Demographic data and their influence on car ownership rates

Natural growth in the population of the European Union will remain at a relatively stable rate of a maximum of 0.3 per cent per annum, although the rates will vary from one country to another with the population ageing more rapidly in certain countries.

The unknown factor is that of migration, the scale of which can easily exceed that of "natural" phenomena relating to births and deaths. Very few assumptions are made regarding this parameter since it is highly sensitive and the figures proposed are primarily based on natural growth rates.

The trend in the age pyramid of the population is therefore a stable parameter, which adds to the interest of a "demographic" transport model.

Such models show that rates of car ownership depend upon factors relating to age, generation and transport prices, as shown by the estimated data in various countries[9].

At present these demographic factors are rarely integrated in projected rates of car ownership, although they can provide much insight into local and regional traffic flows which account for 90 per cent of movements by car.

2.1.3 Foreign trade and the opening of markets

The scale of foreign trade reflects the rates at which economies open up, which are rising faster than growth in domestic trade as a result of not only European integration but also the globalisation of the economy. A distinction needs to be drawn between these two phenomena because of the different impacts they have on the major European corridors, the routes for international and transit trade which may or may not be linked to the major platforms located in ports and airports.

The growing presence of international freight transport in some parts of networks is prompting countries to consider different alternative scenarios for foreign trade, according to the degree to which economic growth is driven by the internationalisation of trade in relation to the degree to which countries are integrated into Europe. However, in the case of a reference scenario, it does not seem necessary at this stage to increase the number of assumptions with regard to the future of the European Union, which would simply make the scenario harder to interpret. At all events, the rate of growth in international trade has been estimated to be higher than that in GDP but without introducing a large differential between the share induced by neighbouring countries within the European Union and that resulting from the globalisation of trade. This corresponds to an open concept of European integration, with relations with Central European countries receiving special treatment.

In the case of passenger traffic, once again the trends are not driven by the same imperatives as those in freight traffic. Tourism is the main purpose of trips. The traffic is determined by the attractiveness of the destination areas and the price of services, and also exhibits seasonal peaks. Tourist areas are in more direct competition with each other at both European and world level.

In the case of both freight and passenger transport, an international market is emerging which is more directly subjected to the rules of competition and into which the countries of Central and Eastern Europe are gradually being integrated.

2.1.4 The specific case of scenarios for the opening to Eastern Europe

The opening up of Eastern Europe, and now the accession of new countries to the European Union accompanied by the necessary creation of cohesion funds, are major challenges for the years to come and will also play a determining role in the future of European institutions.

However, this is also a development regarding which there is most uncertainty. In constructing a scenario it is difficult to measure trends because a transition is, by definition, a break, a period of far-reaching change. The 1990s are not a long enough period of observation. They have been marked by a general decline in activity followed by a gradual recovery which first became apparent some four or five years ago. In addition, the statistical data are very poorly matched to the reality of the situation; designed to be used in an earlier system, they are not capable of properly reflecting new phenomena and the most serious questions, including those regarding economic aggregates, still remain unanswered. It was noted in the first part of this paper that the volume of freight traffic appeared to be extremely high in relation to levels of economic activity, indeed up to 3 to 4 times higher according to what may be seen in the European Union for comparable levels of output.

This poses several specific questions regarding the projection of trends. In addition to questions over long-term projects there are also questions regarding the assessment of levels in the base year.

Consequently, it proved difficult to select merely one reference scenario[10].

With regard to economic growth, possible trends in GDP are covered by two extreme assumptions, one of low growth and one of high growth. Because it is impossible to prejudge the pace at which economies catch up, it was decided to define a fairly broad field of possible trends; while it is always possible to choose a "median" rate between these two extremes, such a rate bears no relation to an "ongoing" situation that has no real meaning.

A second major issue was the date of integration of new Member States which are due to gain accession in successive waves over a period of 10 to 20 years. This is a political decision that will have a very direct impact on transport in that, as of the date of integration, structural and social cohesion funding will be made available and it is highly probably that a large share of that funding will be devoted to transport, as has already been observed in the past at the time of the accession of Greece, Spain, Portugal, Ireland and, more recently, the new *Länder* in Germany. Hence the need to include several assumptions regarding dates of accession in the reference situation, between which there are significant differences in terms of the impact on transport.

In view of these considerations, four basic scenarios, differing according to whether growth is slow or rapid and integration relatively swift or drawn out, were drawn up in order to determine the prospects for transition and the opening of markets:

- European renaissance: rapid growth, rapid integration;
- European dilution: rapid growth, slow integration;
- European solidarity: slow growth, rapid integration;
- European fragmentation: slow growth, slow integration.

These base scenarios, in conjunction with assumptions regarding transport, have been used in a project regarding projections in the priority corridors in Central and Eastern Europe (PHARE study) and also in research work carried out under the 4th Framework Programme for R&D (CODE-TEN).

Slow growth is taken to mean growth at a rate close to that of EU Member States; rapid growth would entail higher growth rates of above 5 per cent a year, making catch-up possible within two generations (2030-2040). With regard to foreign trade, it should be noted that the Central European countries are already strongly oriented towards the European Union and that revitalising trade between neighbouring countries is a central issue.

These countries do not all experience the same rate of growth and this rate increases the further they advance in the transition. This is borne out by observations made over the past ten years with a difference of around five years between the recovery dates of countries which had liberalised their economy swiftly and those whose reforms took longest.

In order to gain a clear idea of how to represent this set of situations, it proved necessary to define a number of stages in the transition process:

- Liberalisation and privatisation and, in particular, the liberalisation of road transport;
- Organisational reforms including root and branch reform of the railway companies;
- Creation of more decentralised institutions with, for example, the development of urban and regional transport plans under the aegis of local institutions.

The successive wages of integration expected to take place within the European area correspond more or less to a concentric expansion of the European Union which may also be combined with the "interreg" programmes, aimed at ensuring the cohesion of neighbouring cross-border regions.

Images such as these, which aim to simplify the representation and which vary time, space and the different levels of institutional organisation, make it easier to combine the assumptions relating to these four scenarios and to produce a kind of "grid" to analyse and evaluate the transition.

Figure 7. **Growth GDP index of CEECs**
(base 100 in 1989)

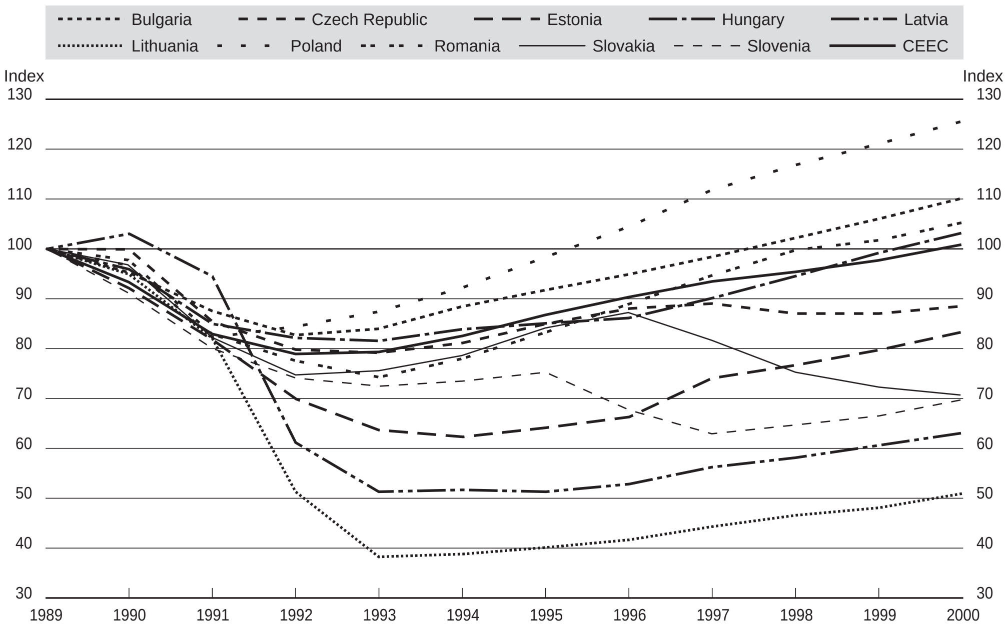
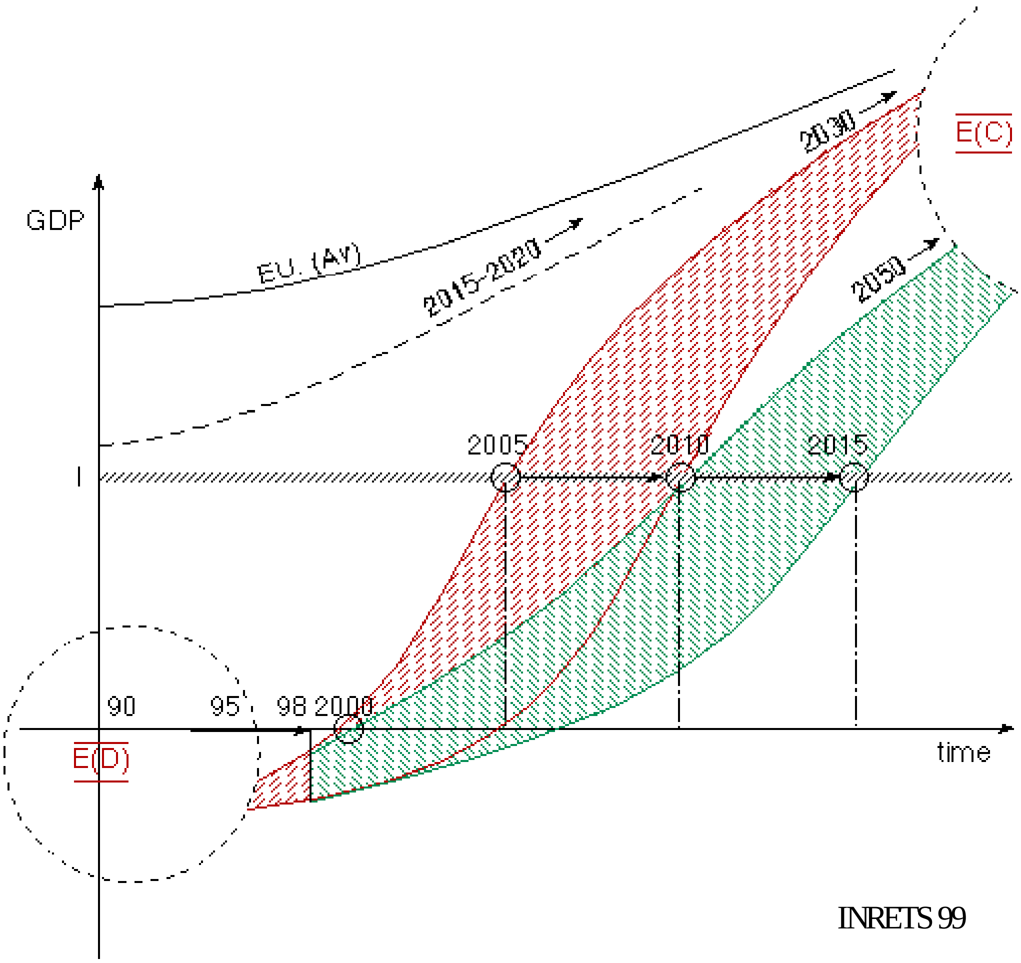


Figure 8. **CEEC Scenarios**



Source: INRETS, 1999.

2.2. Spatial dynamics and local development

A transport scenario only becomes properly meaningful once it has acquired a spatial dimension: the impact of an infrastructure project, environmental impacts and congestion cannot be analysed without reference to a precise spatial or territorial location. A study of economic and abstract relations alone is not sufficient.

The plan for development of the Community area focused on the major trends that affect European geography in terms of the polarisation of activities, growth in urban areas, saturation of corridors and peripheral situations where the emphasis is placed on relations between neighbouring regions and between cities.

However, the introduction of a spatial dynamic complicates the task of designing transport scenarios and it starts to become difficult to determine the respective roles of factors in the competitiveness and attractiveness of regions, policies aimed at encouraging regional development or even the quality or performance of transport services[11].

In describing the socioeconomic context and its long-term future outlook it is not particularly realistic to make use of a scenario that assumes uniform regional growth and that limits itself to differences in growth rates at the national level. The ideal solution would be to obtain the same type of regional or local socioeconomic information as that described above at national level; however, such information is not available.

In most of the European research projects that have been mentioned, the basic geographical unit has usually been the region[12]; only data on employment by sector and on the population are usually available, there is no information on trade. Regional added-values by sector have nonetheless been estimated and projected in the SCENARIOS and EUFRANET projects on the basis of in-depth studies carried out by the DGXVI on regional development. These data have been "externalised" vis-à-vis the transport system, whereas in other approaches (STREAMS project), the factors of production and regional consumption have been integrated with elements describing transport costs within the same given model of regional development. This is an entire field of research which requires investigation and on which some exploratory work has been done under the SCENARIOS[13] project, notably through dynamic systems analysis techniques.

Other methodological and technical options relate to the description of the infrastructure networks providing the linkage between different geographical areas. The difficulty lies in establishing an adequate level of detail and the appropriate grid for studying relations between regions as defined above.

This means that:

- The designer must work at an appropriate level of detail with regard to the assignment of routes in order to be able to gain a clear idea of the capacity of the infrastructure linking two areas; the aim is to be able to estimate capacity and the level of congestion, both of which must be determined in order to establish the quality of transport and investment requirements.
- It is also necessary to be selective in order to conserve a fairly large body of information with regard to network nodes and sections in terms of their physical characteristics, transport time and costs; the aim here too is to assess possible transfers between modes, the size of intermodal chains and even, in the case of the railways, types of operating modes (complete train loads, single wagons).

The GIS have made great advances over the past few years and now allow networks to be described extremely accurately. However, in many cases there is not enough information available about these networks to be able to carry out relevant simulations of traffic assignment. After carrying out a series of experiments it is now possible to obtain network descriptions which include the main European links at a sufficiently detailed level to be able to accurately represent all the routes used in flows between the regions in Europe, thus making it possible to simulate different techniques of rail operation. This usually requires several points of entry per region and per mode. The detail required increases in proportion to population density.

Once the relevant regional level has been determined, complementary data on populations can be entered at a more detailed level, for example, cities or conurbations, thus improving the indicators of accessibility.

However, in these projections the rules governing patterns of growth in urban mobility differ from those applicable to interregional mobility. More qualitative scenarios may be developed at this stage with regard to short-distance transport, leaving work on conflicts between local and interregional traffic in the share-out of available network capacity as an area for further research.

2.3. Scenarios for transport policy and the interplay between actors

The final objective of the scenarios method is to give the decisionmaker an insight into possible choices of transport policy or corporate strategy; assessing the choices available and the anticipated impacts of such choices assists in the decisionmaking process. The growing number of local, regional, national and international actors enhances the interest of such an approach both when actors co-ordinate their efforts and when they express differing interests. This interplay between the actors is in fact an integral part of the analysis of the transport system and must also be described and projected, both for the reference scenario and for the alternative scenarios.

In practice, transport policies are often incorporated in a highly incomplete manner into scenarios despite the fact that they have a particularly strong impact on the conditions, costs and prices of transport supply, either directly (new investment in a new type of service) or indirectly (through the rate of taxation or rules of tarification.

In many cases prospective analysis is limited to a comparison of alternative scenarios in which attention is focused solely on the differences between these alternative scenarios, defined *a priori*, with no global view of the system. This often results in a lack of detail regarding the chain of events leading to one or the other of these alternatives, with the risk that the exercise may remain purely speculative unless the situations studied are “unattainable”.

In reality, not enough attention is paid to the “reference” policy scenarios, an exercise that is frequently delicate but nonetheless necessary, as may be seen from experience with the SEA project where the research goal implicitly required an overall view of the system. A trend cannot therefore be projected without analysing the existing context for transport policy, whose impacts continue to be felt in the medium and long term.

One assumption that is often used is that relative prices will remain unchanged between modes, which means that changes in the conditions of supply together with a large share of the policy impact can simply be disregarded; this simplifying assumption is far too broad and considerably diminishes the interest in constructing scenarios.

A good example of the above is that of the policy aimed at liberalising the road haulage sector. This policy has been pursued in France for over ten years and since the creation of the single market it has spread throughout Europe. The outcome has been increased competition and a significant decline in road haulage prices, in addition to technical advances in vehicles and improvements to the road network. Prices have declined by around 1 per cent a year over the past few years. However, the impacts of this policy have not finished making themselves felt, particularly in countries where protection of the road haulage sector has been highest. Competition with hauliers from Central Europe, widespread use of cabotage and new advances in fleet management would seem to suggest that road haulage performances will continue to improve, resulting in a further lowering of prices.

To conclude, the “reference scenario” must be accompanied by a “reference scenario for transport policy” and, in particular, assumptions regarding trends in costs, prices and the consistency of transport infrastructure networks.

Infrastructure investment projects are clearly identified in trans-European networks or national schemes. Indeed, in several countries the public authorities devise their own assumptions regarding reference growth rates and even their procedures for decisionmaking and collaboration.

The same is not true of prices, costs and productivity gains. Indeed it is often difficult to identify the underlying assumptions in existing documents, despite the fact that the impact of such assumptions is usually far greater than that of building the infrastructure.

An example of this problem may be seen in the work carried out as part of several projects under the 4th Framework Programme on R&D, where policy scenarios based on a uniform approach were devised in order to assess the impact of trans-European networks (SEA) and to define road (SOFTICE) and rail (EUFRANET) scenarios.

The difficulty in designing a "reference policy" scenario first became apparent in the SCENARIOS and SEA projects and resulted in a number of choices being made which will always be fairly "prescriptive" but which must remain logical and straightforward to allow the results to be interpreted. The SEA project consisted in a strategic study of the environmental impact of the development of trans-European networks and the first requirement was to identify those aspects of European transport which were to be assigned to development of these networks and those which were not. In other words, the question is to determine with regard to which transport policy context the Commission's actions towards these networks must be evaluated. Since this was a pilot study aimed at demonstrating the feasibility of such an operation, the assumptions and outcome are given for information in order to establish the possible consistency of a reference scenario and an alternative transport scenario within such a study.

As in the case of the external socioeconomic environment, a "reference" policy scenario is rarely designed to observe trends. In addition, the task of measuring trends will be made all the more difficult if local, national and European policy actions are combined without setting the same, or even compatible, objectives.

Transport policy has been broken down into four major components which do not necessarily represent stages but rather interlinked layers in the implementation of a European policy, namely: liberalisation, harmonization, the development of Trans-European networks, construction of a citizens' network.

- *Liberalisation and free access*. This principle is enshrined in the Treaty of Rome and has left a strong imprint on European policy during the 1990s prior to creation of the single market; at present, this principle must be applied not only to road and air transport, but also to maritime transport, inland waterways and the railways, which will lead to major organisational changes. With regard to the railways, adoption of this principle would require that companies currently incurring losses of up to and sometimes even more than 50 per cent[14] on their freight operations succeed in breaking even. In terms of the associated assumptions, this would mean continued productivity gains in the road sector (and declining prices), and at the same time a sufficient increase in rail prices to cover the deficits observed.

- *Harmonization*. Harmonization goes hand in hand with liberalisation and for many years the debate over where the priorities lie with regard to harmonization and liberalisation has thwarted the implementation of a European transport policy. The fact that this debate was settled in favour of liberalisation after intervention by the Court of Justice in 1985 does not make it any less necessary to implement a harmonization policy in order to create equality of treatment with regard to the market in an approach which integrates the external effects of transport; the internalising of externalities, harmonization of social conditions and the introduction of emissions standards have been integrated into this so-called “harmonization” component.

These first two considerations have a direct impact on developments in the way in which markets placed under the direct surveillance of the Court of Justice operate in accordance with the legal principle on “non-discrimination”.

- *Development of Trans-European Networks*. The development of Trans-European Networks was one of the goals set out in the Maastricht Treaty because networks play an important role in promoting trade, economic efficiency and spatial cohesion. Physical networks are designed from an intermodal standpoint, including nodal points. However, the design of Trans-European Networks has gone even further in that the aim is no longer simply to interconnect national networks but also to promote interoperability and intermodality. The network is not perceived simply in terms of infrastructure but also from the standpoint of operation, particularly in the case of rail transport which should be able to benefit from more efficient operation on major international corridors and thus derive greater benefit from economies of scale. Such assumptions, offering the prospect of more attractive rail prices on certain major routes and the development of hubs providing more frequent feeder services throughout the European area, must be introduced into projections that provide a more differentiated view of transport unit costs and a more specialised approach to the future use of modes.

National and European policy are closely intertwined in the development of infrastructure networks. The same comment applies to the opening-up towards Eastern Europe where in addition there are prospects of funding being provided through the cohesion funds. Improving access to peripheral regions with a view to enhancing spatial cohesion is the final aspect of the future shape of the European area in which better use will be made of the economies of scale in densely populated central regions.

- *Constructing a citizens’ network*. At this stage a less formal approach will be adopted at the European level, where in practice local authorities have responsibility for many initiatives as a more direct approach of development and land-use policies; it is nonetheless possible to consider incentive measures, exchanges of good practices and the promotion of collaboration in accordance with the principle of subsidiarity. These urban policies are directly involved.

The European institutions work in close collaboration with local institutions in developing the citizens’ network.

From the standpoint of sustainable development, a transport policy scenario may be represented in a plan setting out several different possible situations and characterised by an economic performance axis and an environmental efficiency axis at a given horizon year. A policy of liberalisation will increase economic efficiency but certain adverse environmental impacts of the road sector will have to be remedied through harmonization measures; network development also increases economic efficiency but to a lesser extent and is above all likely to achieve major advances in terms of quality and spatial and social cohesion; this might be the first interpretation of the effects of a reference policy.

Breaking down a policy in this way offers the advantage of reflecting priority areas of action for different types of actor and corresponds to the different modes of dominant regulation -- regulations applicable to an international, national or local market that is more or less dominated by the principles of competition, regional and social balances, environmental protection – but, of course, without ever oversimplifying the representation, since all these concerns are to be found to varying extents at all these levels.

The corresponding assumptions with regard to prices and costs for short and long-distance passenger and freight transport have been listed in the Table 2. A reference policy scenario can therefore be designed at two levels depending upon the number of transport policy measures incorporated into the scenario.

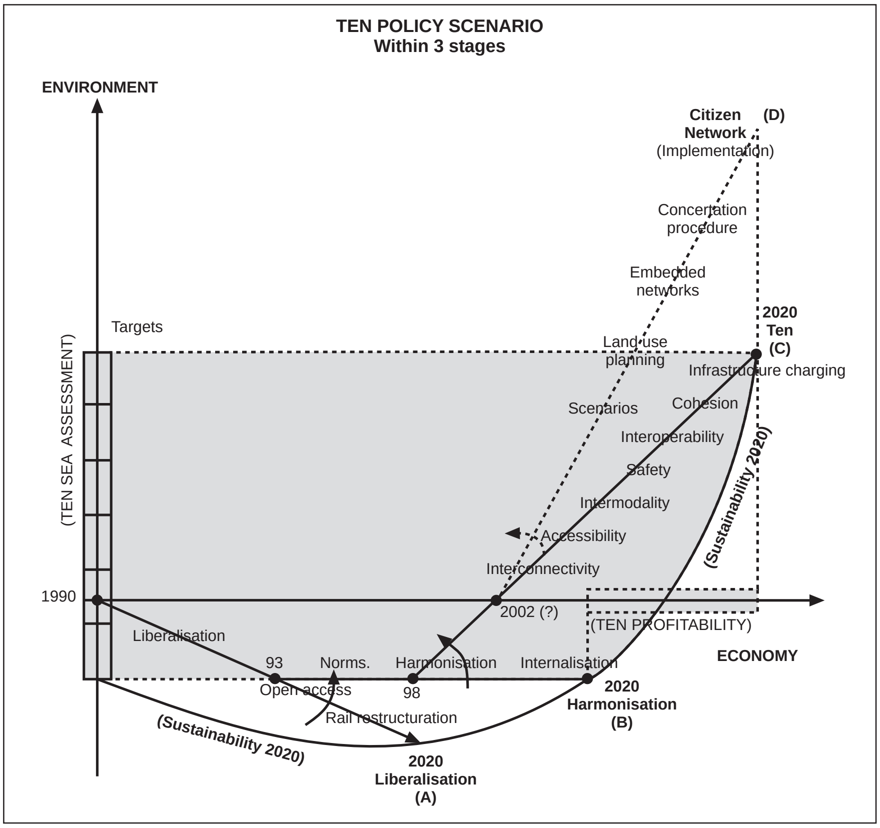
- Integration of *liberalisation measures*. A liberalisation scenario is undoubtedly the more logical one for a trend scenario at the European level, although the effects of a policy of openness towards the railways remains at a very preliminary stage and there might be some hesitation about incorporating them. Whatever the case may be, the prospects of a trend scenario characterised by a liberalisation policy are therefore highly favourable towards road, although the assumptions to be taken into account with regard to trends in rail prices[15] remain very open.

- The integration of "*harmonization" measures*, in addition to liberalisation measures. Such measures will remain fairly speculative as long as uncertainty prevails over the value to be placed on external effects or on social harmonization measures. It would not seem easy to integrate them into a trend scenario in that, even though agreements have been reached in principle, these measures have not been implemented at the European level.

Table 2. **REFERENCE SCENARIO (Liberalisation)**		
FREIGHT		**% Change in total cost per year**
Road: **Long distance**	• ↑ in productivity (with +30% more if 44 t becomes widespread) and ↑ in quality of service • Quick adaptation to logistical changes • Decrease in prices due to strong competition at the national and international levels	-1%
Road: **Short distance**	• ↑ cost of local transport due to weaker competition (monopoly situation of trucks) • More difficult traffic flows in high-density areas • ↑ in costs due to congestion	+0.5%
Rail: **Long distance**	• ↑ competition (particularly with road transport) and development of commercial strategy • ↑ in infrastructure charges (budget equilibrium) • Improvement of operating systems (long trains, better use of wagons, network specialisation)	+2%
Waterways: **Long distance**	• Liberalisation and ↓ in price for some specific traffics where competition is possible (main waterway basins) • ↑ in infrastructure charges	+1%
Maritime and ports	• ↑ productivity with use of bigger container ships and information technology • Strong competition • Significant ↓ in freight prices • Liberalisation of short-sea shipping	- 1%
Combined transport	• Improvement in transhipment terminals (maritime and inland) - low cost overall • Adaptation to market requirements in logistics • But significant ↑ in rail infrastructure charges	+1.5%

Table 2 (continued). **ALTERNATIVE SCENARIO 1 (Harmonization and internalisation)**		
FREIGHT		**% Change in total cost per year**
Road: **Long distance**	• Harmonization of social condition • ↑ fuel taxes to internalise external costs (affects local traffic more than international/interregional traffic) • Technological improvements → diminution of external effects	+1 %
Road: **Short distance**	• ↑ fuel taxes to internalise external costs (5% of cost over 10 years) • More stringent conditions for urban traffic flows. • Increase in wages (up to 50% of total costs) • Development of light trucks and increasing development of city logistics	+1.5 %
Rail	• Harmonization of tariffs and social costs at the European level	0 %
Waterways	• Development of specialised logistics for bulk goods or containers	0 %
Maritime and ports	• Internalisation of costs • Improved quality in ports	0 %
Combined transport	• ↑ in road terminal transport in high-density areas • Harmonization of rail tariffs at European level	0 %

Figure 9. **TEN policy scenario (within 3 stages)**



Many alternative scenarios for transport policy at the national level are designed to assess the impact of political harmonization measures aimed at enhancing environmental protection or, in the same vein, at securing a better modal split, hence the testing of assumptions regarding high road taxation at rates that can easily reach between +30 per cent and +100 per cent by the horizon year 2010 at petrol or car prices that are usually considered to be stable.

In practice, it is essential that the assumptions adopted are clear, even if their presentation is somewhat "schematic" or prescriptive because there is always a risk of mixing different policy aspects and impacts. While admittedly it is hard to separate the various aspects, this only adds to the importance of the classification work that will be undertaken as part of the aid to the decisionmaking process in which, if necessary, the conclusions can be modulated at a later stage.

Lastly, in specifying the network development scenario it was felt that an infrastructure investment policy could not be dissociated from the operating policy for that network. This has led to the adoption of assumptions about the cost and pricing structures for the specific type of link concerned with operating modes specified on the basis of distance or traffic volumes, and in this respect the EUFRANET provides an original contribution.

2.4. Quantified prospects for a reference scenario

On the basis of the above assumptions and a reference scenario selected as a "trend" scenario characterised by liberalisation measures, a number of traffic projections were made to the horizon year 2020 for the European Union and Central Europe.

It should be noted that:

- As a general rule, the elasticity of traffic growth to GDP is below unity both for passengers and for freight, which would indicate that growth in traffic, despite being significant in volume terms over such a long period, will remain modest.
- With regard to freight transport, growth in international traffic is higher than growth in national traffic and growth in tonne-kilometres is higher than growth in tonnages, reflecting an increase in the distances travelled; there is an increase in all types of traffic relating to international trade, but a decline in certain types of bulk transport at the national level.
- With regard to passenger traffic, growth rates would seem to be fairly flat and the traffic largely consists in short-distance movements; long-distance rail traffic is highly sensitive to assumptions regarding the entry into service of a high-speed train network although it should be borne in mind that the construction of a trans-European network and the substantial investment this would require poses a number of problems.
- In a reference scenario ("liberal" trend), the market share of road increases substantially; even on the assumption that rail prices remain unchanged, rail loses a significant amount of market share and even the introduction of better targeted and more sophisticated rail operating modes (full trains, faster shuttles) is not sufficient to offset productivity gains in the road sector.
- As a general rule the results are more sensitive to assumptions relating to market operating conditions and price trends than to those relating to infrastructure development; in developing a network, it is essential to adjust operating modes in certain areas and notably in Germany and England; the number of congested segments of the network rises sharply but measuring the impacts of congestion on mobility and traffic transfers remains hard to assess.

- The environmental balance is not favourable with regard to CO_2 due to growth in traffic, including rail in cases where the primary energy remains oil or coal, but is better with regard to other emissions and in highly significant proportions due to the advances achieved in emissions standards.

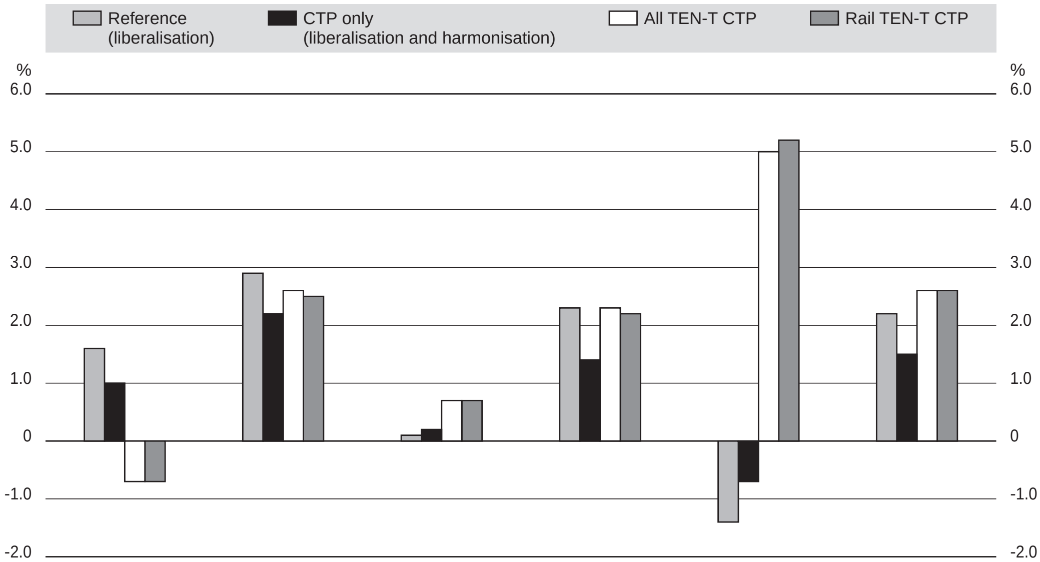
The following comments apply to the results for Central European countries:

- Even when GDP growth rates are high, traffic elasticities remain modest, at below unity, and thus mitigate the idea that transport amplifies changes in rates of activity; it should be recalled that the CEECs still have economies that are strongly geared towards bulk traffic which is growing at a slower rate if not declining and which certainly does not favour rail; in addition, the rationalising of product distribution is likely to result in lower traffic levels for the same level of economic activity.
- Foreign trade flows from the CEECs are growing strongly but have already been reoriented towards the European Union and there is no way of telling whether trade will resume at the regional level.
- Car ownership rates in the CEECs are rising but are already high with regard to GDP levels and the level of private car usage is sensitive to assumptions regarding fuel prices.

The assumptions with regard to price trends that underpin transport policy scenarios in the CEECs are different to those in the case of European Union Member States. In the event of strong economic growth, consideration must be given to the trend in the relative price of transport and also the investment that companies require in order to modernise their operations. For this reason relatively higher rates of growth in road prices have been assumed for the reference scenario (+1 per cent for road freight transport compared with +1 per cent for the European Union), implying a certain degree of harmonization of the conditions of competition in the international market. With regard to the cost of private car use, assuming a slightly higher rate of growth in usage costs seems warranted even though household expenditure on cars in the CEECs are high in comparison with the rates observed within the European Union.

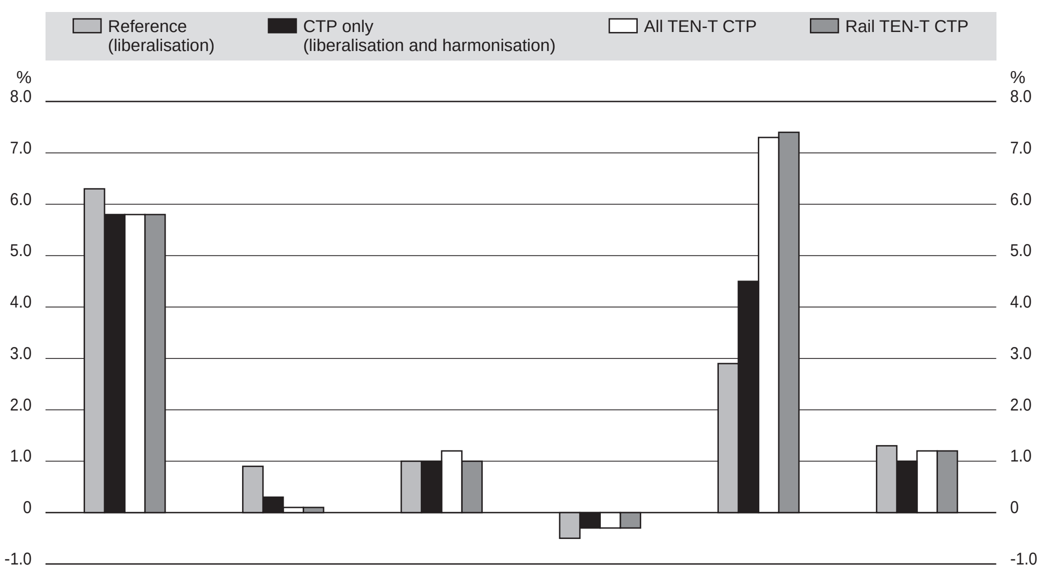
The figures given in the annexes have been taken from EU projects (SEA, EUFRANET and the PHARE study on projected traffic levels in Central and Eastern Europe). Some remain provisional or exploratory and the SEA project is a pilot study; they are not official EU figures and have been given simply to indicate orders of magnitude and perhaps to initiate a debate. The assumptions regarding the socioeconomic context (GDP, foreign trade, population trends, infrastructure projects) are compatible, but differences remain between the assumptions made with regard to prices and, in particular, rail prices (price increase in SEA but not in EUFRANET).

Figure 10. **EU 15 – Freight scenario**



	Air	Truck	IWW	Shipping	Rail	All trips
Reference (liberalisation)	1.6%	2.9%	0.1%	2.3%	-1.4%	2.2%
CTP only (liberalisation and harmonisation)	1.0%	2.2%	0.2%	1.4%	-0.7%	1.5%
All TEN-T CTP	-0.7%	2.6%	0.7%	2.3%	5.0%	2.6%
Rail TEN-T CTP	-0.7%	2.5%	0.7%	2.2%	5.2%	2.6%

Figure 11. **EU 15 – Passenger scenario**



	Air	Car	Coach	Slow	Rail	All trips
Reference (liberalisation)	6.3%	0.9%	1.0%	-0.5%	2.9%	1.3%
CTP only (liberalisation and harmonisation)	5.8%	0.3%	1.0%	-0.3%	4.5%	1.0%
All TEN-T CTP	5.8%	0.1%	1.2%	-0.3%	7.3%	1.2%
Rail TEN-T CTP	5.8%	0.1%	1.0%	-0.3%	7.4%	1.2%

3. A PLEA?

This paper on scenarios has set out to demonstrate the interest in adopting a formal approach that will allow the actors concerned, and particularly policymakers at the national and European level, to work together in discussing the future outlook for transport.

In response to rising levels of expertise and the need to assess policy, the number of forecasts has increased but without being able to genuinely inform the debate; expert appraisals are swiftly followed by counter-appraisals.

As a result, there might be a temptation to pursue more qualitative analyses which focus on the more specifically political aspects of trends in transport by emphasizing the interplay between actors.

However, there is an inherent danger in systematically opposing an approach based on projections to a more open retroactive approach, that is free of the constraint imposed by the data, or in opposing a reactive approach to a proactive one.

Firstly, it would seem possible to establish a certain number of parameters for the transport sector and to specify a common reference framework for analysis, even if some assumptions may subsequently need to be reviewed. This framework may include GDP, foreign trade, trends in population or even the rate of car ownership.

However, it is necessary to go beyond an external reference framework and integrate the context in which the interplay between actors and transport policy are located; it would seem feasible to proceed in stages and to work on a consensual basis in order to create a relevant basis for analysis.

From this perspective, the question of type of model is not of paramount importance; it is simply a technical consideration that is important only to the extent that it is necessary to have a good understanding of its scope and limitations. It is therefore necessary to "demystify" models, which play the role of tools in the broader approach of a forward projection. Admittedly progress still remains to be made in establishing a clearer division between segments in the markets for passenger and freight transport, in representing the quality of supply in a more precise manner, and in taking account in a more relevant manner of problems relating to capacity; several models already exist at the European level, however, and their results are not incompatible.

At the same time, retrospective analyses have proved to be particularly helpful in constructing transport policy scenarios, in providing insight into decisionmaking procedures and in explaining the impacts of a given measure.

Prospective analysis in the transport field can therefore draw on two different streams and merits study as a field of research in its own right and in close association with practical work. At the end of this first stage it would seem possible to draw up a reference scenario for transport which would be able to secure a fairly broad consensus and serve as a useful framework for analyses at the national level and also to provide support for synergies between different types of approach.

NOTES

1. SOFTICE Project survey, notably with regard to transport costs, but also several other research projects.

2. REDEFINE Project.

3. In the 4th EU Framework Programme, compare the respective choices of methodology made in SCENARIOS and STREAM on the one hand (forward) and POSSUM on the other (backward).

4. Cf. the approach adopted by OD Estim.

5. A concept which prevailed in the SCENARIOS Project, in which a more detailed classification of models is given in D3.

6. See the results of the MATISSE Project on the respective impact of infrastructure investment.

7. Cf. EUFRANET.

8. TIT report for the Berlin Conference.

9. SCENARIOS Project.

10. See the work carried out as part of the CODE-TEN project and the PHARE study with regard to projections in the ten priority corridors.

11. Cf. D2 of SCENARIOS.

12. At the level of NUTS II, although this definition does in fact vary slightly from one country to another. For the CEECs, a regional breakdown has been defined on the basis of the preliminary work involved in defining Eurostat Stats 2.

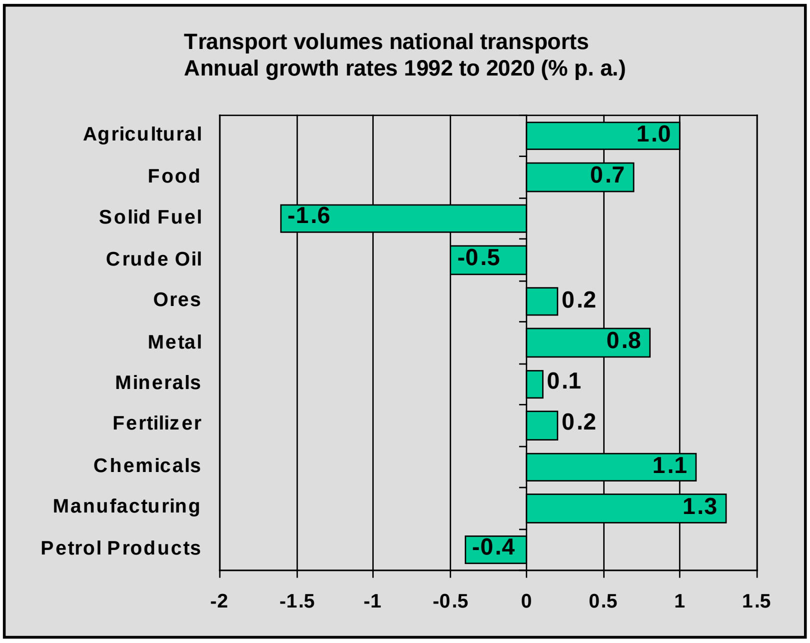
13. See note 12.

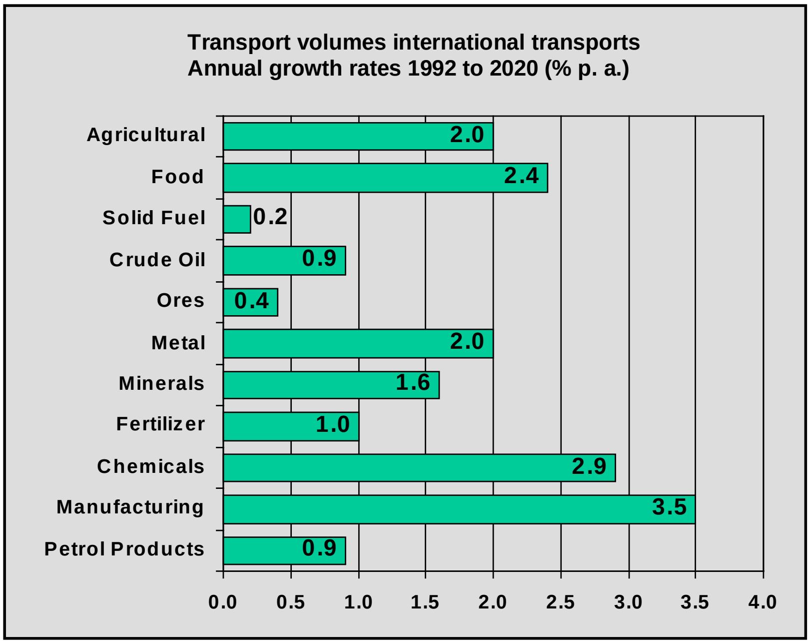
14. See ECMT report on social costs (February 1997).

15. In the SEA project, a +2 per cent increase per year was assumed with regard to rail freight in contrast to a -1 per cent assumption for road.

ANNEX

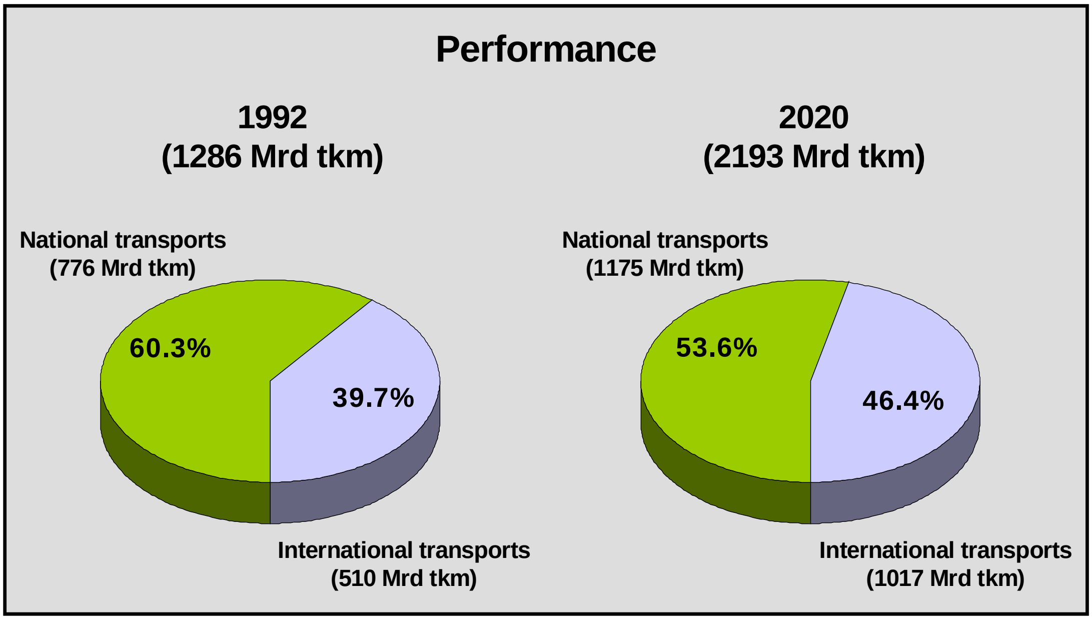
Annual Growth Rates By Commodities (Volumes)

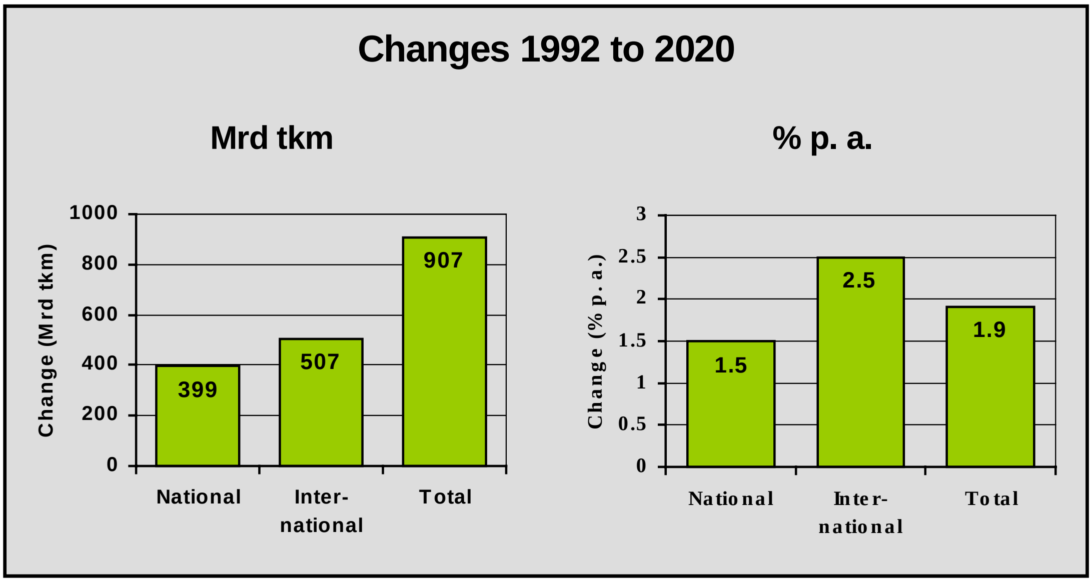




Source: Eufranet.

Traffic Demand 2020 – Performance (in billion t-km)





VIEWS ON FORECASTS, TRAFFIC FLOWS AND INFRASTRUCTURE NEEDS IN HUNGARY

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SUMMARY

Budapest, May 1999

FOREWORD

Some years after the end of central planning in Central and Eastern Europe (CEE), decision makers in the region have made significant progress in building bridges to market economies. In the course of the transition, each country has followed its own path. Accordingly, the rapidity and ease of change have depended greatly on the political and economic environment in which the changes have occurred and the approach taken to economic liberalisation. The path has not been without obstacles, and challenges continue to face countries in the region.

The transport sector has been subject to particularly acute pressures from system users seeking faster, more efficient forms of travel, while on the supply side, the burden of inadequate infrastructure, rolling stock and equipment and lack of financing weigh heavily on transport system operators. How decision makers react to these pressures will shape transport sector development patterns for decades to come. Although it is difficult, especially given the immediacy of private transport demand and current budgetary constraints, governments must keep in mind the long-term development of the transport system in order to assure sustainable sectoral growth.

Hungary, like its neighbours in the region, is shaping its transport system to respond to evolving passenger and freight demand. This paper examines, in general terms, how sustainable transport principles are reflected in the current development of transport policy in Hungary. It describes recent trends in the transport sector and government reactions to these trends and explores the prospects for sustainable transport.

When the economic and political changes took place in the early 1990s, they had a considerable impact on all aspects of the country's economy, including the structure of the transport sector. Because of the changes, it became impossible to use the old forecasting methods, and this made it especially difficult to appraise new developments or define priorities in order to help decision makers take decisions based on reliable evaluations.

This problem became evident in the course of preparing projects to be carried out as concessions. For motorway projects, this lack of proper and acceptable forecast methods caused significant delays.

The war in Yugoslavia further complicated the development of an appropriate means of traffic forecasting. Hungary's geographical position makes it a transit country between the western and south-eastern parts of Europe and explains its dependence on the region's political predictability.

The economic transition helped to increase, to some extent, the funds available for maintaining and developing the transport infrastructure. Apart from special funds allocated under the State budget, there are legal provisions for calling for and using private capital for development and operational purposes. International finance institutions have increasingly participated in the financing of the transport sector and, through the PHARE programme, the European Union also provides assistance. The latter is of course a limited resource but is important in helping the country to meet the accession requirements for becoming a full member of the EU.

The Hungarian Ggovernment has approved the country’s new transport policy, which has defined four objectives:

- To promote the country's integration into the EU.
- To assist in the balanced development of and co-operation with neighbouring countries.
- To protection human life and the environment.
- To implement efficient, market-oriented regulation of transport.

These aims should be supported by flexible implementation scenarios depending on the amount and type of resources available.

1. RECENT AND FUTURE TRENDS IN PASSENGER AND FREIGHT TRAFFIC

In Central and Eastern Europe, the period since 1989 can be characterised by the following trends. With regard to passenger transport, the volume of traffic has basically followed the evolution of the economic situation, particularly as reflected in household income. In 1990-96, the overall volume of passenger traffic dropped sharply, when unemployment in the region peaked. A principal factor in the decline was a jump in user costs, as governments cut subsidies and transport companies raised fares to recover lost subsidy revenue. Higher transport costs have also been accompanied by an overall decline in the quality of service by the financially strapped transport companies. This has obviously not helped attract transport system users.

At the same time, vehicle ownership has risen steadily, despite higher vehicle and vehicle operating costs and higher fuel prices. Indeed, with market liberalisation, used vehicles from Western Europe flowed in, new luxury cars arrived on the scene, and companies began to provide vehicles for their employees. The capacity of the road infrastructure has not always been able to accommodate the greater numbers of cars; as a result, the road network, especially in urban areas, has become severely congested. The overall volume of freight transport has declined as well in recent years. However, as relations with the European Union become closer, trade should be facilitated and freight traffic will probably rise, especially as concerns the building and construction industry, which generates demand for transport. Most of the decline is attributable to a falling off in freight transport by rail due to economic restructuring. The railways have lost one-third to one-half of their freight traffic. Road transport, by contrast, has remained relatively stable. Policy makers have done little thus far to slow the move to road transport, with the exception of the imposition of transit and customs taxes and higher fuel taxes. Further measures will certainly be needed to encourage the use of rail for freight transport.

In terms of transport infrastructure, rail networks in the region are generally quite dense, as rail constituted the principal means of freight and passenger transport under the previous regime. Moreover, the state of electrification of the lines is generally satisfactory, especially on major international and national lines. This being said, railway networks were designed, with few exceptions, for relatively moderate travel speeds (100-120 km/hour). They very often go through towns and follow curves, and this can make renovation and upgrading of the lines difficult and expensive.

The rail network has suffered from the effects of insufficient maintenance and lack of necessary repairs for many years. As a result, traffic is often delayed, the quality of service is inadequate and travel conditions are poor. Financing has been inadequate for the upkeep of the rail infrastructure and rolling stock; it is estimated that only one-fourth of the necessary maintenance is actually carried out. Unless higher priority is given to improvements in this area, rail will be unable to compete for transport.

In many cases, by contrast, development of road infrastructure has been the focus of transport infrastructure financing, particularly from international sources. With rising road transport demand and a relatively sparse network of major motorways, substantial resources are being allocated to increasing highway capacity. Future EU accession is a driving force behind this development throughout the region. High levels of traffic often remain fairly localised, however, so care should be taken when evaluating demand for increased capacity.

In spite of these quite particular circumstances, or because of them, many forecast studies for both passenger and freight transport have nevertheless been undertaken in recent years in Hungary. They have included scenarios, experts' forecasts, extrapolations, separate or combined applications of transport models. The results presented here cover the period up to the end of the 20th century and deal separately with passengers and freight.

Table 1. **Number of transport companies and individual enterprises**

	1990	**1995**	**1997**	**2000**	**2005**
Company with legal status	734	2 947	4 244	4 520	4 800
Company without legal status	431	3 723	4 172	4 200	4 500
Total companies	1 165	6 670	8 416	8 720	9 300
Number of individual entrepreneurs	29 500	54 679	50 213	48 000	42 000
Total	**30 665**	**61 349**	**58 629**	**56 720**	**51 300**

For passenger transport, the broad trends are described and indicate a general decrease in traffic.

The decline in local public transport is due to fare increases and also to the fact that transport to and from work has significantly decreased as a result of the closing down of workplaces. The performance of companies owned by local governments, which manage local public transport in the capital and the three large towns, has also suffered from the reduction of passenger traffic. Within local public transport, use of buses has increased, use of trams and trolley buses has decreased, and the level of transport by underground or suburban railway has remained unchanged.

The reorganisation of the economic and social environment changed the structure of passenger transportation significantly. As the demand for public transport decreased, demand for individual transport increased. The regular use of passenger cars for business purposes increased, although performance data do not fully reflect this. This is because passenger cars were chiefly used previously for family travel, but with the development of the market economy they have tended to become work tools, and this has entailed a decrease in the number of passengers. As a result, the participation of passenger cars in transport increased, although the increase in running costs considerably decreased the distance travelled by a certain number of the vehicles.

Table 2. **Number of passengers transported by transport companies, by economic sector (million persons)**

	1990	1995	1997	2000	2005
Railway passenger transport	210.6	155.7	156.9	160.3	165.0
Coach service	550.0	494.8	518.0	520.0	525.0
Local public transport	3 133.0	2 672.0	2 395.7	2 360.0	2 390.5
Water transport	3.5	3.7	3.1	3.0	3.5
Air transport	1.4	1.7	1.2	1.5	2.0
Total	**3 898.5**	**3 327.9**	**3 074.9**	**3 044.8**	**3 086.0**

Table 3. **Passenger transport performance (million passenger-km)**

	1990	1995	1997	2000	2005
Railway passenger transport	11 402.5	8 441.0	8 671.8	8 800.0	9 400.0
Coach service	10 808.1	10 775.0	10 920.3	11 240.0	11 320.0
Local public transport	12 392.0	10 679.2	9 358.6	9 300.0	9 270.0
Water transport	55.7	49.0	38.0	40.0	42.0
Air transport	1 344.3	2 383.4	3 049.2	3 200.0	3 500.0
Total	**36 002.6**	**32 327.6**	**32 037.9**	**32 580.0**	**33 532.0**

Private transport is expected to increase from approximately 51 billion passenger-km in 1994 and 53 billion passenger-km in 1997 to 54-55 billion in 2000 and to 60-62 billion in 2010. The observations and predictions generally concern the stock of vehicles. As far back as the early 1960s, the number of private cars started to increase, and in fact rose from 30 000 in 1960 to 2.1 million in 1993. There were 2.2 million cars in 1995, 2.3 million in 1997, and the forecasts are for 2.5 million or even 3 million in 2000, depending on the economy's growth rate.

Public transport is expected to remain an important mode in the new century, but its market share is likely to fall. There was a total of 32 billion passenger-km in 1997, of which 58 per cent in Budapest. In 2000, it should account for 32-33 billion, and in 2010 for 30-34 billion. In this sector, the modal structure is not likely to change in the course of the period under study. Road and rail should therefore retain their present share of 57 per cent. Inland waterways (mentioned here because they stand in first place for leisure trips) should also continue to account for approximately 65 million passenger-km. Air transport is likely to see its traffic increase by 60-80 per cent by 2000, owing to changes in flight routes in the region. Domestic air transport activities have increased, but as this is charter-type traffic only, they will not play a decisive role (owing to the size of the country).

The proportion of international passenger traffic should increase considerably by 2000. It is not possible to give a realistic figure, however, because there is uncertainty about different factors that can have an impact on the trend. While the liberalisation of tourism is one factor, international relations (both diplomatic and economic) are sensitive and delicate factors as well. Both the Balkan war and the widening of the European Union are also important factors.

Visa requirements are also an issue with a strong impact, especially for passengers from eastern Europe. For road transport, the figures indicate that about 10 million foreign vehicles a year entered Hungary in the middle of the 1990s.

Forecasts have also been made for freight transport. On the whole, the results presented in the following table show probable moderate growth in freight transport to 2000. Over the forecast period, export and transit traffic are likely to grow faster than the average.

Table 4. **Goods transport according to transport organisation forecasts (billion ton-km)**

	1990	**1995**	**1997**	**2000**	**2005**
Transport companies	25.4	14.6	15.9	16.4	18.7
Non-transport companies	11.3	9.0	9.9	10.5	12.2
Individual enterprises	2.7	3.3	3.6	3.8	4.0
Total	**39.4**	**26.9**	**29.4**	**30.7**	**34.9**
Of which: domestic	10.2	4.6	4.5	4.8	5.0
imports	14.6	4.1	4.7	5.0	5.2
exports	7.4	5.0	5.1	5.3	5.5
transit	7.2	13.2	15.1	15.6	19.2

As of the parts of the nine priority corridors defined during the Second Pan-European Conference on Transport in Crete, the extension of the M1 motorway from Gyõr to Hegyeshalom at the Austrian border, planned to be completed in 1995, the implementation of the M15 branch motorway from Mosonmagyaróvár to the border point of Rajka and Slovakia in 1996-97, the construction of the Budapest-Hegyeshalom rail line, as well as the extension southward of the M5 motorway from Kecskemét in 1996 are particularly important from the standpoint of the Transport Corridor Number IV (Praha-Bratislava-Budapest-Arad-Sofia-Istambul). The preparatory work for the extension of the M7 motorway, and the restoration of the rail connection between Hungary and Slovenia, as well as the eastward extension of the M3 motorway from Gyöngyös, are part of the development of the Trieste/Koper-Postojna-Ljubjana-Budapest-Uzsgorod-Lvov Transport Corridor Number V.

The following table shows trends in market shares for the different transport modes. The railways are expected to lose points to road transport. The growth of road traffic is assumed to cease in 2000, following the development of the use of multimodal transport techniques.

Table 5. **Trends in the structure of the freight transport market 1985-2000 (%)**

	1985	1990	1995	1997	2000	2005
Railway transport	46.4	42.7	31.3	29.6	28.2	30.5
Road transport	24.8	38.6	50.0	51.2	52.4	48.4
Water transport	18.7	5.3	3.5	3.3	3.5	4.5
Air transport	0.04	0.04	0.1	0.1	0.1	0.1
Pipeline transportation	13.4	13.4	15.1	15.8	15.8	16.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

2. RECENT AND FUTURE SITUATION AS REGARDS INFRASTRUCTURE AND INVESTMENT PROJECTS

According to the response from Hungary, earlier economic and social developments that led to the crisis were closely associated with degradation of transport infrastructures for which the State was responsible. Economic growth was also affected by the fact that infrastructure development had been relegated to the background. In recent decades, the improvement of networks and services had been decoupled from economic development. In the early 1990s, however, the situation improved somewhat because of privatisation, the involvement of private capital, the restructuring of institutions and the creation of separate funds that are independent of the state budget. Legal regulations have been upgraded or developed so as to remove obstacles to an environment conducive to development

The lack of sufficient resources, however, remains a serious problem. The backlog is so huge that it has been impossible to make up for the lack of capacity on existing networks. Thus, there are still gaps in the networks owing to insufficient capacity or the complete lack of certain network elements.

This problem places a burden on the economy of the country at large. Certain regions are not adequately connected to the main transport arteries, there are problems encountered for investments and it is not possible to achieve the levels of service required for European integration. Because of balance of payment difficulties faced by the State budget, the resources needed for these developments cannot be provided.

Road transport is the source of significant levels of local and global air pollution, noise and safety hazards. Development of the road infrastructure can increase capacity but also draw more vehicles onto the roads, thereby leading to congestion and increased environmental damage. The investment required to develop this infrastructure can put pressure on already tight budgets for many years. Public mass transport, on the other hand, offers clear advantages in terms of fuel efficiency, per vehicle emissions and safety. Transport networks in Hungary are extensive and dense, if in need of repair and maintenance. Hungarian policy makers are now challenged to:

- Take advantage of the structural advantages offered by intercity and urban public transport networks.
- Look beyond the current pressures of rising demand for road transport and answer the long-term call to manage growth in road transport.
- Make the kinds of policy decisions that will shape an environmentally healthy context for the development of the transport system.

Delays and incomplete implementation of policies have slowed Hungary's transformation process. One of the country's most pressing problems has been its current account and budget deficits. Growth has largely been consumption-led, and this has led to rising inflation and record highs in the trade deficit. In 1997, the current account deficit stood at more than 9 per cent of GDP and the consolidated budget deficit reached 7.5 per cent of GDP. Hungary also is burdened by a sizeable external debt service problem, partly inherited from the previous regime, but in large part acquired through the financing of the current account deficit. Hungary had the highest per capita debt service in the region in 1995; foreign debt accounted for 80 per cent of GDP and servicing the debt consumed over 40 per cent of export earnings. Hungary has continued to honour its debt, however, and, possibly as a result, has continued to attract foreign direct investment.

Special emphasis is put on the flexible development policy. The Hungarian Ministry of Transport, Communication and Water Management (MTCWM) introduced a so-called "rolling infrastructure development programme" that allows the State to initiate the development of projects where the need for and the likely availability of capital is highest, so that resources allocated by the state budget can be put to best use.

An investment plan cancelling earlier ones is being drawn up. Changes are expected first in the (mainly transit) rail network and the motorway network. The two main factors underlying the urgency of these transformations are the indispensable opening to the European Community and preparation for the country's integration into the EU.

The transport networks suffer not only from the state of infrastructures, but also of rolling stock, vehicles, operating methods and management.

3. FUTURE TRENDS BY TRANSPORT MODE

3.1. Rail transport

In international rail transport, the aim is to achieve speeds of 140-160 km/h. For intercity links, speeds should be above 100 km/h.

Two major rail projects are described here. The first concerns the Budapest-Hegyeshalom (Austrian border) line, which is intended to permit operating speeds of 160 km/h. The rebuilding of this entire line in Hungary (178 km) will make it possible to travel between the Hungarian and Austrian capitals in two hours. The work, begun in 1995 and scheduled for completion in 2001, also includes the installation of safety equipment, modernisation of the electrification and the rebuilding of all the stations. The project also provides for the purchase of new rolling stock and the construction of maintenance and repair facilities.

From the European standpoint, this project is in the first place part of the development programme of the Hungarian Railways (MÁV), but the fact is that most trips made by Hungarian tourists are to Vienna and the realisation of the project will make possible a connection to Greece.

The second big rail project concerns the line from Budapest to Kelebia (border with Serbia), which aims to achieve speeds of 140 km/h. The work, scheduled for 1996-2002, includes the laying of a second track alongside the existing one, upgrading to permit higher working speeds, the construction of station buildings, the replacement of the old safety installations and a new system of electrification. This involves 140 kilometres of track for the line itself and 40 kilometres for the stations, safety equipment for 19 stations, pedestrian subways and the upgrading of level crossings.

This project forms part of the Trans-European (TER) north-south route, which is a strong factor in favour of its realisation (the project headquarters are in Budapest). This project for upgrading the line for high-speed operation benefits from favourable terrain, which makes it relatively cheap.

The remaining MÁV investment programmes include further modernisation of the network by the construction of second tracks where necessary, electrification and the promotion of combined transport through the installation of terminals. Rolling stock and automatic train control are also part of this general reconstruction plan.

3.2. Road transport

For roads, the priority remains the motorway network, which does not yet really exist. Another major objective for the improvement of the Hungarian road system is to relieve the big towns of through traffic by the construction of bypasses. In the case of the capital, this also implies the construction of two big bridges over the Danube, which are destined to become part of motorways. One of these, as part of the M0 motorway bypass, has been put into operation, while the other should be built by the end of the decade.

The projects concern five motorways. The first involves the extension of the M3 motorway from Gyöngyös (70 km east of Budapest) to Polgar in the direction of the border with Ukraine (110 kilometres of two-lane dual carriageway). This extension not only permits connection with the former Soviet Union but also serves the industrial region of the northern and eastern regions of Hungary. According to a government decision of October 1995, the project will benefit from public financing. The construction work, started in 1996, is scheduled to be completed to Füzesabony (44 km) in 1999 and to Polgár (69 km) in 2001.

The extension of the M5 motorway (running south-east from Budapest to the border with Serbia) involves sub-projects, which might be implemented simultaneously. This motorway carries traffic on the Belgrade-Sofia-Istanbul route. It is part of the Trans-European Motorway (TEM) north-south route. From the standpoint of the Hungarian domestic network, it permits a connection between the motorways of the southern and eastern parts of the country. The first section is between Ujhartyan and Lajosmizse (km 44-km 74) and is to receive a second carriageway. Continuing on from this first section, a bypass around Kecskemet is to be built, plus a further 72-kilometre stretch of two-lane dual carriageway in the direction of the southern border of the country in at least two phases. The contract for the execution of this project, in the form of concession, has been signed and the building started in 1996.

The extension of the M7 motorway (from Balatonaliga, 90 km south-west of Budapest) to the border with Croatia and Slovenia includes a fork and involves three sub-projects. The Hungarians issued a call for tender for the construction and operation of a new 87 km two-lane dual carriageway on a section of the motorway along Lake Balaton. A tender was submitted in November 1995 and adds a second carriageway of 20 km as well. This motorway is a major route serving the Hungarian tourist region of Lake Balaton. In addition, it carries traffic heading to Zagreb and Ljubjana, but further sections of this motorway are not in plans to be implemented in this decade. The work began in 1998 and is to be completed in 2003 as part of corridor Number IV.

The M1 motorway is also to be extended as far as the Austrian border, from Gyõr to Hegyeshalom. This route is part of the international TEM project, but from the domestic standpoint it plays an important role in the road system of interconnections between the developed industrial and agricultural regions, the tourist areas and the Hungarian capital. The missing last section was put into operation in December 1995. A branch motorway (M15) will be built to join and extend a motorway planned by Slovakia at the new border point of Rajka. It implies the construction of another 15 kilometres of motorway. This section is also part of the TEM project and is implemented under the 1997 concession contract for M1.

The M0 motorway serves as a bypass around Budapest. The aim is to link all the motorways radiating from the capital. Today a 30 km section is in operation, which connects Ml, M7 and M5. (Construction was supported by a World Bank and EBRD loan.) The northern part, including a bridge over the Danube, will be built next. The work is to begin in 2000.

As for public transport on roads, the fleet (buses) should be updated; this is partly the task of the State and local governments.

4. SUMMARY OF CAPACITY PROBLEMS

4.1. Rail transport

Hungary's railway network is denser than the European average. It has a total length of 7 800 km, 3 075 km of which are trunk lines. The overall quality is below the EU average, however, especially as concerns the share of double tracks, electrified lines and maximum speed allowed. The technical state and composition of the rolling stock of the Hungarian National Railways is inadequate for use on the international network. Declining demand for rail transport has led to a drop in overall railway output. A principal factor in the decline of the railway’s activity is the generally poor condition of the rolling stock and tracks. Also contributing to the drop in demand is an incapacity to respond to the evolving demand for travel services.

The Hungarian administration indicates on the map of international routes the sections of the domestic rail network considered to be heavily trafficked. All the rail stretches concerned are located around Budapest,towards the north-west and south-east. In 1990, the average traffic volume on these sections was between 110 and 175 trains a day, which corresponds to utilisation rates of close to 90 per cent.

Capacity difficulties on the Hungarian rail network seem to be directly connected, according to the competent authorities, with the technical characteristics of the infrastructure, among which are different track gauges and a share of electrified double-track lines that is lower than the international average. Another difficulty is connected with the geographical configuration of the network, which seems too centred on Budapest (star pattern radiating from the capital). On the other hand, network density is close to the European average.

A consequence of the age of the railway tracks is that maximum speeds are reduced to only 40-60 km/h over what is considered to be a significant proportion of the main lines (about 20 per cent).

A specific problem is that the Hungarian rail network includes five bridges across the Danube. Two of these also permit the circulation of non-rail vehicles, while a third, in the north, is not permanently open to rail traffic. Four of the five are single-track; only the bridge to the south of Budapest is double-track. The total length of the bridges is 2 442 metres. Six other bridges cross different arms of the Danube: one is dedicated to the express Csepel line and is the only one that is double-track; three others are also road/rail bridges. The total length of these bridges is 628 metres.

Of the seven railway bridges over the Tisza, only one (at Szolnok) is double-track and two others are road/rail bridges. The total length of these bridges is 1 243 metres.

On all the bridges over the Danube and the Tisza used by both road and rail traffic, and on the northern rail bridge in Budapest, train speed is limited to 10 km/h. On most of these bridges, maintenance, and in particular protection against corrosion, has not been correctly carried out. What is more, in most cases, the conditions required for sea-going craft are not met as the arches are too narrow and too low.

Significant major programmes to be implemented in the railway sector in the near future are:

- Construction of the Hungarian-Slovenian railway connection (22 km of new track in Hungary) as a part of the Transport Corridor Number V.
- Increase in the length of electrified railway lines (about 254 km).
- Development of logistic centres (Hungary will have nine logistic centres to be developed gradually): the second project to relocate the existing combined terminal from the centre of Budapest to its vicinity is under preparation.

The technical obsolescence and poor state of the rail installations also concern the sidings and marshalling yards of the network. The entire operation of the network seems to be affected, and a description of the rail capacity problems reveals an apparently fairly dramatic situation: an obsolete and inadequate rail loading capacity, station tracks too short, unsuitable safety equipment, few tracks permitting simultaneous movements, little or no mechanisation, old and damaged tracks. The rolling stock maintenance sheds are outmoded and in a ramshackle state. Station services have remained at the level of fifty years ago. The telecommunications system is also in need of further development.

4.2. Road transport

Hungary's road network totals more than 100 000 km, almost 30 000 of which constitute the state-owned national network; of the latter, 6 740 km are major trunk roads. The density of the national highway system is approximately at the European average; however, the quality of the infrastructure is significantly lower. As concerns major motorways, Hungary lags behind the European Union in both density and quality. Major infrastructure investment projects are currently under way to meet the requirements for EU accession.

The sections considered as heavily trafficked had average daily traffic volumes in 1990 ranging from just over 10 000 to just under 19 000 car-equivalents, corresponding to an average utilisation rate of 85 per cent. The most heavily trafficked section (18 900 car-equivalents, 114 per cent utilisation) is relatively short and is located to the north of Budapest, between the capital and Vac, close to the border with Slovakia. Another section parallels the M3 extension project. Further to the south, the route leading to the Ukraine parallels the same project and also seems partly overloaded. In the tourist region of Lake Balaton, the route of another motorway project (M7) is cited among the saturated sections. To the north and parallel to this route, difficulties are also reported in the direction of the Austrian border.

Despite significant, and at the time adequate, development between 1970 and 1980, road quality is not up to the standard required by the increase in traffic. Road surfacing was the first to be affected by the cuts in resources allocated to road maintenance and development during the 1980s. The deterioration of the roads is leading, as for the railways, to increasingly frequent congestion, rising fuel consumption, delays, pollution, accidents and increasing growing maintenance costs.

The shortcomings of the trunk road network reported as the most significant in the mid-1980s range from the capacity problems of two-lane roads (saturated over 440 km) and level crossings over railway tracks to the need to build cycle tracks or to upgrade many bridges (almost 4 000) because of inadequate loading capacity. Over 12 000 km, the capacity of the trunk road network seems inadequate and the surface is scarcely conducive to good road safety. Lastly, on the international routes classified "E" in Hungary, 1 400 km do not meet the standards required by the agreements.

The overall structure of the trunk road network in Hungary is distorted by the small number of bridges over the Danube and the Tisza and by the lack of quality roads linking the big towns and regions. Like the rail network, the road network is considered to be too much centred on Budapest.

There are few places where the roads are configured to separate traffic according to the speed or size of vehicles or according to whether it is local or through traffic. Few towns have bypasses.

The density of the national road network is 320 km/1 000 sq. km. This may be considered low, in view of the average for the 20 European countries of 557 km/1 000 sq. km). The Hungarian national network has over 11 000 bridges, but half have neither adequate bearing capacity nor sufficient width, thus forcing certain vehicles to make what are often long detours. A large proportion of these bridges are old, in poor repair and not adequately protected against corrosion.

4.3. Waterway transport

The Danube is Hungary's principal inland waterway and a major part of the transcontinental Danube-Main-Rhine system since autumn 1992. Despite the international importance of this waterway, problems persist; for example, the stretch of the Danube just above Budapest is quite shallow and does not meet EU specifications for navigation. Despite the presence of other major navigable rivers, inland navigation is hindered by a number of other factors: port density on the country's other major rivers is considerably less than in western Europe, and cargo ports on these rivers do not meet the loading requirements of most western European countries. Adding to the unfavourable shipping conditions is the state of the Hungarian shipping fleet, which is old and thus increasingly costly to maintain and operate.

The transport policy calls for action to support inland waterways including:

- Modifications to the section of the Danube above Budapest to comply with EU standards.
- Development of ports at cities of importance along the Danube; building of ports on inland waterways for combined transport and establishment of rail connections.
- Modernisation of the shipping fleet for use on western European waterways.

4.4. Air transport/aviation

Airports will be developed gradually, in accordance with evolving transport demand. Long-term development plans of the Kiskunlacháza airport must be made in concert with those for Ferihegy (Hungary's main international airport at present). The country's other airport, which also serves international traffic, will be made suitable for general aviation and for air taxi services. Airports serving regional interests and tourism are to be developed by private enterprise.

Ferihegy International must be built to handle passenger traffic in the years following 2000 by enlarging terminals and other commercial establishments. A large-scale modernisation and expansion programme, which includes a new terminal building, is under way and is projected to double the airport's capacity from the current 2 million passengers a year to 4-5 million. Air traffic control services will, through a continuous and comprehensive development programme, ensure, in accordance with EUROCONTROL regulations, the safe and up-to-date control of flights in Hungarian air space.

It is necessary to modernise Hungary's international aviation relations and agreements as well as develop them in line with the capacity of MALÉV Ltd. in order to increase its markets and traffic.

MALÉV Ltd., as Hungary's national airline, must obtain the same support as that granted by EU member countries to their own national airlines.

Air travel is on the rise in Hungary, and is projected to increase by 60-80 per cent by 2000. Hungary also has several military airfields (for NATO) which could present opportunities for further expansion of air travel.

4.5. Urban transport

In urban transport, to reduce congestion as well as emissions and noise pollution, it is necessary to slow and eventually, to halt, the contraction in public transport. To promote this, it is necessary to promote the renewal of the urban and metropolitan vehicle stock and the modernisation of networks.

Various installations/measures are needed in suburban and outlying areas. It will be necessary to provide: parking facilities at railway and bus stations and at transfer points; bicycle stands/storage facilities with connecting trails; and park-and-ride parking with easy access, supplemented by attractive service units and combined ticket system for riding and parking. The system of zone fares must also be introduced. An attractive fare structure is needed for public transport, so that it, rather than private vehicles, is used. At the same time, it should be accessible and affordable for those who need it most. Through the establishment of transport boards, public transport in metropolitan and satellite areas could be made more efficient and attractive to users.

In densely populated areas of major cities, in protected zones of historic or architectural importance and in those used for leisure and recreation, private vehicle traffic should be limited.

In the interest of improving the quality of life, the number of districts enjoying traffic-calming measures must be increased. In the inner city, parking regulations are also needed that will help moderate traffic.

Parking problems, especially in larger areas, require economic solutions and measures that can affect travel habits. Parallel with the introduction of facilities for pedestrian traffic, their protection must also be ensured and the movement of those with reduced mobility should be made easier.

To regulate and co-ordinate commercial transport in urban areas, various measures are needed in terms of organisation and development.

The division of responsibility for public transport, between the State and local governments, should be re-examined. After review, the possibility of changing the present spheres of responsibility, which are linked to administrative boundaries, will have to be considered. Similarly, legal, organisational, economic and technical distinctions should be made between local and out-of-town traffic, along western European lines.

These tasks are particularly important for Budapest. The agenda for the capital includes the systematic renewal of bridges across the Danube, enlarging the river crossing capacity primarily to the south of Budapest, and further grade separation at road/railway crossings of lines with heavy traffic. Parallel to the implementation of parking regulations, large capacity parking installations are to be established primarily outside the urban core.

Road capacity to Ferihegy will have to be enlarged to meet the growth in air traffic; in the long run, public transport by rail should link it to the city centre. The peripheral ring road system encircling Budapest must be developed further. The feasibility of linking MÁV lines to the urban/metropolitan system, to facilitate movement of passengers, will have to be explored. In the long term, the city's metro system needs to be extended.

Key aspects of achieving sustainability in urban transport systems in Hungary include:

- Managing traffic growth in city centres by establishing and enforcing effective parking control and traffic-control measures.
- Continuing the rehabilitation and upgrading of public transport.
- Ensuring the long-term financial health of urban public transport companies and encouraging cost recovery in the public transport system through sound fare and subsidy policies.
- Integrating transport considerations to the extent possible in urban land-use development.
- Ensuring that as responsibilities for urban transport are decentralised to municipality level, the means to manage and develop the system are placed in the hands of the municipality.

The transport policy calls for the following measures, among others:

- Improvements to parking facilities at railway and bus stations, park and ride opportunities.
- More attractive fare structures to attract riders.
- Re-examination of state and local government authority over public transport.
- Renovation of bridges across the Danube and increased river-crossing capacity.

Fares have been significantly raised over the past five years as subsidy support has been reduced. Further increases are envisaged over the next few years as BKV (Budapest Transport Company) aims to achieve by 2000 the 50 per cent cost recovery requirement which was imposed as part of the conditions of the international loan. Cost recovery was at 34 per cent in 1995 and around 40 per cent in 1998. BKV continues its restructuring initiatives, which have included streamlining of activities, capacity cutbacks and staff layoffs. Despite these efforts, its market share in Budapest transport seems threatened for some time to come.

4.6. Combined transport

In order to mitigate the negative effects of road transit traffic, or for that matter, of Hungarian export/import traffic, it is desirable to augment the role of combined transport, to promote co-operation between modes and to create the necessary conditions for achieving these goals.

It will be necessary to acquire rolling stock suitable for the transport of drive-on/drive-off piggyback units, trailers and special containers. For waterborne movements of trailers, special tow barges and transfer terminals will be required. The introduction of competitive fares, state support and enactment of regulations that stimulate modal transfers, will also be necessary. Container transport by rail and on inland waterways will have to be developed and encouraged.

Transfer terminals, where justified by demand, will also have to fill the role of logistics service centres. Various approaches may help to promote the adoption of certain methods of transport logistics and combined transportation, such as:

- Raising the overall quality of the operations of the transport industry.
- Favouring public carriers in goods transport as opposed to private or own account ones.
- Increasing the number of medium-sized transport companies.
- Elevating professional requirements in the transport industry.
- Developing telematics.

There is considerable potential for further development of combined transport in Hungary. Combined transport accounts at present for only around 0.5 per cent of total traffic and 7 per cent of transit traffic through Hungary. According to the transport policy, rolling stock and infrastructure will need to be acquired for both road and water combined transport, the long-term goal being to increase the share of combined freight transport to 3-4 per cent of import/export traffic, and 15-20 per cent of transit.

4.7. Transit traffic

Hungary's geographic situation makes it inevitable that it is and will remain a transit country. The main routes from south-east Europe and the Middle and Far East all cross Hungary. Of the nine priority corridors chosen at the Crete conference, no less than three (numbers 4, 5 and 7) pass through Hungary and Budapest in particular.

The environmental and capacity problems posed by transit are significant. With the changing trade flows, the extra traffic demands have been high, though perhaps not as high as expected or as is often thought. Transit is expected to increase from about 12 billion ton-km in 1985 to 16 billion ton-km in 2000 under an "optimistic" growth scenario. Transit traffic increased substantially during the war in Yugoslavia and it is not clear whether this traffic will decline as normal relations resume in the Balkans.

Transit is an emotional subject, in that the methods of dealing with it are often unilateral and controversial in the eyes of other countries. The principle of "territoriality" – that payment is made where the journey is undertaken – is now more widely accepted in theory, but in practice there are numerous exceptions. The need for transition countries to obtain payment (especially hard currency) as compensation for the wear and tear on their infrastructure and the environmental damage caused is understandable, but if the charges are applied only to foreign hauliers tensions are created with trading partners.

The dilemma of "territoriality" for the transition countries is that it is very difficult to apply full cost pricing both to domestic and foreign vehicles. Consequently, it is impossible to cover costs by applying charges that are acceptable to domestic companies to foreign vehicles. The solution most consistent with the principles of territoriality and non-discrimination is to introduce direct road user charges or tolls. However, practical or political considerations do not always permit this. The transit issue is a difficult one for many countries and will remain so in Hungary for the foreseeable future.

4.8. Pipelines

Assuming the opening up and continuous operation of the Adria pipeline, the capacity of the international crude oil pipelines will satisfy demand to the end of the century. In order to be prepared to meet crisis situations, reserve storage capacities must be expanded, and the use of the railway and inland waterways should be increased.

The capacity and security of the country's natural gas pipeline network can be increased by establishing the Austro-Hungarian line and by building a connection to the TRANSGAS network that crosses Slovakia.

5. MEASURES AND INVESTMENT IN INFRASTRUCTURE

As already pointed out, the primary aim of the infrastructure projects for Hungary's transport sector is the radical upgrading and reconstruction of the networks and their equipment. However, the country's transport policy is also aimed at ensuring that the transport system develops favourably with respect to criteria such as network capacity, environmental protection and energy consumption.

As the country is in a transition situation, this means maintaining or even developing the attraction of public transport modes (rail, coach, urban transport) in view of the expected substantial growth in the number of private cars. General transport policy thus conceived takes account of the consequences of this growth: certain and rapid saturation of the road network if nothing is done.

No measures to limit demand for passenger transport are envisaged, in domestic traffic because no significant growth is expected for the moment, in international traffic because this corresponds to the political and economic objectives of opening up the country and is an important source of income.

However, certain restrictions are envisaged on passenger car traffic in saturated city centres.

With regard to the freight sector, the ongoing evolution of the structure of Hungary's productive sector will no doubt significantly modify the growth in the volume of transport services supplying local demand. Because of this, it will be necessary to reduce long-range transport to some extent. Transit is likely to increase significantly and should therefore be subjected to close attention.

Among other actions relative to the sector, institutional and regulatory changes permitting the introduction of market mechanisms have led to changes of status of certain transport enterprises and recourse to the concession system. All of the regulatory issues with an impact on the utilisation of private capital (*e.g.* investments) have been addressed and the most important ones have been enacted as laws. Joining the EU will greatly ease the need for foreign capital. These changes are such as to also encourage demand.

Hungary, like most of its neighbours in Central and Eastern Europe is facing the difficult task of meeting the requirements to join the European Union as soon as possible, while at the same time completing its transition to a market economy. Along with the restructuring of institutional, regulatory and economic systems, the modernisation of inadequate, obsolete infrastructure is a factor in accession. As concerns transport, a safe, rapid railway system and modern roads and highways are important aspects of building links with Western Europe.

Questions arise, however, when exploring how best to assure an adequate quality of transport infrastructure:

- How can the existing infrastructure – for intercity rail, urban public transport and road – be renovated, rehabilitated and optimised for more efficient use, thereby minimising the need for costly investments and enhancing public transport use?
- What are the necessary investments in new infrastructure and in what time frame should they be undertaken based on available domestic and international resources?
- What are the real environmental, financial, social and economic consequences of new infrastructure development?

These are some of the questions that governments should be asking when thinking for the long term about how to build transport systems that are not only technically, but also economically, financially and environmentally sustainable. The exercise may seem redundant, given that financing for new infrastructure development is being given by the lending institutions. These questions are essential, however, and not always completely answered by the World Bank. The case of Hungary is illustrative.

Hungary sees development of road infrastructure as critical for its economic growth and a strategic part of its preparation for membership in the European Union. At least partly as a result of this strategy, road capacity is being increased, while capacity of the rail network is being reduced, despite some improvements to rolling stock and tracks.

It is not that all road infrastructure development is unnecessary; the issue is rather one of priority, that is, which aspects of the development of the transport system should receive priority for the allocation of scarce funds. Optimising the transport infrastructure in place via repair, upgrading and maintenance of the existing fixed plant and rolling stock should take precedence over investment in new infrastructure. Favouring intercity and urban public transport provides the best path to a sustainable transport system. Hungary's transport policy makes this clear.

6. RELATION BETWEEN MAINTENANCE AND DEVELOPMENT

To determine the proportion of resources to be devoted to maintenance and to development, the following have to be considered:

- Transportation infrastructure constitutes part of the nation's wealth, and its value changes over time. This depends on the extent and level of maintenance, or the lack thereof. The importance of regular maintenance of infrastructure cannot be overemphasised.

- Gradual modification of the proportions of user fares, on the one hand, and, on the other, state subsidies, so as to approach the (constantly evolving) trend in EU countries.

Both of the above points mean that user fares must gradually assume the financial burdens of maintenance and development.

To realise the strategic objectives of the transport policy, significant additional state resources, which will increase over time, will be needed, for the following reasons:

- In the case of motorways financed through concessions, the required level of state contributions may reach 40 per cent of the project cost;
- Upkeep and modernisation of old railway track is a long-term task in order to rectify decades of deferral and neglect in terms of maintenance;
- The construction of the required national ports demands significant contributions from the State;

- The development of the network of waterways requires state resources on many river segments;
- The renewal of the stock of public transport vehicles, and its continuous replenishment, necessitate ongoing support;
- The acquisition of physical resources for combined transport cannot occur without government assistance.

Investments in transport development are justified for the following reasons:

- A well-functioning transport system is a significant source of government revenues;
- The current deficiencies, and the consequent inefficiencies in the transport sector result in HUF 120 billion annually in excess costs to the national economy;
- Many sources of credit, assistance and capital are only available when public support has reached a certain threshold.

7. THE STRUCTURE AND OBJECTIVES OF THE BUDAPEST TRANSPORT ASSOCIATION (BTA)

The advent of the market economy in Hungary has brought about big changes. Some of the older large-scale industries, which were heavily supported by public transport, have declined, and new private industries, located throughout the suburban areas, have started up. With increased wealth generation there has been a rapid rise in car ownership, which, together with constraints on public spending, have had an impact on the public transport operator’s ability to maintain what is a very comprehensive public transport system.

It is useful at this point to summarise the current situation so that the evaluation of options can be put into context. There are three main operators responsible for public transport in Budapest and the outlying areas. BKV (the Budapest Public Transport Company) is owned and financed by the municipality. It operates bus, tram, trolley bus, metro, underground and suburban rail (HÉV) services, and the impacts of any options tested should be established for each sub-mode. BKV’s task is to organise, provide and manage public transport in Budapest, where it has an exclusive right to operate, and in some cases outside. The municipality determines the network operated in terms of routes and frequencies. Fares have to be approved by the Ministry of Finance which subsidises concessionaire fares (for students and pensioners).

MÁV is the State rail operator, operating suburban rail services on 11 lines to and from Budapest. The Ministry of Transport determines MÁV’s timetable and fares: the fares have to be approved by the Ministry of Finance. MÁV as a whole operates at a deficit. There is a service agreement between the State and MÁV (established in February 1995) under which essential services are defined, with the State agreeing to cover all recognised costs not covered by ticket revenues or social subsidies (student passes are subsidised, pensioners' fares are not). There is one other body with a financial interest in MÁV's operation: employers are obliged to refund 86 per cent of the full price of their employees' passes valid for intercity journeys.

Volánbusz is a state-owned company set up in 1993. It operates suburban and intercity buses serving both Budapest, along radial corridors, and other settlements in the Budapest region. Volánbusz's timetable and fare system are regulated by the Ministry of Transport and approved by the Ministry of Finance. Employers reimburse 80 per cent of their employees' full price intercity passes and the State subsidises student passes. There is no subsidy for pensioners' fares. The state does not wish to support either the operating costs or the development of the services of Volánbusz, and so far the company has covered its operating costs though there is cross-subsidy between services.

The current situation, in theory at least, is clear. The three operators operate independently of one another. They sell their own tickets and keep their own revenues. They bear their own costs and receive any necessary revenue support from their owners.

For the Budapest Transport Association (BTA), the situation is less clear. The fare revenues attributable to each operator will be determined at least in part on the basis of the agreed revenue-sharing procedure. There is a question mark over the contribution made by employers towards their employees' intercity passes. Social subsidies will continue to be provided by the State for all student passes and for pensioners within Budapest. The question then arises of how revenue support will be provided: will the municipality support BKV, with the State supporting Volánbusz and MÁV, or will the BTA's deficit be funded as a whole by the State and the municipality on a basis to be agreed? The funding of investment expenditure is also less clear: the real question is whether the municipality continues to own BKV and the State continues to own MÁV and Volánbusz, or whether the municipality and the State between them own the BTA.

The principal groups to be affected by the options being evaluated are:

- Public transport passengers (and the employers who support their fares).
- Other transport system (road) users.
- Public transport operators (by sub-mode).
- The municipality and state government.

The evaluation of options should focus on the present and on the short term (to 2000). It should address impacts under the following headings:

- Level of service.
- Operational efficiency.
- Economic impact.
- Financial impact.

The economic impact of options should be measured via conventional cost-benefit analysis, although if the changes are simply in annual operating costs and benefits it will not be possible to produce a conventional rate of return evaluation. The output measure might be an efficiency gain (additional benefits minus additional costs) perhaps expressed as a percentage of the costs of operating the base public transport system. The principal components of the evaluation will be:

- Costs: changes in the variable costs of operating public transport.
- Benefits: changes in hourly coverage of public transport, excluding the effect on fares. If modal transfer is modelled and a framework exists or can be made to exist for assessing the impact on the road network, this could be added to the estimated benefit.

The economic performance of the BTA will be affected by exogenous factors beyond its control, particularly in the longer term. Changes in economic conditions will lead to higher car ownership and potentially increased competition for public transport; changes in transport policy, including parking policy and environmental policy and regulation, may affect the use of private and public transport. Scenarios for the shorter term and the medium term (five years) will be developed and agreed as a basis for assessing the performance of the BTA.

Assessment of the financial issues surrounding the BTA has two principal elements. First, there are the annual costs and revenues, including social payments made in respect of discounted fares, under each scenario (fares, service, economic factors) to identify the revenue shortfall of each company and the need for subsidy from relevant bodies. This subsidy requirement will then be assessed against the requirements without the BTA and against targets for the reduction of the subsidy. Second, particularly over the medium term, it will be necessary to take account of the different investment scenarios and identify priority investments on the basis of operational, economic and financial performance and to ensure the consistency of the proposed investments with the funds likely to be available.

Conclusions will be drawn concerning a proposed series of measures (including fare and service measures) and on a timetable for their implementation. Issues of timing will be important. One key issue is the timing of any major change in the fare structure or significant changes in service provision. One school of thought advocates a phased change to a unified fare system first and then to integrated services; another school of thought argues that it is better to implement all major changes at once. The relative merits of these approaches will be explored to determine the way forward.

A schedule will be drawn up of the changes to be implemented and the preparatory steps to be taken, having regard to the progress being made in the establishment of the BTA.

The principles of the Management Information System will be determined in order to identify:

- What data should be collected.
- The data source.
- The frequency with which it should be collected.
- The use to be made of the data.

The principal intention of the passenger information system is to make it easy for people to use public transport and thus to encourage its greater use. The information system should aim to convey the following to the population of the BTA area:

- An appropriate image of the association.
- The principles of the association.
- Information at stations and terminals and on vehicles.
- General timetable and fare information.
- Individual timetable and fare information.

8. PRINCIPAL CHALLENGES TO SUSTAINABILITY

Hungary is not alone in the challenges it faces from transport-related environmental problems, particularly as concerns air pollution. Like the other countries in Central and Eastern Europe, exhaust from the growing numbers of old, fuel-inefficient and polluting vehicles in the fleet is worsening already poor air quality, especially in urban centres. In Hungary, traffic accounts for 45-50 per cent of carbon monoxide, 40 per cent of nitrogen oxides, one third of hydrocarbons and 90 per cent of lead emissions. Transport is also responsible for approximately 14 per cent of CO_2 emissions. Within the transport sector, 85 per cent of pollution is from road traffic: 12-13 per cent from railway and the residual from water transport (CAAG, 1995). Of particular concern is air quality in Budapest, where traffic is the primary source of air pollution. Despite Budapest's lower degree of motorisation, the emissions output of vehicles in Budapest is comparable to that of cities of similar size in western Europe, where motorisation is more developed. The poor air quality in Budapest is largely a result of the structure of the private car fleet and its average age of over ten years. In addition, deficiencies in infrastructure, *e.g.* lack of bypass roads and traffic control equipment, exacerbate congestion and air quality degradation.

One of the principal contributors to vehicle-related air emissions has been two-stroke engines, which comprise a large portion of Hungary's vehicle fleet. These engines are particularly responsible for significant levels of hydrocarbons and particulate matter. The government has been pursuing policies designed to reduce the share of these vehicles in the fleet. Action has also been taken to phase out leaded petrol. Until 1992, most motor vehicles in Hungary used petrol with a lead content of 4 grams per litre (gpl), at which time, lead content was reduced to 1.5 gpl. Unleaded petrol is also being sold for vehicles equipped with catalytic converters. Today, only unleaded petrol is being sold in Hungary.

The transport policy describes goals for the "protection of human life and the environment" as:

- Improving co-operation between transport modes.
- Slowing the rate of attrition in railway and waterway transport.
- Increasing the role of combined transport in import/export and transit traffic.

To address transport-related pollution, the policy calls for the application of more stringent international standards for new road vehicles: building of bypass roads to avoid residential areas; priority treatment for mass/public transport and railways. Preserving protected zones and national heritage sites as part of transport development is also cited.

As concerns lead pollution in the soil, the policy calls for: the discontinuation of use of leaded petrol; reduction of the use of chemicals in roads; favouring of vehicles with the most non-polluting technologies.

Transport-related noise, according to government estimates, affects around one-third of all Hungarian households, although noise pollution has declined since 1990. Further reduction is to be brought about by adopting 1995 EU regulations on noise pollution and by encouraging the "introduction and operation of quieter vehicles". Progress has been made in implementing some of these measures:

- As mentioned above, as of 1996, imports of vehicles of more than four years old are prohibited, along with those with two-stroke engines.
- Since 1992, according to the government, the number of vehicles passing mandatory yearly inspection tests has increased.
- To stimulate vehicle fleet renewal, a vehicle scrapping programme offering public transport tickets as an incentive to retire old two-stroke vehicles from the fleet resulted in the scrapping of 10 000 vehicles per year; 400 000 vehicles were retrofitted with subsidised catalysts.
- Since 1995, emissions standards for new and used gasoline vehicles are equivalent to EU emissions standards introduced in 1993.
- Also since 1995, UN-ECE emissions standards for new diesel vehicles are being applied.

It should also be noted that significant fuel price increases appear to have played a role in reducing vehicle use over the last five years. In addition, Hungary imposes a 4 per cent tariff on petrol to finance environmental mitigation measures and sets a tax on batteries and tires to finance their disposal costs. Revenues from these sources are estimated at HUF 8.4 billion for 1998, or approximately 0.15 per cent of GDP. Though all environmental costs due to road transport are not covered by these taxes, their application demonstrates real efforts on the part of Hungary to address road transport externalities.

In terms of safety, the transport policy recognises that the number of accidents involving personal injury is higher than that of other countries with comparable vehicle fleet size. The government estimates that the cost of these road accidents to the economy exceeds HUF 50 billion annually.

Table 6. **Traffic injuries and fatalities 1980-2010**

Mode/year	**1980**	**1985**	**1990**	**1995**	**2000***	**2005***	**2010***
Injuries	23 827	24 840	36 996	27 840	29 900	32 000	34 000
Fatalities	1 630	1 756	2 432	1 560	1 600	1 650	1 500
Total	25 457	26 596	39 428	29 400	31 500	33 650	35 500

The transport policy calls for efforts to further reduce the number and gravity of accidents via improvements in the road network and vehicles, more stringent regulations and controls, public information initiatives and improved emergency response operations as is detailed in the National Traffic Safety Programme.

9. FINAL REMARKS

In its transport policy, Hungarian policymakers have clearly considered the short- and long-term impacts of transport on the environment and safety. This is to be commended, as it demonstrates a recognition of the importance of sustainability in the development of the transport sector. The question of what Hungary can do now - when the resources necessary to provide the right kinds of stimulation to sector development, particularly for the enhancement of public transport, are inadequate – remains open.

Financing is insufficient to properly maintain and repair rolling stock and track equipment and infrastructure, needs that are specifically called for in the transport policy. Though by no means the only reason for the scarcity of resources, the burst of recent road infrastructure development seems to be a factor in the financial strain on the transport sector. Internal and external pressures for new infrastructure development are no doubt real, owing to on EU accession objectives and perceived domestic economic development concerns. However, Hungary's debt remains a problem and appears to be worsening, in part due to the development of the transport sector, despite the government's recognition of the need to measure new infrastructure development against overall economic development and the availability of financial resources.

Hungary is not alone in facing the challenge to build a transport system that is both sustainable and responsive to immediate market demands. Indeed, this is the task of decisionmakers throughout the CEE and in OECD countries as well. Economic pressures from both inside and outside Hungary may render the challenge even more complex. Policymakers in Hungary are seeking ways to balance pressing needs for system improvements with severe budgetary constraints and lack of adequate financing. The way they respond to these pressures will shape the development of the transport sector for years to come. Though certainly difficult, especially given the prevailing economic climate, it is in the interest of governments, including that of Hungary, to consider the long-term development of the transport system in order to assure its sustainable growth.

Table 7. **Trends in costs and financial resources**

Denomination	**Measures**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2006**
		fact	**fact**	**fact**	**Forecast**	**forecast**	**forecast**	**forecast**	**forecast**
Road/railways freight (ton-km)	%	190	185	184	183	182	183	185	200
Road/railways pass (pass-km)	%	823	840	840	840	843	855	855	900
Length of motorways, roads	km	379	395	548	554	554	642	686	843
Vehicle air emissions	bill. tonnes	8.59	8.72	9.36	9.9	10.6	10.8	11.0	11.9
Number of public road accidents	thousand	18.4	19.1	20.6	21.0	21.5	22.0	22.0	23.0
The tax content of fuel price	%	86.5	66.2	69.6	74.5	75.0	75.0	75.0	75.0
Age of Hungarian trucks:									
1 to 5 years	%	24	25	26	27	28	28	29	32
51 to 10 years	%	32	26	26	27	27	28	29	30
over 10 years	%	44	49	48	46	45	44	42	38
Hungarian passenger cars by age									
from 1 to 5 years	%	15	16	17	18	19	20	21	25
from 1 to 5 years	%	27	23	23	24	24	25	26	32
over 10 years	%	58	61	60	58	57	55	53	43

BIBLIOGRAPHY

Ministry of Transport, Communication and Water Management (1996), *Transport Policy of the Government of the Republic of Hungary*.

Ministry of Transport, Communication and Water Management (1997), *Development Trends of Transport in Hungary*.

Ministry of Transport, Communication and Water Management, Transport data, 1988-1997.

Topic 1

SCENARIOS, FORECASTS AND DATA COLLECTION: EXPERIENCE AND PROSPECTS

b) Data collection: Experience and prospects

THE STATE OF EMPIRICAL RESEARCH INTO MOBILITY, AND OUTLOOK

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SUMMARY

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1. THE POVERTY OF EMPIRICISM

In the sixties and early seventies study of the transport sector was typified by the attempt to survey large quantities of data as easily as possible using basic traffic parameters. This approach owed little to the methodology of empirical social research. As a rule it produced surveying procedures and instruments and data sets derived from them, the quality of which did not correspond to the importance of the decisions founded upon them.

With the development of more exacting surveying procedures – which originated in systematic basic research conducted over many years – the picture has radically changed. This development is reflected, for example, in the first nationwide survey to be held in (West-) Germany (1975), which lasted a whole year and was tailored to the requirements of the persons questioned (KONTIV). There followed a series of surveys of the same design up to and including KONTIV 82. At the same time, the so-called KONTIV Design was (supposedly) taken up by a number of researchers. However, in most cases only the questionnaire proved to be suited to the inquiry into behaviour and not the survey design. As a result, surveys were conducted and data collected, which actually failed to comply with the standards embodied in the original KONTIV Design.

With the advent of KONTIV 82, however, it was already apparent that this original design was in need of further development. The main reasons for this were the findings of the ongoing basic research into methodology (Socialdata,1986), the need for fuller, in-depth knowledge, changes in social attitudes towards surveys and hence in the behaviour of the respondents, and changes in the technical means available for carrying out surveys. This development suggested the need for a fundamental reappraisal of the methodology used hitherto.

There began (1983) the "seven fat years" for the development of survey designs in the transport, or rather mobility sector. By 1989 the "Neue KONTIV-Design" (NKD) had been developed, fulfilling all the extended data requirements identified hitherto, without detriment to the quality of the methodology. On the contrary, consistently returning to (changed) demands on the part of the persons questioned could even increase the validity and reliability of the survey. At the same time the design was structured so that it could be used without difficulty even in large-scale applications and, in spite of the considerably extended amount of data, provided comparable basic characteristics to those of the design used hitherto. Consequently a smooth – to the layman almost unnoticeable – transition to an up-to-date methodology was ensured.

In the eighties, however, awareness of the need for a methodological advance of this kind was not particularly pronounced in the specialist circles concerned. The development of methodology was therefore conducted behind the backs of the (specialist) public.

Towards the end of the eighties the debate over surveys in the transport sector flared up again. This debate was mainly influenced by the easy availability of new ways of questioning people (such as the telephone) and was chiefly driven by the claims and interests of the questioners, rather than the potential and limitations of those questioned. The result was a perceptible lowering of methodological awareness. The seven fat years were followed by "seven lean years" between 1990 and 1996.

These seven lean years may be characterised here by seven problematic developments:

1.1. Simplification and short-cuts

Transport behaviour can be very complex, and therefore not easy to deal with in empirical data compilations. Hence the need for simplification, but it must be simplified in such a way that essential aspects of transport behaviour are not left out. Unfortunately, they very often are. The best known example of this is (still) the so-called "modal-split", where non-motorised means of transport were left out of consideration and in the case of private motorised transport no distinction was made between drivers and passengers.

Another example is the preoccupation with presenting the modal choice with reference to the distance travelled, which is hardly in line with the urgent need to analyse transport behaviour and requirements, mobility being determined by activity and not the desire to cover a certain distance.

1.2. Uni-dimensional perspective

Although the specialists never tire of emphasizing that transport is – or can be – a very complex area of behaviour, they immediately lose sight of this insight when they begin work in the field.

At the moment this is becoming particularly clear in empirical work that examines the connection between environmental awareness and modal choice. Here, little account is taken of the fact that modal choice must be seen in terms of a particular situation and that every individual finds him/herself in several different situations every day. For this reason it is always possible – or even probable – that, for example, even those who are very environmentally conscious occasionally travel by car (of necessity), as they would otherwise be quite unable to achieve certain goals.

But uni-dimensionality is not only a feature of transport analysis, but also a significant problem for the relevant research into methods. For there are more and more experiments into methods, in which one or two design variables are changed and the supposed effects measured (e.g. surveys by telephone *vs.* surveys in writing). But if it is known that the success of a design for a transport survey is determined by 50 or more factors, it soon becomes clear that such experiments regularly suffer from their own one-dimensional perspective.

Only against the background of this methodologically undifferentiated discussion can we understand how it is possible that researchers into transport, for example, believe that a connection can be established between the quality of the transport supply and the (non-)respondent quota in mobility surveys (Valleé, 1994).

1.3. Confusing "state of the art" with "state of the practice"

In research into transport and mobility in particular, many principles of empirical surveying methodology have traditionally been applied on a grand scale. An important reason for this is that transport researchers and planners (nearly) always regard it as self-evident and appropriate to conduct surveys for their own planning/research purposes themselves. Because the more complex survey designs also require extensive experience of practical planning and implementation of surveys, over and above methodological know-how, such designs are often not used.

As a result, a multiplicity of surveys of questionable quality have grown up, of which there is a very impressive compilation in Axhausen's travel diaries, for example. This "state of the practice" should not however be confused with the "state of the art": methodological standards are necessary precisely when many people *fail* to observe them.

1.4. "Statistomania"

Conducting an analysis, in which the connection between two variables is (also) statistically checked, is necessary and sound; equating this (statistical) connection with the reality, replacing thinking with calculation, so to speak, is not always sound.

Discussions about the quality of mobility surveys are traditionally dominated by consideration of chance mistakes, which suggest to less experienced users of data that statistical reliability can be equated with the "correctness" of the results. This simplification is as false as it is misleading. For, particularly when complex phenomena (like mobility behaviour) are surveyed, use of inappropriate methods with complex survey designs can have a far greater influence on the outcome than chance mistakes. Moreover, since consistent mistakes can in principle be recognised and, to a certain extent, corrected, the failure to take account of these flaws in discussions about the quality of mobility surveys and the concentration on chance mistakes can perhaps be explained by the fact that traditional transport research has usually called for good statistical knowledge but little practical experience of empirical methods.

1.5. Trivialisation

In the field of transport research, the seventies and eighties were marked by intense and controversial debates over different ways of explaining and modelling travel behaviour. A great variety of approaches were developed and elaborately justified criticism of them advanced, and in the process none of the approaches under discussion was spared. Yet despite all the criticism levelled against them, there was one thing they could not be reproached with, for they did at least try to do justice to the complexity of transport behaviour by including a fairly extensive system of variables.

This has fundamentally changed. Methods borrowed from consumer research (so-called "conjoint analysis"), which encourage the belief that it is possible to determine chocolate-buying behaviour for example, are uncritically applied to transport behaviour – if by another name (so-called "stated preferences"). The "model" used for this is reduced to a tiny part of the reality, and is presented in the form of a wide range of fully structured alternatives, from which respondents have to choose. The verbal comments made by these persons in a hypothetical situation then become the decisive input to a model, which is thought to enable users to make statements about future behaviour. The background of the stated preferences, the situational determinants, the artefacts of these highly reactive measurement methods, are virtually left out of consideration. On the other hand, those using these methods even point to the fact that they simplify matters (by failing to take account of important behavioural determinants) as one of their advantages!

In this way the task of explaining the origins of behaviour, showing connections and revealing susceptibility to influence, was merely put off and the problem passed on to the respondents. This amounts to a declaration of intellectual bankruptcy on the part of the researchers concerned, and if the seven lean years may be characterised by a single example, there is none more telling than this trivialisation of transport behaviour.

1.6. Specification

Transport planning is concerned with expert system analysis and development of supply, transport research is normally understood as being an instrument of transport planning and so it often has a system-orientated perspective. Accordingly, one aspect regularly breaks down, completely or partially, which is of great significance for the future development of transport behaviour and the corresponding transport supply. We all perceive the "objective" world subjectively and make decisions about our behaviour in the context of our subjective world.

Unfortunately, the systematised thinking in transport research, which has become traditional, is now finding its way into the development of survey designs. Thus, for example, the issue of how a questionnaire must be designed so that it can be read by a machine, arouses greater interest than the question of how it should be set out so that it can be read by a respondent. And as a result of the rapid development of various forms of information technology, the field of activity is expanding fast. The use of computers in surveys, which have been made available to respondents for their own use, the adoption of tagging systems, surveys over the Internet or attempts to make data preparation fully automated (which rules out any checking or monitoring), are examples of a new development, marked by an obsession with new technologies (TEST, 1999), which are regarded as suitable for use, because their implementation is technically possible. The fact that surveys represent a form of communication in which the first priority is not to use smart technologies but to collect the most reliable information possible from the highest possible proportion of the respondents is a point that has been completely overlooked.

1.7. Ignorance about respondents

Communication is a complex matter, and especially when a particular form of communication is concerned, namely surveying. Successful communication has to fulfil many requirements and take account of many influences, of which the most important are combined in the famous Lasswell formula as the five (main) factors: "Who says what to whom in which channel with what effect". If this process does not work, it is almost never because of just one of these factors: a readiness to blame the respondent for the limited success of a survey is quite misplaced.

But how do we achieve willing, reliable co-operation with as many respondents as possible? They must be treated as *customers,* not as a necessary evil and certainly not as sacrificial victims. There are a number of reasons why this is not normally the case. Here we might indeed begin by citing the lack of standards and the lack of methodological awareness. The principle that "the cheapest survey is always the most expensive" (as it leads to false conclusions and decisions) is often recognised in theory, but is just as frequently overlooked in practice.

This short sketch of some of the essential problems of the seven lean years of empirical transport research makes one thing quite clear: lack of standards and insufficient awareness of the fact that conducting surveys requires appropriate knowledge and above all experience, have led to a perceptible deterioration in the methodological quality of surveys carried out in the transport sector.

It is too early to put a label on the situation at the present time. It may, however, count as a transitional period. In the meantime, discussion of appropriate methods has indeed undergone a certain revival, but opinions are divided as to whether this revival can halt or even reverse the continuing fall in quality. The new discussion on the quality of transport surveys may serve as an example.

2. BEWARE OF CASES!

Having exhausted the discussion on current transport surveying methods, mainly in the debate over statistical accuracy (chance mistakes), those involved in this work should direct their attention chiefly towards the potential for routine mistakes. Chance mistakes can be taken into account, but they cannot be corrected; routine mistakes, on the other hand, can be corrected and – with the appropriate know-how – assessed, at least in respect of their scale and orientation.

The following statements therefore give real examples of the influence of survey instruments and survey design factors on the validity of the results and the conclusions for the planning decisions derived from them. The case studies presented here by no means cover all possible sources of mistakes, but they illustrate the significance of such considerations. The client and researcher are not named here, but all examples given are authentic.

2.1. Careless use of empirical data

Example 1

In a large-scale inquiry into mobility styles in Germany, the persons responsible carried out diary surveys over a period of 14 days. The evaluation of these diaries showed that in an East German town the trip count was 4.5 trips per person per day. This figure clearly exceeded the corresponding finding of 3.0 trips per person per day derived from a classic mobility study in the same town.

The persons responsible for the study of mobility styles concluded from this that current transport research measured very limited mobility using unsound procedures and that their own methods were superior to such procedures. This "realisation" was very actively spread abroad.

But in fact, essential aspects of the two survey designs were not comparable:

Figure 1. **Comparison of mobility study designs**

Distinguishing feature	**Mobility style study**	**Classic mobility study**
Trips per person/day	4.5	3.0
Total population	From 14 years	From 0 years
Survey period	Autumn	Whole year
Trips	All trips	Trips up to 100 km
Business transport	Included	Excluded
Choice of respondent	"Self selection"	Random sample
Design-effect		+1.8 trips per person/day

If all these differences are taken into account and their effect on the result is estimated, it emerges that the classic mobility study with the same design as the mobility style study gives a value of at least 4.8 trips per person/day. The apparently higher level of mobility measured, with the consequent assumption of improved quality, turns out to be a mere artefact of the design used!

2.2. False input for political decisionmaking

Example 2

In a European city, the council decided to promote environmentally friendly traffic. So that this process could be monitored, the goals of the exercise had to be established. To this end a transport survey was commissioned; the proportions identified by the survey were then to serve as a basis for the performance targets the policy was to meet. The survey showed, for example, that public transport amounted to 37 per cent of all trips; the political objective was to raise the proportion by 20 per cent, to 45 per cent for public transport vehicle traffic.

However, the mobility survey that produced these results used a (problematic) design, which greatly influenced its findings: the survey was restricted to fixed days (Tuesday and Thursday), it achieved a (very small) response rate of 25 per cent, used a badly drawn-up questionnaire and promised the respondents an annual public travel card free of charge as an incentive for taking part in the survey and filling out the diaries in full.

From the relevant research into methodology, however, it was known that all the design factors referred to in the survey would have a considerable influence on the proportion of public transport traffic identified and would produce values that were obviously exorbitant. It therefore came as no surprise when a slightly later mobility study with an clearly better design showed a markedly lower proportion of public transport traffic (29 per cent).

This resulted in the curious situation in which the public transport operators, since their policy aim was a 20 per cent increase in demand, actually achieved a proportion of around 36 per cent (in line with the correct finding of 29 per cent) and accordingly remained – despite having reached their goal – below the benchmark figure of the corresponding policy decision (37 per cent)!

Example 3

In 1998, an East German town agreed upon a traffic development plan which was based on a mobility survey conducted in 1994. This found the share of public transport to be 20 per cent and this figure was accordingly factored into the traffic development plan.

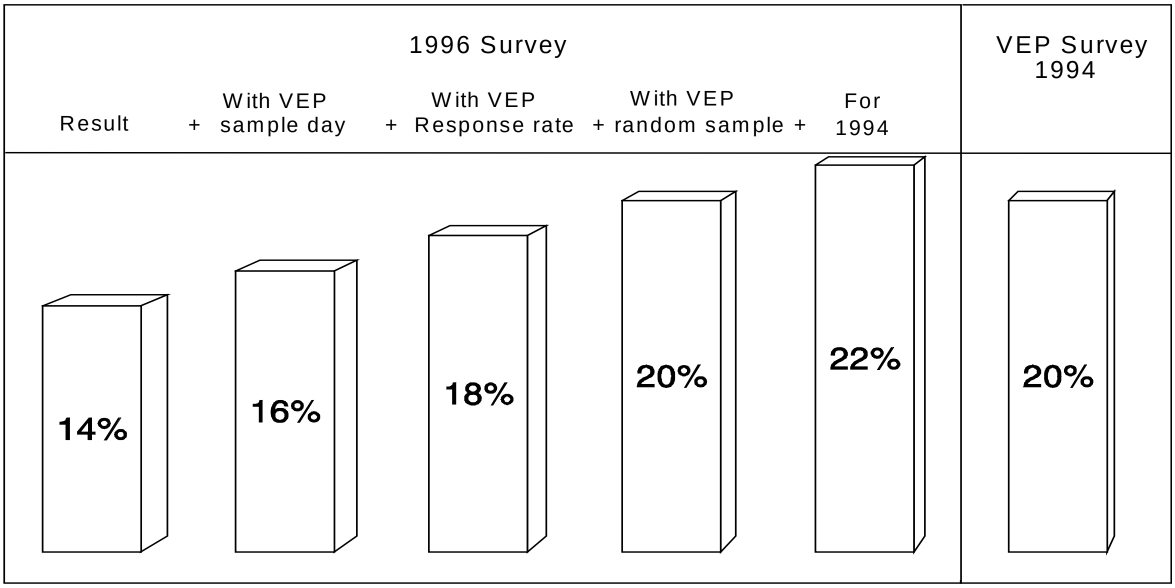
A mobility survey conducted in 1996 revealed that the share of public transport was a mere 14 per cent, which raised the question whether policy decisions were based on an overestimation of public transport demand. On the other hand, the answer lies in the respective survey designs:

Figure 2. **Comparison of design of public transport studies**

Characteristic	Base-Survey VEP 1994	1996 Survey
Net (responses)	416 households	2 857 persons
Response rate	49 %	89 %
Survey days	Tuesday-Thursday	All days of the week
Sample	“German citizens”	All citizens in the town
Selection	In case of refusal or unavailability alternative household may be chosen	Random sample
Survey methods	Verbal; recall	Written-postal; diaries
Corrections	Sociodemography	Sociodemography; non-response Non-reported trips; seasonal

In this case too, the effects of each routine mistake can be easily estimated and contribute two percentage points respectively for the reference days, the response quotas, and the other determinants. In view of this, the share of public transport would be 14 per cent in the VEP survey or 20 per cent in the comparative survey if the same design were used. However, in the period between the two surveys, use of public transport in this town declined by over 10 per cent. On the other hand this shows that the apparently higher share of public transport shown by the VEP survey – determined by the chosen design – actually falls short of the reality.

Figure 3. **Design effect and proportion of public transport**



2.3. Responsive survey designs

Example 4

In a large-scale study in Sweden, the effects of high-response methods, such as "stated preference" techniques were to be tested (Widlert, 1994). The parent population consisted of

5 700 passengers in long-distance trains. In the process identical questions were asked in the framework of a total of 25 different survey designs. As shown by the "value of time" variable used in assessment, very great differences were observed, from substantially similar random samples, depending upon the design chosen, with the highest value more than four times that of the lowest! This is one of the most impressive instances of routine error in mobility research and a certain refutation of the increasingly indiscriminate use of such methods at the present time. At the same time, it is interesting that all measured "values of time“ are regarded as highly significant and for this reason it cannot be determined which of the 25 *most significant* results is also the correct one or *even* whether there *is* a correct result among them. This confirms the idea first discussed, that simply appealing to statistical importance is not only insufficient but can sometimes even be misleading.

Example 5

In several transport-combines the procedures described in Example 4 are currently applied under the name of "conjoint analysis". Here too, the level of knowledge of the respondent is ascertained by simple questioning. Since ignorance cannot be surveyed – a person does not normally know what he/she does not know – the measured level of information is high and the "information potential" revealed is low. Serious inquiries measure knowledge levels differently: they ascertain subjective knowledge and then test it from secondary material. This is a far more costly, but incomparably better method. The result shows that the most important subjective determinant for the failure to use public transport is lack of information. For this reason, information can provide the key to a more rapid and effective increase in demand for public transport. Inquiries (like those referred to above), which quite fail to show the importance of particular action, thus fail to satisfy the demands made of serious mobility surveys or provide for sound recommendations.

2.4. Unprofessional preparation of questionnaires

It is an important principle in the design of questionnaires that they should be made as simple and clear as possible. If this principle is not adequately observed, distorted results must be expected.

Example 6

The questionnaire for a mobility survey of elderly people set out to obtain travel information using a format with lined spaces. On the first side of the questionnaire, after the instructions and clarifications, there was only enough room left for three lines, i.e. three trips. Other trips, if undertaken, were to be recorded on the back of the page. Unfortunately, one instruction was omitted: that the questionnaire was to be turned over if there were more than three trips. The effect of such an apparently simple error may be observed if the findings of this survey are compared with those of a survey conducted throughout Germany (special assessment of senior citizens).

Table 1. **Comparison of effects of unmethodical practice in two different surveys**

Base (persons’ survey days)	**"Survey of elderly“ (9 279) %**	**National survey (24 569) %**
Patterns of activity involving up to 3 trips	81	61
4+ trips	19	39
Total	100	100

Mobility measured by the nationwide survey is around 25 per cent higher; this is essentially due to the fact that the proportion of patterns of activity involving more than three trips is more than twice as high in the comparative survey. A clear effect of the choice of questionnaire design!

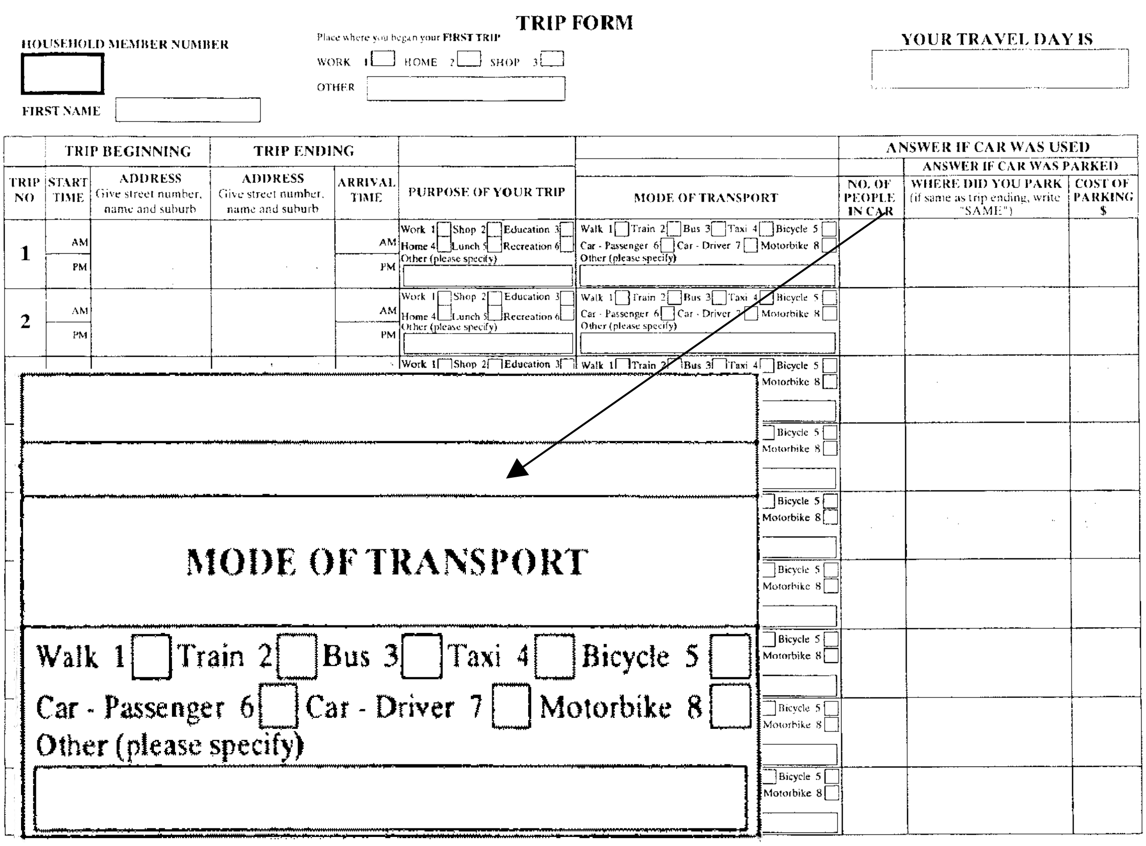
Example 7

The importance of each individual detail in diary design will become even clearer from the following examples. This diary likewise surveyed trips using a "lined format" (although the literature points to the disadvantages of this approach (cf. Brög, Däsler *et al.*, 1983) and a special arrangement of indications and boxes for the answers (Figure 4).

This arrangement encourages the respondents to tick the wrong box, especially if they want to mark "Car-Driver". The layout invites the respondent to tick the box between the "6" and "Car-Driver". But that box was for "Car Passengers". The result was that a random survey of 7 000 households gave 1 000 trips for which the "car-passenger" box was marked, but the number of persons in the car (which also increased) was only one. There were 15 000 more trips with the "Car-Driver" indication, which was unlikely, since private car ownership was not indicated or was higher.

Similar problems arose in connection with other means of transport (e.g. ticking "train" instead of "bus", "taxi" instead of "bicycle", etc.) and with the purpose of the trip (e.g. "shop" instead of "education", "lunch" instead of "recreation", etc.)

Figure 4. **Transport diary**

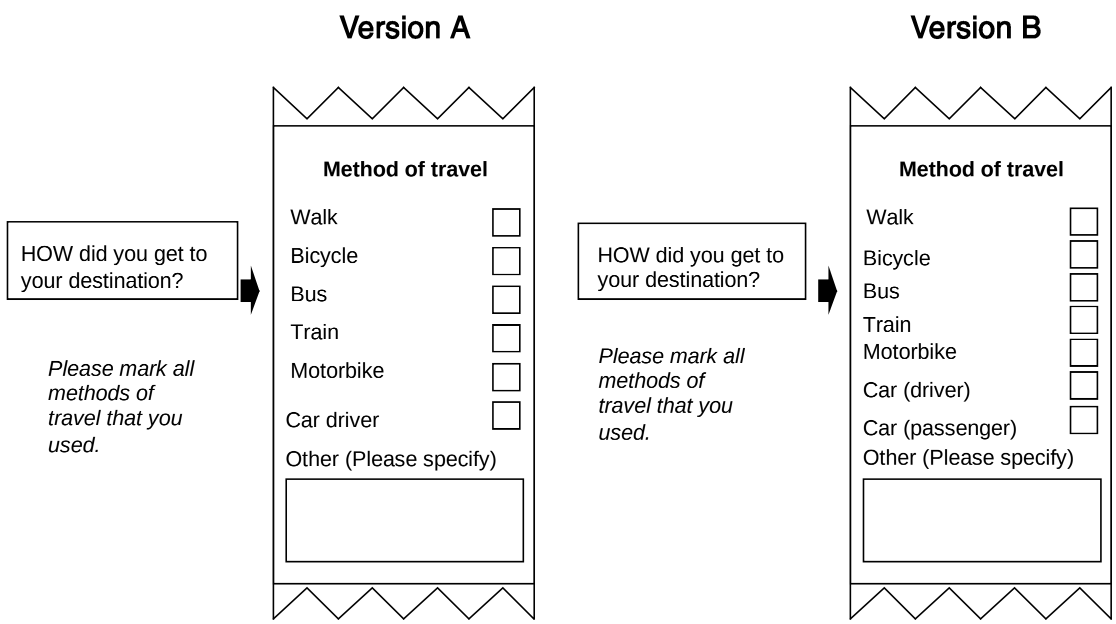


This is one of the few cases where a routine mistake cannot be corrected. As a result, it was decided in the meantime not to use the data collected from this survey; expenditure on the survey - over a million DM – had been in vain!

Example 8

In 1986, two mobility surveys were conducted in the same town and at the same time: a survey of the town and a nationwide survey. These surveys took account of a great many cases (over 2 500 households in each case), used the same design and the same procedure. There was just one small difference between the questionnaires: version B, unlike version A, included the option "Car as passenger", which respondents confused with "bus passenger". In version A, however, they were able to write the correct answer in their own words in the blank space and the classification was included by the coders.

Figure 5. **Questionnaire design (detail) for each survey**



This difference between the questionnaires led to apparent differences in modal choice:

Table 2. **Modal choice, different questionnaire design**

	Version A %	Version B %
On foot	12	12
Bicycle	6	6
Motorised two-wheeled vehicle	1	1
Car as driver	58	58
Car as passenger	16	18
Public transport	6	4
Other	1	1
TOTAL	100	100

The proportion of each means of transport used was the same in both surveys, with the exception of "car passenger", which amounted to 16 per cent in version A and 18 per cent in version B and "public transport", which represented 6 per cent according to A and 4 per cent according to B. As a result, public transport "lost" a third of its users according to version B because the category "car as passenger" was misunderstood and bus users ticked the wrong box.

2.5. Misleading instructions

Example 9

In the case of the elderly citizens surveyed in Example 6, a sample trip was presupposed by way of example. But one of the problems was the unclear definition of "trip": the example did not refer to a return trip. Because a pattern of activity involving a one-way trip is very rare, it is not advisable to use such an example. The effect can be clearly seen from the results. The high proportion of sample activities involving only one trip cannot be explained in any other way. Activities involving a one-way trip are very rare; they only occur if somebody returns from a previous destination on the survey day, having spent the previous night there or if somebody goes somewhere and does not come back until the following day (or later). And in the case of the over-sixties in particular, such patterns of activity are even less frequent than for other age groups.

Table 3. **Comparison of methodological effects in two different surveys**

Base (persons' survey days)	**"Survey of elderly" (9 279) (%)**	**National survey (24 569) (%)**
Pattern of activity involving 1 trip	17	1
More than 1 trip	83	99
Total	100	100

Example 10

In the mobility survey described in Example 7, trips were to be examined in stages (so-called "unlinked trips"). However, both the instructions and a sample filled-in form that was also provided referred only to "linked trips“.

As a result there were found to be 1.12 stages per trip. Because the expected value was in the region of 1.5 stages/trip, the survey was systematically rechecked. This revealed that the actual value must have been at least 1.42 stages per trip, a difference that can be ascribed exclusively to the misleading instructions.

3. WHERE THERE’S A WILL THERE’S A WAY

In recent years, The Netherlands’ national mobility survey (OVG) has seen a significant decline in the response rate. The OVG is a survey conducted by telephone and post. Between 1978 and 1984, the data was collected in the course of personal interviews, but for reasons of cost the data has been gathered in writing and by post since 1985. The total number surveyed encompasses the residential population of the Netherlands. The survey unit is the household.

The decline in the response rate is partly due to the growing proportion of ex-directory telephone numbers and thus the decreasing accessibility of households. Furthermore, people have tended to be less willing to participate. These factors taken together caused the response rate to fall from 51 per cent in 1985 to 35 per cent in 1998 (Moritz and Brög, 1999).

Increasingly, the decline in the accessibility of households and the rapidly falling response rate has raised serious doubts about the representative character of the sample and the comparability of the findings. At the same time, there has been an increase in demand for information about transport and mobility from politicians and planners. This situation caused the Netherlands Statistics Office (CBS) and the UK Ministry of Transport and Public Works to look out for an alternative design that would combine distinctly better response rates with greater flexibility in research.

Provisional investigation into a new design for The Netherlands’ national mobility survey resulted in the choice of the New KONTIV Design (NKD), developed by Socialdata. The Netherlands Statistics Office tested this design in a pilot study in September 1997.

This pilot study succeeded in applying the NKD procedure to a sample consisting of 74 per cent of households (Table 1). This figure was significantly better than the response rate in the control group, where the conventional OVG procedure was used (in this group a sample of 44 per cent was obtained). The NKD Households without a telephone, unlike those following the OVG procedure, were written to. For these households a response rate of 45 per cent was achieved. But this difference only partly explains the higher response rate on the part of the NKD group. The response rate from households whose telephone number was known was considerably higher in the NKD group – 81 per cent as opposed to 55 per cent in the OVG group.

Table 4. **Response**

	OVG		**NKD**	
		Total	Tel. (+)	Tel. (-)
Net sample (households)	1 014	960	765	195
Respondent households	446	708	620	88
Response rate	44%	74%	81%	45%

The NKD pilot study revealed 1.72 activities and 3.33 trips per person per day (Table 5). The OVG control group engaged in 2.32 activities and made 3.88 trips per person per day. It was presumed from this difference between the NKD and OVG mobility indices that the NKD would achieve better response rates and the OVG better results, since the latter's measurement revealed a mobility level (in trips per person) that was 28 per cent higher.

Table 5. **Mobility indices: Comparison NKD – OVG**

	NKD	OVG
Activities per person/day	1.72	2.32
Trips per person/day	3.03	3.88

If the number of trips revealed by the NKD survey (3.03) is set at 100, then the corresponding number of trips according to the OVG survey (3.88) amounts to 128. If a comparison is made on this basis, considerable differences emerge with respect to the breakdown of means of transport.

Table 6. **Modal choice: Comparison NKD-OVG**

	NKD %	OVG %
On foot	17	19
Bicycle	31	41
Motorised two-wheeled vehicle	1	1
Car as driver	34	42
Car as passenger	14	19
Public transport	3	4
Other	0	2
TOTAL	100	128

In the OVG survey the proportions of all means of transport are higher, since the base rate – trips per person per day – is also higher (128 as opposed to the NKD figure of 100).

A more searching analysis of possible routine determinants revealed three points that explain these differences:

- Coding conventions;
- Behaviour of respondents;
- Respondents as volunteers.

In order to test the coding effects, the NKD questionnaire was coded independently by two teams following the same coding rules. It emerged in the process that differences in the results showed up even where identical questionnaires and coding conventions were used.

The most important reason why the Team A coding produced a greater number of trips was that so-called "unlinked trips" were taken into account. This was at odds with the definition of trips ("linked trips"). Since it was known that some respondents cited unlinked trips instead of linked trips, it was of some importance that such mistakes on the part of the respondents should be corrected by the coders. (This is a good example of showing how coding serves as a process of correction; the data is not just fed in "blindly".)

Another example is the substitution of another day for the reference day. This is typical in the case of respondents who are normally very active but who are not mobile on the survey reference day for particular, exceptional reasons (e.g. illness). They tend to substitute a "normal day" for the "unusual survey day" (as they see it) and accordingly report a higher mobility.

Table 7. **Coding effects: Effect on number of trips**
Base: Actual number of trips per person per day

	NKD	
	Team A % (trips)	**Team B % (trips)**
Coding errors	+0.5	+3.0
Unlinked trips	-4.9	-
Split in round trip	+0.4	-
Unclear questionnaire	-0.6	-+0.4
Trip on private land	-0.5	-
Change in survey day	-0.9	-
Business transport	-0.4	+0.4
Faulty questionnaire	-	+0.3
Children's game	-0.5	-
Non-reported-trips/Over-reported-trips (Exploration)	+0.1	0.0
TOTAL	-6.8	+4.1

On the other hand, coding is frequently not seen as the most important aspect of data validation and it is therefore given insufficient time and attention. The result is apparent, for example, in the under-reporting of trips by Team B. (In this particular case, the reason was that Team B had to carry out their coding under severe pressure.)

By and large, Team A over-reported trips by 7 per cent and Team B under-reported them by 4 per cent. It can therefore be assumed without qualification that in unfavourable conditions (e.g. different questionnaires, little monitoring of coding, more coders, slightly different coding rules) only the coding effect can produce differences in the number of trips of between 20 and 30 per cent – and there are examples of this having happened!

A second important routine mistake in mobility surveys is the effect of different response rates. In the literature on this subject it is well documented that the survey design used tends to encourage people with higher mobility to participate (cf. Brög and Meyburg, 1981). As we have shown, the response rate in the OVG survey was clearly lower than in the NKD survey. However, in the NKD survey an information return system was consistently applied, so that the results could be analysed at the rate at which answers were given and, in accordance with this familiar process, the NKD results for the same response rate could be worked out. This analysis showed that the number of trips revealed by the "44 per cent NKD sample survey" was 11 per cent higher than in the sample survey as a whole, which suggests that the OVG survey was affected by further over-reporting of trips on a scale at least as high.

Lastly, the "self-selection" of respondents is a further source of error, which is often ignored when surveys are analysed. The OVG design required that respondents should first be monitored by telephone and questioned chiefly on sociodemographic matters. Respondents were then asked whether they would be prepared to keep a travel diary. Only if they agreed was a diary sent to them. This is a clear case of "self-selection". Comparable experiments show that self-selection in mobility surveys can result in an increase in response quotas of between 10 and 30 per cent.

If just these three types of routine mistake are corrected, the number of trips identified by the OVG falls from 128 (compared with 100 in the case of the NKD) to 97. This shows that the apparently higher number of trips is actually lower and is determined by "under-reporting" of trips (which is presumably due to the fact that the OVG questionnaire was less clear than that of the NKD):

Table 8. **Correction of modal choice in the OVG survey**

	OVG		
	Original %	**Corrected vis-à-vis coding, self-selection, response rates** %	**NKD** %
On foot	19	16	17
Bicycle	41	32	31
Motorised two-wheeler	1	1	1
Car as driver	42	33	34
Car as passenger	19	12	14
Public transport	4	3	3
Other	2	0	0
TOTAL	128	97	100

In the meantime, the NKD was implemented by the CBS and the OVG has been conducted with the NKD method since 01.01.99. This confirms the fact that routine checking and improvement of the design results in valid (and low-cost) procedures for surveying mobility behaviour.

At the same time, such a system also provides a basis for corrections that take account of inevitable changes in trends resulting from the adoption of new methods over a period of time. Work is currently underway on a procedure for making such corrections.

4. OUTLOOK

This paper presents the state of empirical research into transport behaviour at the close of the second millennium and provides selected examples of routine error. In so doing it aims to help increase awareness of the problems and to achieve a better-informed use of data on transport behaviour in the next millennium.

The perceptible increase in the standard of quality found in mobility surveys is becoming ever more important, since the long struggle for the recognition of mobility research as a tool in decisionmaking at many planning levels is becoming increasingly successful. But here, a concrete sphere of application arises which calls for the preparation of reliable aids to decisionmaking. These aids to decisionmaking should safeguard the investment of considerable financial resources and provide an environment for our everyday life, the consequences of which will perhaps be felt even by our children and grandchildren. Research into practical mobility is anything but inconsequential experimentation as part of an unworldly, academic game. For this reason our endeavours must be directed towards a continuous improvement of its methodological standards.

This urgently needed improvement in the methodological quality of mobility research will come about once we have established a harmonized synthesis between the content of our thinking and the underlying concepts that inform it, and their mathematical and statistical implementation. This is true both for the development and application of models for clarification and projection and for the development and assessment of our surveying procedures.

This is not to deny that enormous strides have been made in the fields of application of every kind of statistical procedure in the past two decades. We should now endeavour to develop our concepts in respect of content and methodology in the same way.

To this end, despite the complexity of the object of the research (mobility), it is often sufficient to apply "common sense": It certainly requires no great scientific effort to recognise that the result of a complicated process of communication, such as a survey, depends on a multiplicity of determining factors, such as parent population, sample survey, selection of addresses, survey period, survey method, survey content, survey instrument, questionnaire, formulation of questions, structuring of instruments, layout, input from respondents, comprehensibility, attention, motivation, looking after the respondents, checking, monitoring or reporting.

Nor did it require any great scientific effort to recognise that the "subject of research" in our surveys was the most complex "creation" that we know: man. But whereas there are special courses on surveying land, "surveying human beings" requires no intensive training or practical experience according to the view commonly held in traffic research circles.

But it is particularly important to design the surveying process from the point of view of the respondent rather than the researcher. Unreadable questionnaires, unintelligible questions, questions involving concepts with no bearing on reality, questionnaires that are too long, etc., would not be possible if we put ourselves as a matter of course in the position of the respondent.

Equally, low response rates, inexact or incomplete answers, etc., are not the fault of the respondent but of the researcher responsible. The respondents are our customers and should be treated as such.

BIBLIOGRAPHY

Axhausen, K.W. (1995), Travel Diaries: An Annotated Catalogue, Working Paper.

Brög, W. and K.-H. Neumann, (1977), The Interviewee as a Human Being - A Critical Contribution to the Discussion of Methods, in Empirical Social Research Paper presented to the ESOMAR Seminar on "Ways and New Ways of Data Collection", Jouy-en-Josas, France.

Brög, W. (1979), Passenger Transport: Mobility and Lifestyle - Sociological Aspects. Report to the Eighth International ECMT Symposium on Theory and Practice in Transport Economics, Istanbul, Turkey.

Brög, W., Ch. Daesler and O.G. Förg (1983), An Empirical Test of Various Survey Instruments for the Recording of Travel Behaviour. Paper presented to the 2nd International Conference, "New Survey Methods in Transport", Hungerford Hill, N.S.W., Australia, in: Conference Proceedings "Workshop Papers, Questionnaire Design and Piloting", pp. 1-26.

Brög, W. and A.H. Meyburg (1981), Consideration of Non-Response Effects in Large-Scale Mobility Surveys. Paper presented to the 60th Annual Meeting of the Transportation Research Board (TRB), *Transportation Research Record No. 807,* Washington, D.C.

Brög, W. (1997), "Raising the Standard!" Keynote paper of international conference - "Transport Survey Quality and Innovation", Grainau.

Meyburg, A.H. and W. Brög (1981), Validity Problems in Empirical Analyses of Non-Home Activity Patterns. Paper presented to the 60th Annual Meeting of the Transportation Research Board (TRB), *Transportation Research Record No. 807,* Washington, D.C.

Moritz, G. and W. Brög (1999), Redesign of the Dutch Travel Survey: Response improvement Paper presented at Transportation Research Board (TRB) on Personal Travel: The Long and Short of It, Washington D.C. (Restricted).

SOCIALDATA (1986), Erhebung zur Ermittlung von Fußwegen und "non-reported-trips". Forschungsbericht FE-Nr. 70157/85 im Auftrag des Bundesministers für Verkehr, München.

SOCIALDATA (1990), Untersuchungen zum Problem der "non-reported-trips" zum Personen-Wirtschaftsverkehr bei Haushaltsbefragungen. Forschungsbericht FE-Nr. 01.122 G 88 C im Auftrag des Bundesministers für Verkehr, München.

TEST Consortium (1999), Technologies for European Surveys of Travel Behaviour, Project for the CEC, DG VII.

Vallée, Dirk, Das Verkehrsangebot als Basis zur Berechnung der Mobilität im Stadtverkehr. Veröffentlichungen des Verkehrswissenschaftlichen Institutes der Rhein. Westf. Techn. Hochschule Aachen, Bd. 49.

Widlert, Staffan (1994), Stated Preference Studies; The Design Affects The Results. Paper submitted to the 7th International Conference on Travel Behaviour, Valle Nevado, Chile.

FUTURE TRANSPORT AND TRAVEL DATA NEEDS: A PRACTITIONER'S PERSPECTIVE

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SUMMARY

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1. INTRODUCTION

This paper focuses on future needs for data collection from the viewpoint of the practitioner. An earlier version of this paper was presented at the conference "Transport Surveys, Raising the Standard", International Conference on Transport Survey Quality and Innovation, in Grainau, Germany, 1997. At that conference, mostly attended by academic and professional researchers, a number of recommendations were formulated. It is important to disseminate these recommendations to a much larger group of concerned individuals and organisations.

This paper deals with three key issues:

- Deficiencies in currently available data.
- The need for new types of data owing to changes that have taken place in society.
- The need for data collection and data harmonisation at European and world scale. While the need is very great, initiatives for doing so are have not advanced sufficiently.

In general, it is thought that innovation is driven in three ways:

- Exogenous developments in society.
- Directions taken by public authorities.
- Technical improvements: new modelling techniques, GIS developments, increased computer power, new presentation techniques, etc.

The paper considers each of these developments successively. It concludes with a "shopping list" of future data needs.

2. TRENDS IN SOCIETY

2.1. Socio-demographic trends

Average household size is decreasing. During their lifetime, people now spend fewer years in a "family relationship". More dwellings and more space are needed. An increasing number of heads of smaller households need to organise their personal lives. As a result, there is an increase in distances travelled. Educational level and income are rising. More people work in services, fewer in production. More people are engaged in paid work, causing larger traffic volumes at peak periods and more congestion. The participation of women in the labour market has increased, resulting in a combination of tasks that require greater flexibility (*e.g.* escorting children to school). There are also increasing numbers of "nomad commuters" who live in a *pied-à-terre* near their job on weekdays and return to a distant home for the weekend. The elderly population has grown considerably, and many are in good health and accustomed to driving a car.

2.2. Increase in scale

Firms and institutions tend to grow in size. For example, the number of schools has been reduced as a result of concentration. Shopping malls, rows of furniture stores and cinema complexes have been set up on the outskirts of cities. National economies are moving towards globalisation. The importance of international trade has increased. Passenger and freight transport compete for scarce road capacity.

2.3. Increased flexibility

There is a clear trend towards more flexible working and shopping hours. This may lead to a better distribution of traffic over the day and less congestion. There are also new opportunities such as telecommuting, "satellite offices" and teleshopping.

2.4. Telecommunication and information

Telecommuting and teleshopping can lead to changes in traffic patterns over the day and perhaps even to less traffic. Car ownership, especially of second cars, may be reduced.

Access to travel information at home and en route will make it possible to improve trip planning. Traffic management measures will increase the capacity of existing infrastructure to absorb traffic.

2.5. Global information networks

In the long term, lifestyles may be profoundly affected by the "information society". There may be wide-ranging changes in organisations. Although the planned economies of Eastern Europe have disappeared, most Western organisations still resemble miniature "planned economies". Telematics may facilitate the appearance of looser organisational forms, in which firms and employees are linked by flexible contracts. Both parties will then be "entrepreneurs" and this may even mean the "end of the traditional colleague" (KPMG-BEA, 1996). Another example is the advent of e-commerce, which may greatly change commodity flows as well as travel to and from shops and service establishments (Gates, 1996, Gates and Hemingway, 1999).

2.6. Technology

In the INIT project of the Dutch Ministry of Transport (INIT, 1996), for example, the following concepts are considered promising for solving current transport problems:

- *New vehicle types:* vehicles designed for specific uses, *e.g.* in cities, over long distances or for a limited number of people. New materials, new propulsion systems and aerodynamic design increase the fuel efficiency of private cars, public transport and freight vehicles. Microcomputers can take over a certain number of driving tasks. Modular vehicles can be coupled to trains, or passenger and baggage modules can be coupled for holiday travel. Differences between public and private transport will diminish.

- *Intermodal coupling system*: an electronic market where supply and demand can be matched. Routes and schedules can be optimised, cargo can be monitored en route, and empty trips minimised.

- *Dynamic infrastructure management*: information, guidance and billing of both passenger and freight carriers. Specific time slots can be reserved and billed over the complete intermodal infrastructure. The other side of the coin is relatively less privacy.

- *Intelligent highway systems*: sensors placed in vehicles and in the infrastructure analyse traffic flows, congestion, traffic behaviour, fuel use and vehicle emissions.

- *Integrated public transport system*: a system of public transport offering services similar to dynamic infrastructure management.

- *Integrated intermodal packing units.*

- *Underground (city) goods transport system.*

- *Tele-activities*: tele-rooms both at home and in the office, flexible working hours, the possibility to control various activities at different locations at the same time. Tele-activities remove the need to be close to service providers and thus increase consumer choice.

2.7. Land use

In the Netherlands, the past 10-15 years have seen six main trends emerge (Martens *et al.,* 1998):

- Expansion of urban regions to fringe municipalities and new nearby towns, owing to the "suburbanisation" of living and working areas.
- Increase in the scale and specialisation of economic activities and outsourcing and the appearance of specialised production clusters.
- Increase of spatial differentiation, *e.g.* the separation of living and working areas on a socio-economic basis.
- Urban restructuring leading to higher densities, especially the redevelopment of post-war neighbourhoods and empty lots (*e.g.* abandoned port areas).
- Upgrading of urban employment in highly developed areas (*e.g.* the Docklands in London or La Défense in Paris).
- Intensification of recreational activities in inner city areas.

Space requirements will continue to increase and land use and suburbanisation will also necessarily spread.

On the other hand, existing built-up areas may also flourish. For more and more population groups, high-density areas and city centres may be attractive places to live (at least in Europe). In most cities, industry and offices are still moving out. Many vacant offices are being transformed into dwellings for a growing class of people who are interested in inner-city life: affluent "yuppies" and "dinkies", students, small households without young children, elderly people who want amenities "around the corner".

Restrictions on traffic in city centres ("car-free" or "car-lean" neighbourhoods) may be an attractive option to improve the urban climate, as has been shown especially in Germany. But this may also create risks, for shops, restaurants and cafes and cultural institutions.

2.8. Changing attitudes towards mobility

Many people take mobility for granted and assume that it is an inalienable right. More and more people travel to holiday destinations on the other end of the globe, take a five-day trip from Europe to New York, spend the weekend in the countryside or live in homes for workers that often mean very long commuting distances.

2.9. New forms of car ownership and other transport modes

"Call-a-car" is a new form of "time-share" car ownership, *e.g.* in the Netherlands and Switzerland. An individual makes an agreement with the provider of the car on a minimum number of kilometres per year, pays a fixed annual fee plus a relatively low amount per kilometre driven. This may be particularly attractive to those living in inner cities and other highly urbanised areas.

Park-and-Ride systems will continue to expand, also in combination with traffic restrictions in inner cities.

2.10. Freight transport: changes in logistics

New technologies such as container transport may reduce production costs substantially. Global production is becoming a reality. As production is transferred to low-wage countries, there is an increase in the transport of semi-finished goods. The Netherlands has become an important distribution centre for certain East Asian companies.

Firms outsource logistics (in part) to reduce total costs in this area and to improve customer service. Transport companies are becoming providers of logistic services. Delivery volume is becoming smaller while delivery distances are increasing.

For freight transport, road transport will continue to dominate. This is the source of severe environmental problems, especially in terms of carbon dioxide (CO_2) emissions. Solutions are being sought in the area of improved vehicle design and the promotion of intermodal transport.

2.11. International freight transport

Transport, especially international transport, has grown enormously in recent years. In the Netherlands, for example, it grew by 60% between 1986 and 1995. Reasons include the removal of borders within the European Union, more intensive trade with Central and Eastern Europe, economic growth in Asia, further economic globalisation and population growth. The share of road transport has increased: rail and inland navigation have stabilised, while road transport has increased. The main reasons are : (i) a shift from bulk to (semi-) finished products; and (ii) the maze-size of transport streams has been reduced, while the number of freight transport units has diminished.

Freight flows within and to and from Europe will continue to increase, and in some segments a doubling of volumes may be expected.

3. POLICY TRENDS

3.1. Increasing citizen participation

Citizens are becoming much more emancipated. Government is increasingly confronted with conflicting interests and increasingly challenged to justify its policies. The authorities cannot take decisions before having consulted a host of advisory institutions. In a mature democracy, it is not possible simply to apply the rule of "half of the votes plus one". Minority interests must also be taken into account. It has become more and more essential to make objective evaluations, to take account of diverging views and to explain the assumptions behind policy decisions.

Among the main problems facing the Dutch Ministry of Transport are: (i) the fact that transport is associated with practically every human activity; (ii) the Netherlands has 15 million inhabitants and as many transport experts; (iii) the field of transport is full of NIMBY ("Not In My Back Yard") problems and "prisoner's dilemmas"; (iv) there are few guiding instruments in transport policy; and (v) legal planning procedures are very lengthy. Social support for the long-term "Transport Structure Plan" (SVV-2) is not strong enough, and the Ministry is partly to blame for this. It should give more attention to "process", instead of focusing on "content". Communication is not just "explaining" but also "listening". The Ministry should move from predetermined models to openness to proposals from outside.

In the process of planning for new infrastructure, more insight is needed into attitudes, moral principles, threatened interests and the risks incurred by the citizen groups involved.

3.2. European integration, decentralisation, deregulation, privatisation

National governments are losing part of their authority to the supra-national institutions of the European Union (*e.g.* regulations on standards applicable to vehicle design). Other responsibilities are decentralised to regional level to bring government closer to the citizen (*e.g.* measures concerning public transport). Because of cases of unfortunate government intervention in the 1970s and the downfall of the planned economies of Eastern Europe, various government services have been privatised and open to competition. Detailed regulation has vanished: it is more important to define the goal to be achieved than how to achieve it.

3.3. Environmental concerns

The Netherlands has been at the forefront of environmental protection. In recent years, substantial progress has been made in improving air quality. The main problem today is the rise in CO_2 emissions. The concept of a "sustainable society" is firmly rooted in the Netherlands, but technical measures to reduce emissions have been preferred to measures designed to reduce mobility. Recently, the priority given to the environment has diminished slightly in public opinion. Economic growth, employment and traffic jams are higher on the political agenda.

The environment is high on the political agenda in other countries as well. In the United States, the Bush Administration established the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991 and the Clean Air Act Amendments (CAAA) in 1990 (Lyons, 1995). These are innovative and aggressive efforts to move US cities towards sintegrated transport and air quality planning. In areas with serious air pollution, air quality will be a major consideration in determining the future shape of urban transport. The CAAA mandates measurable and enforceable air quality targets. ISTEA gives transport planners and decision makers guidelines for reaching air quality goals, as well as other goals; transport planning must emphasise system efficiency, and for cities with severe air pollution, transport projects are expected to contribute to improving air quality.

3.4. Costs of mobility

Increased mobility is largely dependent on prices, from the viewpoint both of equity and of behaviour. It is regularly argued that the price of mobility (especially of cars) is too low and that transport does not pay for its external costs (Kinnock, 1995).

In the Netherlands, for example, prices of both the private car and public transport have remained about constant, in real terms, since 1960. This has helped to increase car ownership and encouraged the move to larger, less fuel-efficient cars. Recently, however, to improve the environment by reducing consumption of natural resources, there has been a shift from taxing income to taxing consumption, *e.g.* by increasing the price of heating gas and petrol.

3.5. Congestion

The number of cars has increased strongly, while infrastructure capacity has not at all kept pace, so that congestion has greatly increased. With few exceptions, the creation of alternatives to the private car has not been very successful. Discouraging car use by pricing measures, parking measures, or measures to reduce the advantage of the private car in terms of speed meet fierce public and political opposition, as soon as really effective levels are proposed.

In spite of its high place on the political agenda, the question of congestion requires some refining. Congestion is still by and large a problem at peak times in urban areas. In fact, 25% of the Dutch population occasionally face traffic jams but only 3% on a daily basis. In spite of congestion, the average speed of commuting trips by car has increased in the past few years (this may be due to the balance between various interdependent factors, such as the higher number of workers, the rise in multi-worker households, longer commuting distance, increased car ownership, etc.).

Outside peak travel times, travel times have been substantially reduced in the past decades owing to the extension of motorways, especially for trips between regions and over long distances. Two of the main problems with congestion are its visibility and its unpredictability. Therefore, policy should not aim at the removal of all traffic jams but at: (i) defining acceptable average travel times by car and other transport modes in the various zones; (ii) reducing the variance of travel times (*e.g.* by dynamic traffic management); and (iii) making the waiting time more bearable (*e.g.* by regulating access to the trunk road system and creating spaces for waiting at motorway entrances).

3.6. Renewed interest in infrastructure

In most developed countries, investment in transport infrastructure decreased in the 1970s and 1980s. Today, there is interest in dealing with the "backlog" thus created. In many countries, such as the Netherlands, investment in public transport (passenger transport) and intermodal transport (freight) has higher priority than investment in new roads.

Private finance and public-private partnerships are seen as a means to finance investments for which public funds are insufficient. This requires forecasting techniques different from those traditionally used, because the planning horizon of private financial institutions is much shorter than that of the public sector and because financial risks have to be examined much more closely. What is needed are robust investment strategies, which are sustainable both in best-case and worst-case scenarios. Therefore, in addition to social cost-benefit analyses over a long period (typically used for the public authorities and covering a period of 20 years or more), medium-term forecasts of earnings are needed for a broad range of scenarios.

3.7. Preferential treatment of target groups and road pricing

Scarce road capacity must be used more efficiently by reserving space for target groups (business traffic, car-poolers, freight transport vehicles, buses) and by introducing road pricing in urban areas. These practices fall under the heading of "selective accessibility". Road pricing, however, is unpopular with the general public, because of its perceived "unfairness" and because of privacy considerations.

3.8. Deregulation and privatisation in public transport

In accordance with EU guidelines, railway track and railway operations are being separated. Competition is being introduced and there will be more regional operators. Tendering procedures have been put in place for municipal and regional bus transport systems. Deregulation and competition may be the source of particular data problems. Previously, transport data were routinely supplied by the state-controlled companies, but in a competitive environment, many data have become sensitive. This makes public transport planning more difficult and may also hinder the entry of new firms.

4. STRATEGIC MODELS AND FORECASTING: THE STATE OF THE ART IN THE NETHERLANDS

For the past several decades, the Netherlands has used modelling for both detailed and general transport forecasting. The Ministry of Transport also has generously financed pilot research into panel-based dynamic modelling, activity-based models, dynamic vehicle transaction models and modelling of the interaction of land-use and transport. Beyond expertise in mathematical modelling, another form of expertise has been built up over the years, the art of "getting models to work". It is a long way from raw model output data to the presentation of the forecasts to the world at large.

Experience has resulted in a few important rules to be followed in the process of translating research into action. The first is that one should not try to answer all questions with a single model or system of models. The second is that, in most cases, one cannot expect a model to reproduce the situation in the base year as precisely as necessary. Nowadays, most models are used to describe changes to an empirically observed base situation. This is the so-called "marginal model" approach. Third, the objective of a model is not to forecast the future (the illusion of the crystal ball), but to assist in reducing uncertainty in policy decisions. A model never furnishes "the truth". In the end, information gained from various sources – descriptive research, model results, expert opinion – has to be combined into a best estimate. There will always be a good deal of subjectivity in this process.

Fourth, policy making is often a bargaining process. This means that many possible solutions have to be evaluated before a final compromise is reached. During the last stage of the process, the professional researcher's model is far too inflexible and time-consuming to be of help. Therefore, like lifeboats on an ocean steamer, every big model system should have a small counterpart that can be used for sketch planning around a central scenario, using elasticities, for example.

Finally, planners must recognise that planning is just one step in the implementation of policy measures and the creation of new infrastructure. Too often, they assume that the community will take rational decisions on the basis of the predictions, evaluations and cost-benefit analyses supplied by the planners. However, the collective decision process involves more than rationality and disinterest: bargaining also enters in. As much attention must be given to the process (of collective decision making) as to the content (forecasts, alternatives, cost-benefit ratios, etc.).

5. INNOVATION IN MODELS AND FORECASTING

5.1. Activity-based modelling

Recent years have seen a renaissance in activity-based modelling. The first models were developed in the 1970s and 1980s, but were later often considered too complicated to be used in operational modelling and forecasting. At present, they are thought to be necessary because of the complexity of the transport problems to be faced. The variety of household types and activity patterns has increased. Solving the transport problem is no longer a matter of just adding infrastructure. The solution to the transport problem may well lie *outside* the transport system, *i.e.* in a general reduction of the need to travel (*e.g.* by reducing the distance between living and working places, greater flexibility, telecommuting, etc.). Modelling the interaction between mobility and patterns of activity is therefore essential.

The activity-based approach has many advantages. Constraints on activities – logical, institutional, household, spatial and temporal, the spatial-temporal context – can be taken into account. It can deal with combinations of tasks and with series of activities and trips. It allows for examining the substitution of in-home/out-of-home activities. Important progress has been made in modelling the duration of activities. The concept of time use can be used to measure the benefit to the user: for example, the value of X minutes saved commuting can be evaluated by observing how those X minutes are used.

It is, however, crucial to set up workable systems. Activity-based models must be used to accompany (qualitatively or quantitatively) existing conventional models; they should not be considered as a replacement for the latter.

ALBATROSS is an example of the new generation of activity-based models. EIRASS (part of the Technical University of Eindhoven) has developed an activity-based model for the Ministry of Transport, which is based on “genetic algorithms” (Arentze *et al.*, 1998). The basic idea is to develop rules for scheduling activities and apply them to activity patterns as observed in a survey. Rules that successfully explain actual behaviour will be preserved, those that do not will be eliminated. The rules take the form of decision tables with yes/no branches.

5.2. Dynamic longitudinal panel models

The dynamic longitudinal approach overcomes the limitations of standard cross-sectional approaches. It can differentiate between age effects and cohort effects, resolve certain ambiguities in causality and provide means of examining observable or unobservable omitted variables. It can describe more accurately the effect of policy changes on behaviour by incorporating phenomena such as habit and inertia in response to change, incomplete information and learning behaviour. An example for the Netherlands is the model developed by de Jong (1996) concerning the choice of type of vehicle, use of the vehicle and the length of time the vehicle is kept.

Everything has a price, however, and in this case it is substantially greater complexity. The major problem is the volume of data required, for the base year and – more importantly – for the forecasting year.

Medium-term forecasts, with a five-year horizon for example, have become more important, and the most promising application for dynamic forecasting models may extend beyond that horizon. Medium-term forecasts can increase the credibility of long-term forecasts. They are also important in the context of private infrastructure financing, because private banks are very interested in the time path of investments and earnings. Finally, the public authorities use medium-term forecasts for planning government expenditure on subsidies and grants to local government, as many such grants are based on an increase in mobility.

5.3. Models focused on the interaction of land use and transports

Given the objective to reduce traffic growth, there is renewed interest in models focused on the interaction of land use and transports. The opening of new transport infrastructure (both road and rail) attracts new activities and increases traffic. This is a particular form of “induced demand” (Hills, 1996) and partly offsets the benefits of increased accessibility. Such models are also important for modelling the effects of congestion. When congestion increases in a region, economic activities may move elsewhere.

Many of these effects are felt over the (very) long term. It is therefore crucial to conduct studies of the effects of the opening of new infrastructure both before and after implementation. One example is the study of the Amsterdam orbital motorway (de Jong and van der Hoorn, 1998). These studies should be repeated periodically every few years.

TIGRIS is a Dutch example of a working model on the interaction of land use and transports (van der Hoorn *et al.*, 1998), which has been successfully applied to evaluate the effects of the proposed

Randstadrail, a light-rail system between The Hague and Rotterdam. Land use effects are typically long-term, and it is hard to distinguish between cause and effect. Therefore, TIGRIS equations have been defined to describe the relationship between land use and transport based on expert opinion. These equations are validated and checked for plausibility against historical time series and by examining the predictions made by the model. For Randstadrail, nine scenarios and variants were evaluated on the basis of different assumptions about socio-economic developments, limited or extensive Randstadrail use and market freedom or government control concerning the location of new houses and industrial sites.

5.4. Equity considerations

The construction of transport infrastructure has to find a balance between increasingly conflicting interests: accessibility, environment, land requirements, etc. In many cases, the benefits are enjoyed by a large group of anonymous travellers, while the disadvantages are borne by a restricted group of people in a limited geographical area, who can easily organise opposition groups. Even when an infrastructure project has a high cost/benefit ratio, it is very important to investigate the distribution of costs and benefits. Disaggregated models, especially when "artificial sample enumeration" is used in forecasting applications, can ease this task (Ortuzar and Willumsen, 1994). The procedure is used in the Dutch National Model (Gunn, 1985) and preserves much of the disaggregated detail in the aggregate forecast.

5.5. Sketch planning models

As mentioned previously, every large model system should ideally have a simplified counterpart that can be used for sketch planning around a central scenario. This schematic model could be based on elasticities derived from the main model. Alternatively, a database with results stored from a large number of model runs could be used. To evaluate a set of policy measures, the sketch-planning model would look for a stored scenario that resembles the proposed policy measures as closely as possible.

6. INNOVATION IN DATA COLLECTION

6.1. Increasing concern about survey quality

The following is taken from Pisarski (1997).

One great source of concern is the declining response rate in almost all surveys. This can be been attributed to excessive solicitation and communication. Aside from response rate problems, there are even more serious problems of biases because some social segments are overlooked or under-represented, because they do not respond or because they are not included in the process. In effect, surveys often compete with other media: for mail surveys, the form may be lost in a blizzard of other unsolicited mail; for phone surveys, most households feel that they receive too many phone solicitations. Additional issues are the busy schedules of urban households, which increase the absentee rate, and concerns about safety and security with respect to interviewers. All of this leads to increased costs, reduced rates of return and serious concern about the quality of responses.

At the same time, one may observe that the demand for data is at all-time high. The need for survey data and the appetite for it (which often transcends the need for it) grow daily. Moreover, modellers, analysts and policy makers are insatiable in their demand for more and more complex information, often remote from the subject and often intrusive. Pressure to obtain responses to an extensive set of questions leads to respondent and interviewer fatigue, foreshortened interviews, refusals and increased editing and processing burdens. The other factor is the number of interviews to be undertaken. Overall interviewer productivity can be affected if pressures for completion are great and emphasis is on the quantity rather than the quality of the output.

One of the reasons for this, which exacerbates the problems, especially those of response bias, is that the collection of transport data often no longer focuses on the mainstream, *i.e.* measuring the travel activity of the majority is no longer considered crucial; rather the focus is often on small sub-populations, niche markets such as the transit needs of the carless household, reverse commute needs of inner-city, low-income populations, etc. These are increasingly difficult populations to access and interview successfully through any of the survey media.

With respect to sampling biases, transport surveys have suffered from a number of weaknesses that have developed over the last few decades.

In this context, it is crucial to maintain and improve survey quality in a cost-effective way. This leads to a set of five objectives that can be summarised as follows:

- To recognise survey quality.
- To improve survey quality.
- To justifying/promote survey quality.
- To facilitate trend statistics.
- To encourage interchange of survey data.

The list proposed by Susan Liss of the US Department of Transportation contains ten means of measuring survey quality:

1. Sample selection – frames.
2. Recruitment rates, response rates, proxy/self-response ratios.
3. Design and format of the survey instrument.
4. Response burden (definition of completion).
5. Monitoring of the interview.
6. Pre-testing/piloting.
7. Survey operations – training, review, real-time editing, coherence checks.
8. Editing after the survey.
9. Survey weighting and expansion.
10. Controls and documentation.

6.2. Data needs expressed in the TMIP programme in the United States

To remedy current US model deficiencies, the federal Travel Model Improvement Program (TMIP, 1996) was initiated to enhance current models and develop new procedures. TMIP is a co-operative effort among organisations involved in transport, land development and environmental protection.

The overriding goal of this programme is to develop travel models that accurately replicate and reliably forecast travel by a broad range of modes. An extensive inventory of the needed data should be conducted early in the TMIP programme to provide a sound, comprehensive database for model improvement and development. This should be followed by continuous sampling of key travel and system performance indicators for trend analysis and perspectives for travel model forecasts. Periodic, more extensive updates of a broader set of factors that influence model parameters should be conducted for updating and revalidating travel models. A continuously updated national longitudinal travel panel survey should also be considered. The following are specific recommendations:

- Information on travel behaviour within households should be collected, including how choices and negotiations determine vehicle ownership and use.

- Improved information is needed on driver characteristics that affect emissions. These include factors in travellers' decisions regarding timing and length of trips, variations in travel during and between days, driving (not travel) characteristics and trip chaining.

- Information on the effects of policies should be gathered. Quantitative assessments are possible for policies such as parking restrictions, commute options and road, parking and fuel pricing. Qualitative information should be obtained on the effects of actions such as widened sidewalks, protected crosswalks, median removal and insertion and building setback.

- Information should be obtained on the performance of demand management actions and other transportation control measures.

- Demographic trends and urban development patterns should be monitored for changes that affect travel, particularly variations from assumptions used in travel forecasting. Changes noted should be incorporated as revisions in the models.

- The potential for using advanced technologies to collect data should be assessed. Remote sensing, automatic vehicle locating technologies and global positioning systems (GPS) appear to have potential for tracking vehicles. These techniques may be useful for travel model validation, goods movement analysis, vehicle classification studies and intermodal studies.

- The products of the data collection activity should be available on a national database, accessible by agencies nation-wide for evaluation of the reasonableness of local results.

6.3. Global positioning systems

Global positioning systems might be useful for improving data collection for activity-based and other models and might partly replace conventional trip diaries. Experiments are under way, including in the Netherlands.

Another application of GPS is the collection of "floating car data" (FCD). For FCD, certain vehicles (probe cars) are provided with special equipment, which allows them to transmit their position and speed to a traffic centre, possibly together with data on weather and road conditions. These data can be used for traffic information and traffic management. FCD are also valuable for logistic services for tracking and tracing, message services, anti-theft services, emergency services and vehicle maintenance services. The question of whether market competition is appropriate or whether a dominant role for the public sector is desirable has yet to be answered. What share of the investment should be paid by users, by service providers, by the technology-providing industry and by government?

6.4. Personal computers and the Internet

At the end of this year, about 5 million Dutch people over 15 years of age (40%) will have access to the Internet, at the office or at home. This situation can greatly facilitate the establishment of consumer panels: the same group of people can be interviewed periodically on the same subject, or incidentally on special subjects.

6.5. Stated preference

Stated preference techniques (*e.g.* Richardson *et al.*, 1995; Ortuzar and Willumsen, 1994) have become extremely popular for a variety of reasons:

- They can deal with situations in which a substantially new alternative is being introduced and there is little or no historical evidence of how people might react to it.
- They can be helpful when the investigator is trying to determine separately the effects of two variables on consumers' choices, where the two variables are highly correlated in practice.
- The variability in observed choices and in the exogenous variables can be controlled and can be made larger than in revealed preference surveys.
- They can be particularly effective in cases where the derivation of sensitivities and elasticities is more important than forecasts of absolute mobility levels.
- The survey costs will often be smaller.

There are many good examples of successful applications of the technique, for example in value-of-time research (HCG, 1990). However, one of the main dangers of the stated preference technique is a questionnaire with a long set of tedious questions that fit the needs of the researcher's advanced mathematical model.

To deal with the problem that people do not always do what they say, and to increase the credibility of stated preference results, techniques using mixed stated preference and revealed preference data are highly desirable (Ortuzar and Willumsen, 1994).

6.6. The process of political decision making

Data derived from "games"

In many cases, the political process is far from rational (see Section 4). Objective forecasts are not enough, insight into the "process" is also needed. For this, "games" can be useful. Representatives of parties concerned are brought together to play a "game", during which they are confronted with the consequences of the choices they make as predicted by a “sketch planning model”. The study of the interaction between the parties may be very useful in increasing the level of support for policy measures.

The “choice questionnaire”

An objection often raised against civil participation is that “ordinary people” have insufficient knowledge to make responsible choices. Moreover, we know from descriptive decision research that people who have to make decisions often do not consider all alternatives, overlook important consequences or cannot estimate very well the likelihood of certain consequences. The choice questionnaire is an instrument developed to meet these objections and can be used to generate detailed information on opinions about various aspects of a problem (for instance, consequences relating to the economy, health, environment or society) (Neijens, 1987).

The choice questionnaire gives information about the problem that requires a choice. The information consists of the alternatives to choose from and the consequences of the choices. For a number of reasons, the choice questionnaire is interesting from a political point of view.

Policymakers gain better insight into the concerns of citizens. The information obtained from choice questionnaires is very detailed, because it gives insight not only into the choices that people make but also into their opinions about the problem.

The choice questionnaire is a means of communicating government policy to the general public. For example, during the “comprehensive social discussion” on nuclear energy in the Netherlands, it became clear that a complex problem might be formulated in such a way that people from all strata of society could participate. In the choice questionnaire, a complex problem is broken down into a number of smaller problems, so that the more complex problem becomes much clearer.

The choice questionnaire can contribute to the creation of a social basis for government policy. When respondents are supplied with information about the consequences of different alternatives, they gain better insight into all aspects of the problem and their resistance may lessen.

The method was recently applied in the Netherlands for the introduction of a paid-parking system in certain districts in a medium-sized town (Leiden). To demonstrate its utility, a comparison was made with a standard questionnaire. The choice questionnaire was submitted to half of the respondents, the standard questionnaire to the other half (Saris and van der Put, 1996).

Infralab

In 1994, Rijkswaterstaat, the public works department of the Ministry of Transport, started an experiment called “Infralab”. Its mission is to find and test new ways in which Rijkswaterstaat, together with society at large, can create an adequate national transport infrastructure. There are two main objectives. The first is to bridge the gap between government and the citizens. Rijkswaterstaat should not define the problem, make blueprints for solutions and then “go outside”. Instead, it should co-operate with those concerned from the outset. The second objective is to find new solutions to infrastructure problems. Not “more of the same”, but other, more imaginative proposals. Many of the ideas have many points in common with those developed by Susskind and Field (1996).

The most important elements of the methodology are:

- The opinion of the end user is a point of departure of the process.
- Government and citizens work together throughout the process.
- The process is of short duration (one year maximum) and is transparent.
- All participants (road users, policy makers and parties concerned) are invited to participate actively and creatively.

The working method comprises three phases:

Phase 1: "The stakeholders' voice". Infralab asks all stakeholders to formulate a common definition of the problem. The result is an ordering of possible definitions. The phase ends with a moment of *decision*. The relevant authority (municipal alderman, provincial commissioner of the queen, or national minister) takes the responsibility to set down in writing the definition of the problem and the initial assumptions.

Phase 2: "The agora". In this phase, Infralab draws on all of the available creativity potential, among both citizens and professional experts, to find tentative solutions. This phase also ends with a moment of *decision*. The relevant authority, after evaluation and possibly feedback to the stakeholders, makes a statement on the desired solution.

Phase 3: "Action". Together, the stakeholders give form to the chosen solution by drafting an action list. Furthermore, the stakeholders commit themselves to get support from their own group. The relevant authority formalises the agreements, *e.g.* in the form of a covenant.

The Infralab methodology may seem trivial, but it is not. It is striking to see how often basic requirements in social planning processes are neglected. There is a natural tendency among experts to think immediately in terms of solutions, whereas an in-depth effort to develop a definition of the problem may considerably enlarge the field of possible solutions and thus limit the choices that are restricted to "yes" or "no".

7. DATA COLLECTION AND HARMONIZATION ON EUROPEAN AND WORLD SCALE

7.1. Time use surveys

Eurostat, the statistical office of the European Communities, has carried out two pilot surveys on time use in Sweden and Italy (Rydenstam, 1996). The main objective of the project is to produce comparable statistics on time use in the European Community in the future. Time-use surveys have been carried out in increasing numbers since the 1960s. Although guidelines for harmonisation have often been applied on a voluntary basis, many are still not truly comparable. The two pilot surveys mentioned are an exception, because everything from the questionnaires to the sampling frames and the coding procedures was harmonised.

The main applications of time use surveys are:

- To provide comparable social statistics on time use in European countries and in different population groups.
- To contribute to the formulation of gender and family policy, for example with respect to the relation between the division of domestic work within households and women's increasing participation in the labour force and problems encountered in reconciling the demands of career and family life.
- To contribute to the improvement of national accounts, particularly by producing data for satellite accounts of household production.
- To check on the exhaustiveness of the national accounts. Hours worked may be unreported, for example for the black and grey economy or the production of own-account goods.
- To contribute to the formulation of policy on working time and to provide more reliable and valid data on working hours, as new forms of work (*e.g.* telework) and flexible and individualised working schedules become more frequent.
- To contribute to the formulation of policy for the elderly, particularly by estimating the extent of their non-market work and the extent of their integration into the activities of daily life.
- To provide data on purposes of daily trips and transport modes for common transport policy in the areas of passenger transport and tourism.
- To provide evidence on participation in cultural and leisure activities.

7.2. Freight data

The disappearance of interior borders within the European Community in 1992 has had important consequences for statistics on imports, exports and transit. Until 1992, virtually all flows were registered through customs declarations. Since that year, firms have to report their imports and exports directly to the national statistical office. There are thresholds for reporting and some articles are dealt with on a sample basis. Inaccuracy has increased and the statistics are published at a higher level of aggregation.

On behalf of the Ministry of Spatial Planning (1997), NEA has produced an illustrated atlas which provides a general overview of freight transport in Europe. It covers eight themes which are expanded upon with maps, graphs, charts, diagrams and explanatory texts. The themes cover trade and freight flows, transport corridors and chains, infrastructure, logistics developments, ports, airports and terminals. Scenarios for future growth in trade and transport are also included. NEA databases in the area of transport and the in-house expertise available at NEA on intermodal and other forms of transport, logistics and ports were used to compile the atlas.

A recurring problem with freight data used when preparing policy is firms' low response rates to surveys. A good solution may be to design questionnaires in such a way that it is clear that the results are also useful for the companies themselves, for example by allowing them to benchmark themselves relative to others.

7.3. Eibsee Conference recommendations for international quality standards

The International Conference on Transport Survey Quality and Innovation held at Eibsee, Germany, in May 1997 called for the development and dissemination of Guidelines for Quality in the Design and Conduct of Urban Travel Surveys.

Following the conference, three major conclusions (and numerous minor conclusions) can be drawn. First, there was seen to be a need for a set of international guidelines to help those commissioning and those performing travel surveys to raise their standards to an internationally agreed acceptable level. To facilitate the production and effective dissemination of these guidelines, an internationally recognised agency was asked to take responsibility for co-ordinating the production and distribution of the guidelines. Second, a major component of these guidelines should be the consistent definition of terms and concepts used in travel surveys. For example, agreed definitions of households, trips and trip stages, trip purposes and a range of other commonly used terms should be specified. Agreement is also needed on several measures of performance, such as response rates, if comparisons of travel surveys are to be attempted internationally. Third, all Workshop Chairs saw a clear need for all methods and definitions used in any survey to be well documented. Only by comprehensively documenting what is currently being done can we attempt to move forward to raise the standard of such surveys.

The overwhelming support in the closing plenary session for clear documentation of existing practices closed the circle to the opening plenary session in which ISO9000 standards were described, since one concise summary of ISO9000 is:

- Write down what you do.
- Do what you write down.
- Verify the results.

8. CONCLUSION: PRIORITIES FOR FUTURE DATA COLLECTION

The following four tables constitute a summary of likely trends and give a “shopping list” of future data needs.

Table A. **Trends in society**

TREND	EXAMPLES	FUTURE DATA NEEDS
Socio-demographic trends.	Smaller households, more dwellings. More elderly households. More workers, more multi-worker households. Higher education level. More employment in services, less in production	Activity patterns, task combination, residential preferences.
Increase in scale.	Concentration of facilities. Globalisation.	Preferences for amenities close by versus concentrated mega-facilities. Changes in organisation of firms, and in the production process and logistics.
Greater flexibility.	Flexible workplaces, work hours, shop hours.	Degree of flexibility in space and time for households and firms.
Telecommunication and information.	Improved trip planning, shifts in traffic, less traffic, improved traffic management.	Availability and use of telecommunication and information technology facilities.
Global information networks.	Availability of information and communication at any time or place.	Changes in activity patterns of individuals and households. Changes in organisation of firms, labour relations, and in the production process and logistics.
Technology.	Vehicle re-design. Intermodal coupling systems. Dynamic infrastructure management. Intelligent highway systems. Integrated public transport systems. Integrated intermodal packing units. Underground (city) goods transport system. Tele-activities.	Preferences and willingness to pay for improved vehicles. Acceptance of new technologies. Privacy aspects and the possible associated reduction in personal control over the vehicle. Willingness of shippers and carriers to switch to intermodal transport
Land use.	Increasing demand for space and continuing dispersion. New interest in inner-city living.	Residential preferences. Acceptance of car restraint in urban areas.
Freight transport.	Globalisation. Logistic service providers. More deliveries of smaller volume.	Changes in organisation of firms, and in the production process and logistics.
Changing attitudes towards mobility.	"Mobility is a given".	More rooted attitudes, travel time budgets, cost sensitivity.
New forms of car ownership and other transport modes.	"Call-a-car" and other forms of shared car ownership.	Market potential as a function of available technology on the supply side and changing activity patterns and land use on the demand side.

Table B. **Trends in policy**

TREND	EXAMPLES	FUTURE DATA NEEDS
Increasing citizen participation.	Consultation of citizen groups and advisory institutions. Long planning procedures. "NIMBY" problems and "prisoner's dilemmas". More concern for the "process" needed.	Insight into attitudes, moral principles, threatened interests, risks incurred by citizen groups concerned. "Management games". Insight into the process, both from the "rational" and the "bargaining" viewpoint.
European integration, decentralisation, deregulation, privatisation.	Transfer of power of national governments to supra-national institutions and regions.	How to maintain a dialogue with citizens concerned.
Environmental concerns.	Concern for a "sustainable society" at the local, national and global level.	Priority of the environment on the political agenda, acceptable and unacceptable measures.
Costs of mobility.	Actual pricing levels, external costs of transport.	Acceptance of tax and other policy measures.
Congestion, preferential treatment of "target groups" and road pricing.	Increasing congestion. HOV lanes. Toll roads.	How to make congestion "endurable", given that it cannot vanish completely?
Renewed interest in infrastructure, and (private) finance.	Increased government budgets, BOT schemes.	Medium-term forecasts for government and private sector.
Deregulation and privatisation in public transport.	Rail, local public transport, tendering by regional authorities.	More reliable forecasts of profitable and non-profitable services.

Table C. **Innovation in models and forecasting**

INNOVATION	EXAMPLES	FUTURE DATA NEEDS
Activity-based models.	Dealing with combinations of tasks, activity- and trip-chaining, in-home/out-of-home substitution of activities, modelling activity durations, user-benefit measures. Models based on artificial intelligence, genetic modelling, satisfying instead of optimising behaviour.	Data about activity patterns without unduly placing burden upon respondents.
Dynamic longitudinal panel-models.	Length of vehicle ownership; medium-term models for infrastructure construction.	Panel data.
Land-use transportation models.	Effects of congestion and of opening of new infrastructure upon regions.	Before-and-after studies with several measurements over the long term.
Equity considerations.	Distribution of costs and benefits.	Disaggregated models and evaluation procedures.
Sketch planning models.	Compendium of elaborate model systems.	Derivation of elasticities.
TMIP Program (United States)	See section on TMIP	See section on TMIP.

Table D. **Innovations in data collection**

INNOVATION	EXAMPLES	DATA
TMIP Program (United States).	See section REFon TMIP.	See section on TMIP.
Global Positioning Systems.	Replacement of trip diaries.	Experiments.
Personal computers and Internet.	On-line interviewing.	Reduced fieldwork costs; better data quality; faster response.
Stated preference.	Many.	Mixed revealed preference/stated preference data needed.
Management games. Choice questionnaire. INFRALAB.	Study of interaction between parties in transport planning.	Insight into attitudes, moral principles, threatened interests, risks incurred by citizen groups concerned. Insight into the process, both from the "rational" and the "bargaining" viewpoint.

BIBLIOGRAPHY

Adviesdienst Verkeer en Vervoer (AVV) (1996). Autogebruik te Sturen? Begrippenkader Beleidsvisie Mobiliteit en Gedrag [Can One Steer Car Use? Conceptual Framework for a Policy Vision on Mobility and Behaviour]. Rotterdam: AVV, Ministry of Transport (in Dutch).

Arentze, T., Hofman, F., Joh, C.H., Timmermans, H. (1998). Experiences with Developing ALBATROSS: A Learning-Based Transportation Oriented Simulation System. In: Beckmann, K.J. (ed.): *Verkehr und Mobilität*, Institut fur Stadtbauwesen, Stadt Region Land 66, Aachen, pp. 61-70.

De Jong, G. (1996). A disaggregate model system of vehicle holding duration, type choice and use. Transportation Research B, Vol. 30, no. 4 (Aug. 1996) ; 263-276.

De Jong, G., Van Der Hoorn, A. (1998). The Impact of the Amsterdam Ring Road Five Years Later. Paper D13, prepared for the European Transport Conference (formerly PTRC), Loughborough University, 14-18 September 1998. London: Proceedings of the Seminar Transportation Planning Methods, ISBN 0-86050-313-5, p.p. 237-248.

Gates, W. (1996). *The Road Ahead*. Viking Penguin.

Gates, W., Hemingway, C. (1999). *Business @ the Speed of Thought : Using a Digital Nervous System*. Warner Books; ISBN: 0446525685.

Gunn, H. (1985). Artificial Sample Applications for Spatial Interaction Models. Colloquium Vervoersplanologisch Speurwerk, The Hague, November 1985, Holland.

Hague Consulting Group (HCG) (1990). The Netherlands' "Value of time" study : final report. The Hague: Hague Consulting Group.

Hills, P. (1996). What is Induced demand? *Transportation,* Vol. 23, No. 1 (Special Issue on Induced Traffic).

INIT Project Organisation, Dutch Ministry of Transport (1996). Werkboek Innovatie in Inland Transporttechnologie, "Concepten in Verkeer en Vervoer" [Work Book Innovation in Inland Transport Technology, "Concepts in Transport"]. The Hague (in Dutch).

Kinnock, N. (1995). Towards Fair and Efficient Pricing in Transport. Communication to the European Commission.

KPMG-BEA (1996). Het Einde van de Collega? De Digitalisering en het Werk (The End of the Colleague? The Digital Revolution and Employment). Rotterdam/Hoofddorp: commissioned by AVV, Ministry of Transport (in Dutch).

Lyons, W. (1995). Policy Innovations of the US Intermodal Surface Transportation Efficiency Act and Clean Air Act Amendments. *Transportation* 22: 217-240, 1995.

Martens, M., Verroen, E., Witsen, P. (1998). Mobiliteitseffecten van Ruimtelijke en Stedelijke Dynamiek (Mobility Effects of Spatial and Urban Dynamics). Delft (the Netherlands): INRO-TNO (in Dutch).

Ministry of Spatial Planning (1997). Spatial patterns of transportation : atlas of freight transport in Europe. The Hague : Ministry of Housing, Spatial Planning and the Environment.

Neijens, P.C. (1987). The Choice Questionnaire. Design and Evaluation of an Instrument for Collecting Informed Opinions of a Population. Amsterdam: Free University Press.

Ortuzar, J., Willumsen, L. (1994). Modelling Transport, Second Edition. Chichester: Wiley. ISBN 0 471 94193 X.

Pisarski, A. (1997). Recognizing, creating and marketing survey quality. Paper presented at the International Conference on Transport Survey Quality and Innovation, Grainau, Germany, May 24-30, 1997.

Rydenstam, K. (1996). Pilot Survey on Time Use 1996, Guidelines on the Survey Design. Brussels: Eurostat DOC E2/TU/PILOT/2/96.

Richardson, A., Ampt, E., Meyburg, A. (1995). *Survey Methods for Transport Planning*. Melbourne: Eucalyptus Press, ISBN 0 646 21439 X.

Saris, W.E., van der Put, C.E. (1996). De Keuze-Enquete als Instrument voor Beleid, Eind-rapport [The Choice-Questionnaire as an Instrument for Policy, Final Report]. Amsterdam: Faculty of Social Sciences, University of Amsterdam (in Dutch with an English summary).

Susskind, L., Field, P. (1996). *Dealing with an Angry Public, the Mutual Gains Approach to Resolving Disputes*. New York: The Free Press. ISBN 0-684-82302-0.

Taale, H., Coëmet, M., Linssen, J. (1999). Floating Car Data: gebruik en exploitatiemogelijkheden (Floating Car Data, potential for use and commercialisation). Paper presented to the 3rd DVM symposium, March 1999, Noordwijkerhout, the Netherlands (in Dutch).

TMIP (1996): Internet site: http://www.bts.gov/tmip/about.html

Van der Hoorn, A., Van der Vlugt, M. (1998). The Application of the TIGRIS Model to Randstadrail. In: Elhorst, J., Oosterhaven, J. (eds). *Transport en Welvaart, Vervoer in Vogelvlucht. Liber Amicorum voor Prof. Drs. J.B. Polak*. Groningen: Stichting Ruimtelijke Economie, REG Publicatie nr 16, ISBN 90-73709-18-0, p.p. 189-200.

Topic 2

TRANSFORMING ECONOMIC AND INSTITUTIONAL STRUCTURES AND TRENDS IN TECHNOLOGY: EXPERIENCE AND PROSPECTS

a) Economic and institutional transformations

DECOUPLING TRANSPORT INTENSITY FROM ECONOMIC GROWTH

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SUMMARY

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1. THE PHILOSOPHY OF DECOUPLING

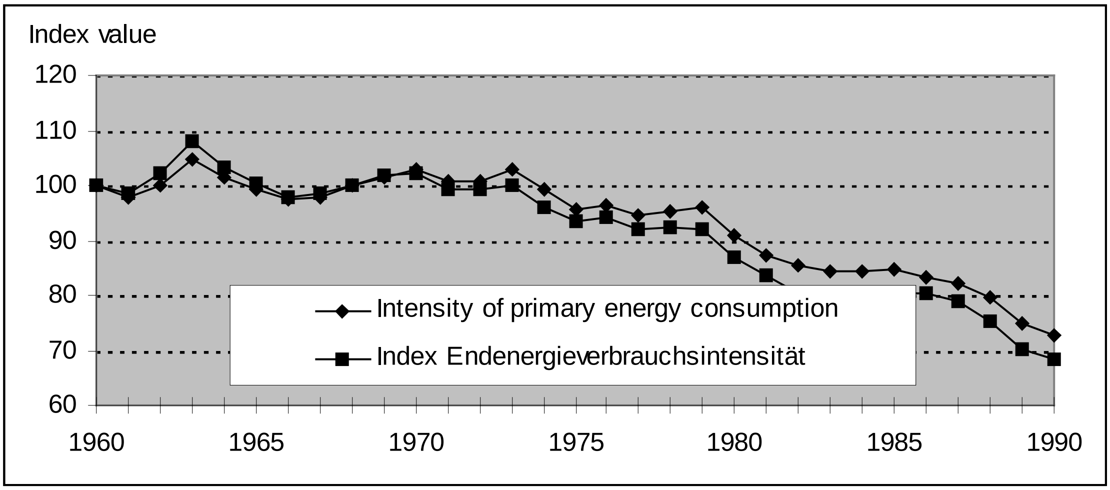
Empirical studies in European countries reveal an increase in transport intensity, particularly in the field of goods transport, but also in that of passenger transport. Transport intensity is a statistical indicator (relationship of tonne-km or passenger-km to Gross Domestic Product), showing how much transport is needed per unit of GDP.

In the past, economic activity and transport services developed in parallel. It was inferred from this that an increase in economic growth was coupled, almost of necessity, with an increase in the amount of traffic. There can be no doubt that there are close interconnections here. However, they do not prove a necessary link and they can, on the contrary, be the result of deliberate action. Both in the transport sector and in the upstream and downstream sectors of the economy there is potential for decoupling economic growth from traffic development.

The decoupling strategy sets out to achieve a continuing upturn in national product in the future together with a diminishing increase in traffic[1]. It is essential that decoupling is not detrimental to economic growth. The important point is to get by with less traffic through increased output in the productive sectors of the economy without restricting prosperity. In this respect the decoupling strategy – together with market and pricing policy and policy on infrastructure in the transport sector – could represent a "third way" of coping with the growing traffic problem.

An example is the energy sector, which succeeded in reducing energy consumption after the oil crises of the seventies and eighties, through appropriate technology, greater efficiency and innovative approaches, without detriment to economic growth (Fig. 1).

Figure 1. **Development of primary energy and end-use energy consumption rates (Index values, 1960 = 100)**



Source: Council of Economic Experts, in "Standortwettbewerb - Annual reports 1995-96", Wiesbaden, 1995, pp. 379 and 464f. Author's own calculations.

Another example of successful decoupling is to be found in the waste management sector, where the quantity of waste per unit of GDP is diminishing and the link between economic growth and amounts of waste is becoming increasingly tenuous (Fig. 2).

Figure 2. **Proportion of waste in manufacturing industries**

	1980	**1990**
Amount of waste (millions of tonnes) (a)	68.3	70.2
Gross value added (billions of DM) (b)	656.03	762.27
Proportion of waste (a/b*1 000)	0.104	0.092

Source: Author's own calculations based on Statistisches Bundesamt (Ed.), *Statistisches Jahrbuch 1995 für die Bundesrepublik Deutschland*, Wiesbaden 1995, p. 661; Umweltbundesamt, Statistisches Bundesamt (Ed.), *Umweltdaten Deutschland 1995*, Wiesbaden, Berlin 1995, p. 37.

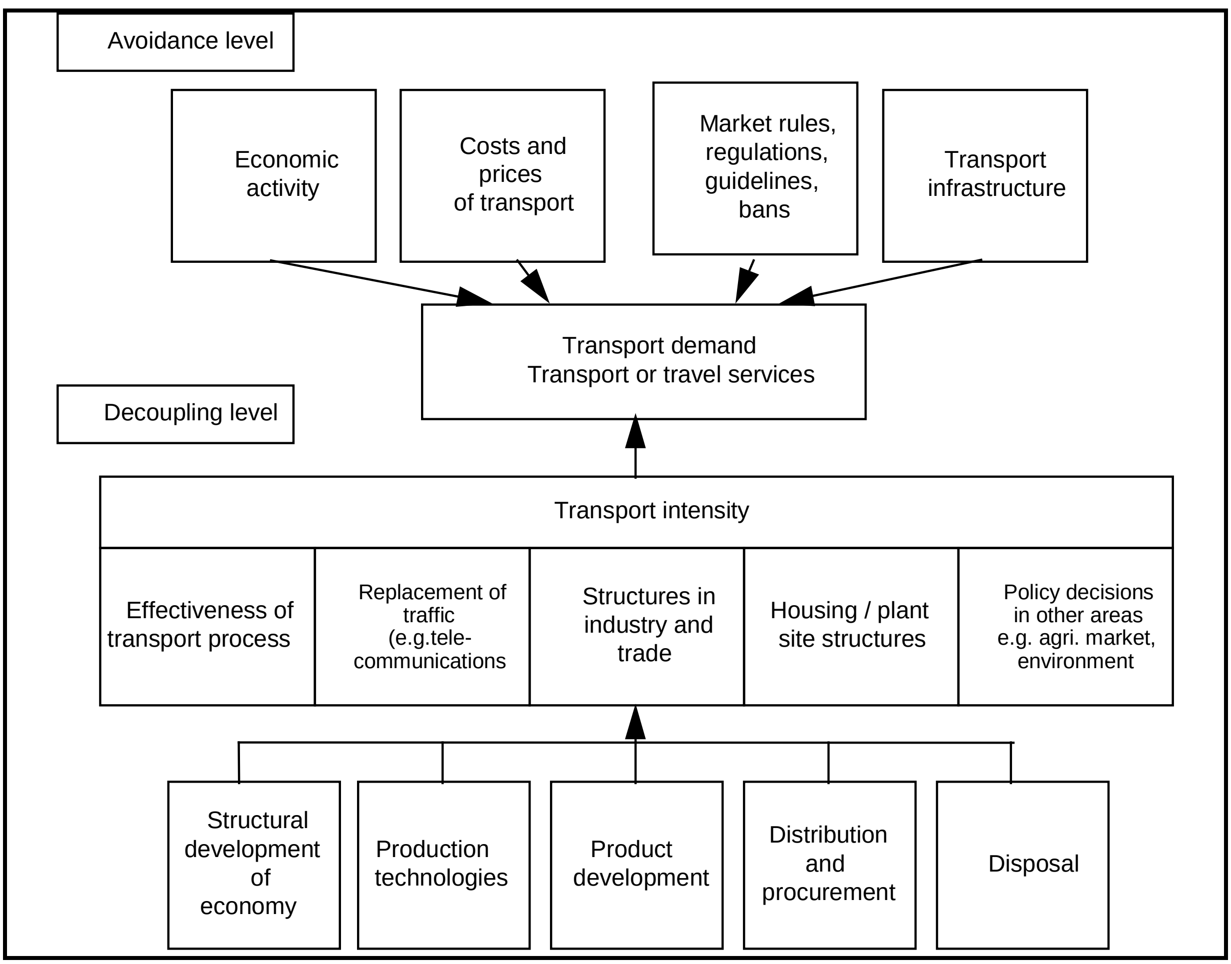
There is an essential difference between avoiding transport and decoupling (Fig. 3)[2]:

- Avoidance involves reducing transport services by the introduction of indirect factors that determine demand (including price or cost of transport services, supply of transport infrastructure, transport schemes). The avoidance strategy does not consider the repercussions of a reduction in traffic on production and sales in the upstream and downstream economic sectors. The crucial point is simply to achieve a fall in demand for transport. The adjustments and changes in the economy and population that will bring about such a fall are still uncertain. It is therefore difficult to assess the macroeconomic effects of a policy of avoidance.

- Decoupling begins with the rise in traffic in the upstream business sectors and sets out to reduce the amount of transport required to produce net product. It does not change demand directly, but brings an indirect influence to bear by reducing the need for transport. As a result, transport intensity is lessened. Decoupling ensues insofar as transport demand is not diminished by the introduction of certain market parameters, but by a change in the combination of factors that produce traffic.

Decoupling is a strategic concept that goes beyond transport policy. The starting points and relevant measures are not limited to the transport sector, but are also to be found in other fields (including production technology, product innovation, procurement, distribution and logistics, choice of location, information technology, legal and institutional regulations). Measures are adopted in other areas of economic policy, such as technological, structural, regional, environmental and labour market policy. Decoupling addresses the transport system as a whole; there is nevertheless a strong emphasis on road haulage, which still shows rising transport intensity.

Figure 3. **Difference between avoiding transport and decoupling**



Source: Author's own diagram.

With a strategic approach of this kind, some of the pressure to take action in the field of transport policy would be alleviated. The fact is that transport policy must contend with problems that originate in quite different branches of the economy and areas of life. If the solution to these problems were to fall to transport alone, strong leverage and carefully adapted remedies would be needed to correct matters across the sector. In this respect transport policy is chronically overburdened. Hence it would be advisable to induce the business sectors where the problems originated to help find solutions, and their contributions would be co-ordinated with transport policy.

Considerable systemic objections are levelled against decoupling. The essence of the accusation is that decoupling is a variant of structural regulation opposing market forces. With interventionist measures, influence would be brought to bear on the structures of the economy, in order to bring about a reduction in traffic. Enterprises, however, would adopt possible measures of their own accord if their business stood to profit from them. The policy of decoupling is thus thought to be superfluous and to run counter to the market decisions of the enterprises. The markets do nevertheless show weaknesses, which detract from this "ideal" use of resources to a greater or lesser extent. It follows that there is an additional need for political action. Within a framework where there is no legal intervention and where alternative choices are open, an approach consistent with market principles can develop.

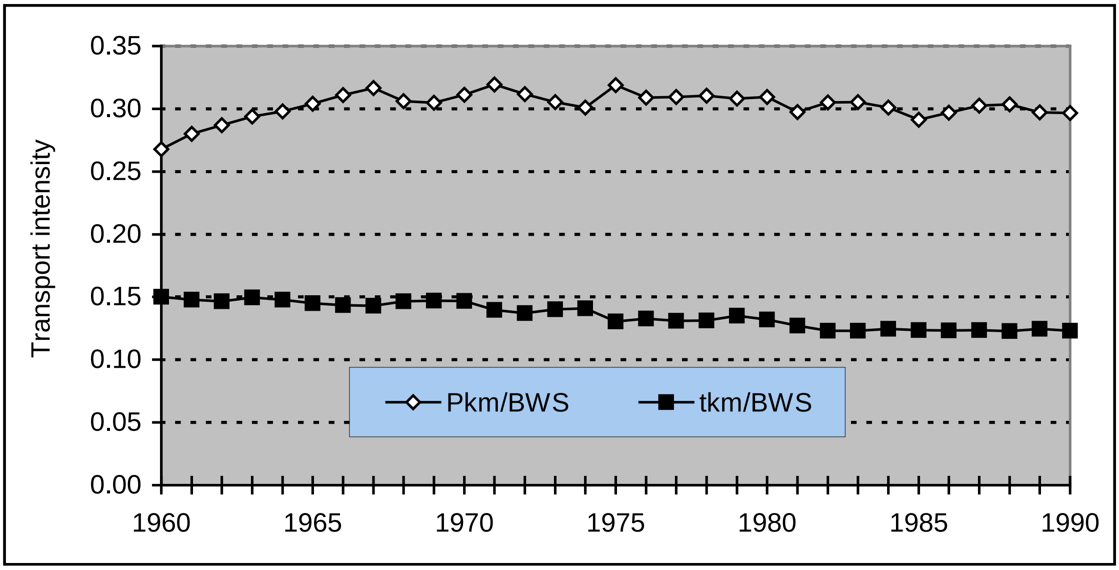
2. DEVELOPMENT OF TRANSPORT INTENSITY

In the past, transport services, both in the freight as well as the passenger sectors, have developed in parallel, as shown in the example of Germany[3]. "Transport intensity" is an index which expresses the relationship between transport services (measured in passenger-km and tonne-km) and GDP (prices given are those of 1991):

$$TI = \frac{\text{Transport services}}{\text{GDP}}$$

In the freight sector a slight decrease in transport intensity can be identified. In the passenger sector it continued to rise until the end of the sixties, after which it remained much the same (Fig. 4).

Figure 4. **Development of transport intensity in freight and passenger sectors**

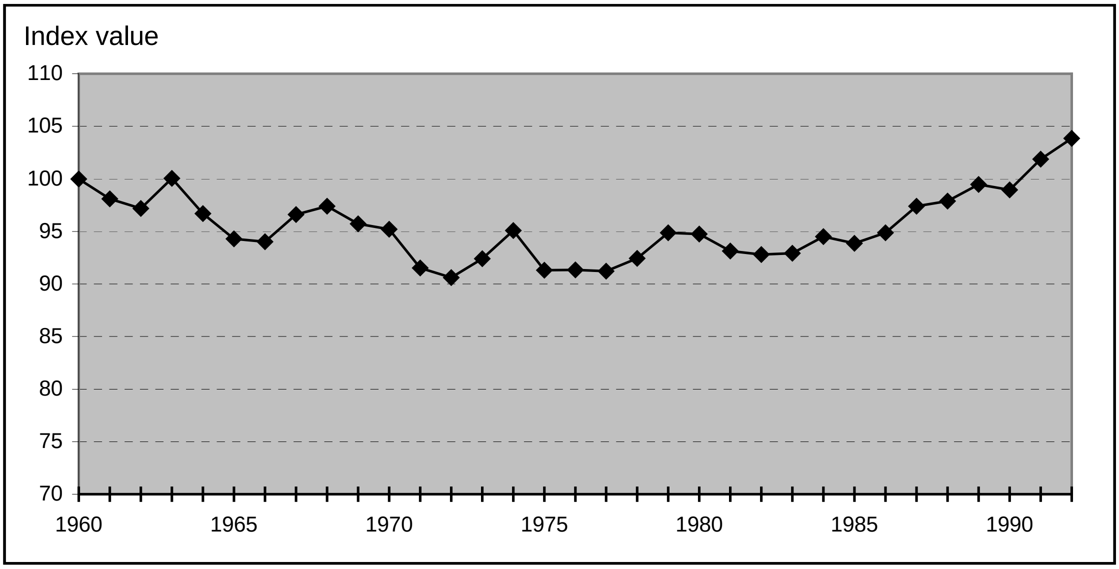


Gross value added (1991 prices)
Pkm = passenger-kilometres
tkm = tonne-kilometres, domestic traffic, including short-distance road haulage.

Source: Federal Transport Minister, Traffic Figures for 1991, Bonn, 1991, pp. 309f. and 341f.
Council of Economic Experts on assessment of macroeconomic development in "Standortwettbewerb – Annual Reports 1995-96", Wiesbaden 1995, p. 379, and author's own calculations.

The trend towards increased traffic in the industrial sector shows the development of transport intensity related to the production of goods and services (industry, energy provision, mining, construction). Transport intensity in the industrial sector remained virtually constant over many years. Since 1980, however, distinct increases are to be seen (cf. Figure 5).

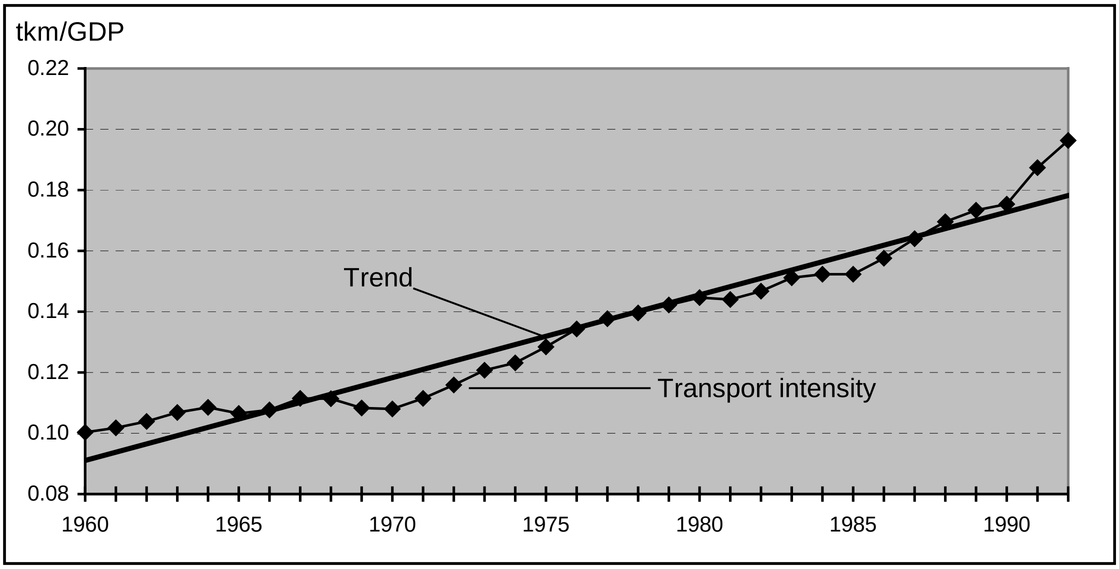
Figure 5. **Development of transport intensity in the industrial sectors (1960 = 100)**



Source: Council of Economic Experts, in "Standortwettbewerb..., *op. cit.*", p. 377; Federal Minister for Transport (Ed.), Traffic Figures for 1991, *op. cit*, p. 340f. Author's own calculations.

If road haulage alone is considered, transport intensity is seen to have increased by nearly 100 per cent over the period 1960-90 (cf. Figure 6).

Figure 6. **Development of road haulage intensity in the industrial sector**



* Commercial road transport and plant operated transport (short- and long-distance).

Source: Council of Economic Experts, in "Standortwettbewerb..., *op. cit.*", p. 377; Federal Transport Minister (Ed.), Traffic Figures for 1991, *op. cit.*, p. 340f. Author's own calculations.

There is so far no sign of a reversal in the trend in the road haulage sector. The rate of increase in road haulage intensity in the industrial sector continues to rise.

3. POTENTIAL FOR REDUCING TRANSPORT INTENSITY AND CORRESPONDING MEASURES

3.1. Structural change in the economy

A reduction in transport intensity can be achieved by acceleration of structural change. Economic policy can exert influence in different ways:

- Promoting technological and industrial innovation;
- Raising qualifications in the workforce and improving human capital;
- Ceasing to maintain "old" branches of industry;
- Increasing productivity by making full use of economies of scale, learning curve effects and spin-offs from innovations;
- Increasing the share of service providers in national product (tertiarisation);
- Increasing the attractiveness of setting up in Germany and increasing inward investment.

The traffic balance resulting from structural change proves to be ambivalent. Greater flexibility and globalisation of economic conditions produce an increase in traffic. On the other hand, modernisation and increased productivity provide greater leeway for reducing transport intensity. A restructuring process whereby mass-produced goods are replaced with diversified quality goods and a higher proportion of high-technology products tends to produce less traffic and innovation in products and technologies, means that smaller amounts of material are needed, competition in the freight market raises production efficiency and the shift away from structurally weak sectors (e.g. agriculture, mining, iron and steel production) lowers the amounts transported. The pace of structural change means that transport economies can be made.

From the standpoint of the transport sector, the trend towards tertiarisation is to be seen as positive. Unlike industrial manufacturers the new service providers use transport less intensely. Regression analysis for the period 1973 to 1990 reveals the following elasticities in transport intensity with respect to the share of the secondary or tertiary sectors in the net domestic product (cf. Table 1)[4].

It emerges from these elasticities that a fall in the secondary sector is linked to a reduction in transport intensity. On the other hand, the growth of the service sector also produces an increase in transport intensity, albeit a relatively modest one. By and large the easing of traffic resulting from the tertiarisation of the economy as a whole has not yet become apparent.

Table 1. **Elasticities of transport intensity depending on structural change in a sector**

Type of elasticity	Elasticity value
Elasticity with respect to the share of the secondary sector	0.074
Elasticity with respect to the share of the tertiary sector	0.0092

Source: Author's own calculations.

3.2. Rationalisation of transport and logistics

Rationalisation means making the organisation and running of the transport process more effective. Its effect is expressed in the relationship between transportation services and kilometre performance:

- Traffic performance is the amount transported multiplied by the distance, i.e. tonne-km for freight transport or passenger-km for passenger transport;

- Kilometre performance is the amount of traffic that covers a given distance, i.e. vehicle-km.

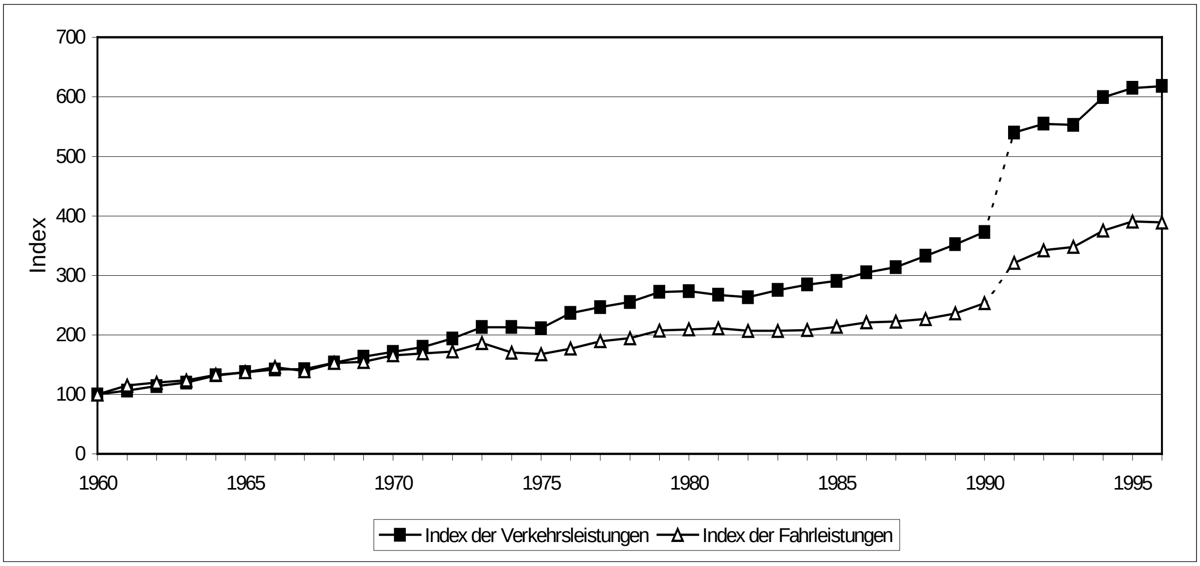
The decisive cause of strain on the roads and the environment is the amount of traffic actually on the roads, i.e. the kilometre performance.

Between 1960 and 1996 traffic performance in Germany's road haulage sector (taking account of the effect of reunification on the statistics) rose by 518 per cent; kilometre performance, on the other hand, only rose by 289 per cent (Figure 7). Kilometre performance and traffic performance could be made to develop in different directions through higher productivity in transport (e.g. by increased vehicle capacity and improved loading). The object of the exercise, now and in the future, is to widen this gap still further.

The potential for rationalisation is shown to be lower with respect to passenger transport (Figure 8). In the past, kilometre performance and traffic performance have developed almost in parallel. With the average level of occupancy expected to fall further from the present 1.4 passengers/private car, passenger transport must in future mean a steep rise in kilometre performance.

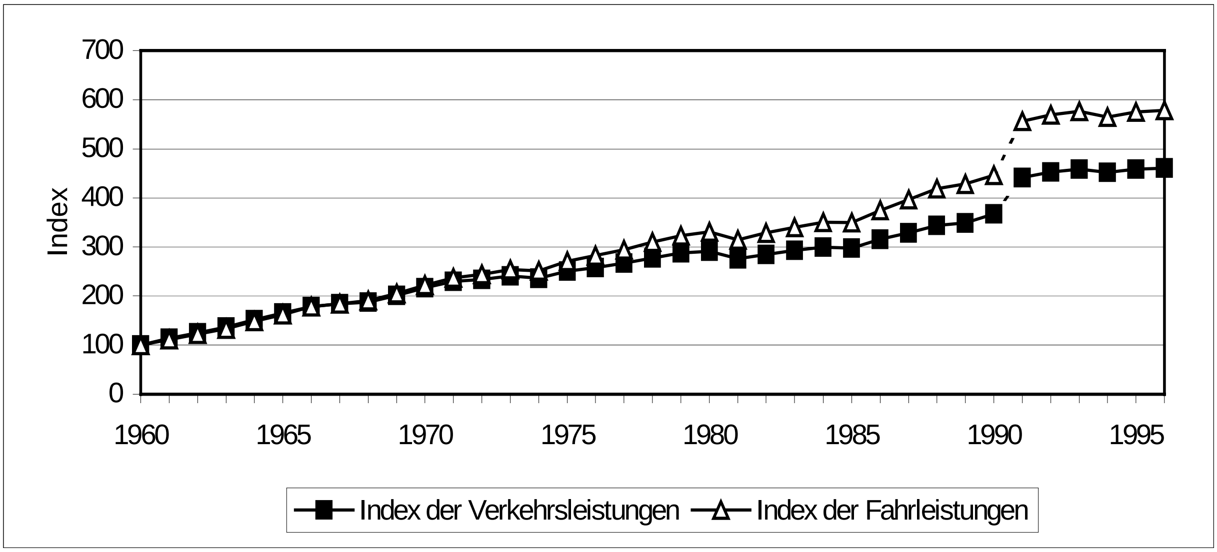
A survey carried out in Germany (1997)[5] revealed an increase in empty runs of rather more than 20 per cent in the road haulage sector and an increase in long-distance, plant-operated transport of around 30 per cent. The load factor in terms of weight amounted to 62.3 per cent in long-distance transport by haulage companies and around 70 per cent in long-distance, plant-operated transport. The discrepancy between weight and volume with respect to the load factor suggests that vehicle structures are not optimised. Efforts to improve the load factor should continue, especially as every percentage increase in the load factor is reflected in a proportional reduction in kilometre performance.

Figure 7. **Traffic performance and kilometre performance for road haulage in Germany**
(1960 = 100)



Source: Federal Transport Ministry (Ed.), 1991 Traffic Figures, pp. 238ff. and 341ff; 1997 Traffic Figures, pp. 159 and 233; author's own calculations.

Figure 8. **Traffic performance and kilometre performance for private car transport in Germany (1960 = 100)**



Source: Federal Transport Ministry (Ed.), 1991 Traffic Figures, pp. 237 ff. and 309ff; 1997 traffic figures, pp. 159 and 217; author's own calculations.

Fleet management involves all measures related to operations and vehicles in which greater efficiency is achieved through the use of information and communications technologies. These include preparation of shipments (freight and logistics management) and the supervision of transport (vehicle fleet management)[6].

- Empirical impact assessments point to the conclusion that it would be possible to achieve load factor increases of between 10 and 20 per cent if route planning systems were implemented by the transport firms involved.

- Co-operation between companies means that transport can be operated more efficiently with improved load factors (bunching, full loading, balanced use of loading space). If companies co-operate, the number of empty runs can be lowered by around 20 per cent.

- The transport field is characterised by an increasing complexity in the logistics function. A whole range of services – procurement, warehousing, distribution – can be taken over by logistics companies.

- In the transport field there is a need for greater vehicle capacity. However, reservations are currently being voiced on this matter. Bigger, heavier vehicles cause more serious accidents. Moreover, wear and tear on highways increases as they have to bear greater weight. However, the increase in overall weight lowers the number of journeys. According to estimates by the Freight Transport Association, the increase in the total weight allowed under British law from 38 tonnes to 44 tonnes led to a fall in kilometre performance of 480 million miles/year and a saving in fuel of around 200 million litres/year.

Given the existing discrepancy between payload weight and available volume with respect to the load factor, it is more important to increase volume capacity if kilometre performance is to be lowered. As a result of the trend towards lighter, more valuable goods, recourse to greater volume will increase. With increased use of high volume vehicles, the weight load factor is improved so that kilometre performance is reduced.

In recent years, possible forms of rationalisation have already been used intensively. Some leeway nevertheless remains, which could lead to a 10-15 per cent fall in kilometre performance in the road haulage sector.

3.3. Restructuring industrial production

The picture presented by the development of industrial production is an ambivalent one. Production technologies show a tendency towards increasing transport intensity, while transport economies are made as a result of product innovation[7].

- Industry is producing increasing quantities with smaller batches and lower stock levels in a shorter time. This is linked to the demand for short delivery times. This results in a change in the modal split, which favours the road haulage sector.

- Greater flexibility in the manufacturing sector (job shop and assembly line production) means that it is possible to reduce production time and stock levels. This development was supported by the widespread introduction of digitally controlled machines (e.g. CNC and DNC machines). The associated reduction in batch sizes leads to faster delivery times. The vehicle load factor falls and kilometre performance increases.

- In recent years more rigorous quality control measures have been introduced into the production sector. In addition, new ideas have emerged (such as the zero defects programme and total quality management). This has led to a reduction in inputs with a drop in defects and numbers of rejects.

- There is an increase in the use of processes that lead to a reduction in the amount of resources used. Thus in the field of energy production it has been possible to increase efficiency by burning fossil fuels. In the motor industry the use of innovative manufacturing techniques has resulted in a reduction in inputs.

- For some time there has been a clear trend towards the miniaturisation of industrially produced goods, notably in the field of computers (laptops, electronic agendas, etc.) and electronic leisure items (cameras, video cameras, mini-stereos, etc.). By way of example, making detergents more concentrated (e.g. Ariel) has produced reductions of 20 per cent in weight and 40 per cent in volume. With "microtechnology" the use of simple raw materials is combined with higher production efficiency and a reduction of waste to a minimum.

- Consumer goods sometimes feature additional functions (e.g. multimedia PCs in which audio, video, photography, CD player, fax, etc., are combined). For products with a wide range of functions, the material input is lower.

- The use of new materials helps reduce the weight of primary and end products. In modern vehicles the proportion by weight of synthetic materials already amounts to 10 per cent. Steel is increasingly replaced with aluminium in automobile production. The weight of the framework has been reduced by 30-50 per cent.

- More and more renewable materials (cotton, sisal, flax, hemp, etc.) are also being used in the automobile sector. Raw materials from natural sources tend to be lighter than synthetic materials. Renewable materials can be produced on agricultural land near the production facility, which shortens transport distances.

- In the industrial sector a tendency to standardize components and extend the "building-block" principle can be observed. Different companies partly collaborate in developing and marketing product components. The building-block concept increases the potential for bunching in transport. Standardized equipment for packing and transport are increasing the vehicle load factor still further.

- By and large, a trend towards "dematerialisation" in the production process can be observed. The share in net output of the tertiary sector is showing a tendency to rise, as shown by the increasing share of software and engineering consultancy firms. Material products are in some fields being replaced with multimedia and on-line services. Printed commodities are being superseded by electronic media (e.g. electronic newspapers, telephone directories and mail-order catalogues on CD-ROMs etc.). Computer simulation is replacing resource-intensive material and product testing in the real world.

3.4. Reorganisation of procurement, distribution and logistics

Procurement and distribution operations have an indirect effect on the inter-company transport processes. They bridge space and time with respect to supply of input goods for production and distribution of output goods. In particular, the volume and weight of consignments, the number and geographical situation of partners in the transaction, the frequency of procurement and delivery, as well as the extent to which the company has set up its own logistical service, all impact on the amount of traffic. In particular, the quantity of goods in transit, transport distances and the vehicle load factor are affected[8].

- For some time there has clearly been a lower level of outsourcing in the industry. Numerous activities providing net benefit are being extended. As a result additional tasks are arising in the transport sector. The extended manufacturing activities often make particular demands on the vehicles (e.g. in terms of protection of stock, flexibility and speed). This tends to increase the road haulage sector's share in the modal split.

- Owing to the growing complexity of trade (reduction in outsourcing, increasing variety of models and parts, shorter product life-cycles, etc.) a reorganisation of supply relationships is taking place in the industry. Enterprises are reducing the number of partners sharing their net profit. A shift from multiple to single or double sourcing can be seen. The number of trading relationships involving transport is diminishing. There is a new potential for bunching. With the fall in the number of suppliers there is a greater risk that consignments will be lost. In view of this, manufacturers of finished products are concerned that the supply companies should set up near their production facilities.

- Just-in-time production is suspected of increasing the proportion of empty runs, the distances travelled and the need for daily runs. However, if the delivery is effected from a source located near the manufacturer, the potential for bunching can be realised. This is also true when combined deliveries are made by local carriers.

- In recent times the outsourcing of logistics operations has been observed in the industry. Co-operation with logistics companies releases the potential for rationalisation in the distribution of goods. Increasingly, complex logistical operations (e.g. commissioning, assembling and warehousing) are awarded to outside companies. The outsourcing of logistical operations improves the vehicle load factor and lowers kilometre performance.

3.5. Disposal and recycling

Transport economies can be produced in the waste disposal and recycling sector[9]. The amount of waste produced by industry has fallen in recent times. The continuation of this trend means that further transport economies are possible. New legal frameworks (Ordinance on packaging) have led to a fall in the use of packaging materials. A delivery system requires additional private car journeys and, with a pick-up system, collection runs by lorries to geographically dispersed households are necessary. The transport of material for recovery from a central collection point has positive effects on traffic levels. The lorry does not need to serve the entire residential area but only certain collection sites. From these, relatively large bunched amounts can be transported.

- Increasingly, disposable packaging is being replaced with two-way packaging and carrier bags. In particular it is possible to reduce traffic through arrangements involving several parties (as in the case of drinks), whereby empty packaging is collected by partners in the arrangement who are near the point of consumption, so that the distance they have to be carried for re-use is reduced.

- Transport intensity increases when waste is disposed of abroad. Transboundary transport can be restricted through legal regulations, such as the EC Directive on Waste Transport.

- A reduction in traffic can also be achieved if products are taken back by the manufacturer and old products are recycled. New quantities of recoverable materials (metals, plastics, glass, etc.) should not be produced. If the collection points are situated near to the recycling plants, the transportation distances are shortened. The foremost objective in recycling is to maintain the identity and function of the used product. It is a question of slowing down the flow of materials. Over a given period, fewer goods pass through the economy.

- To lower transport and dumping costs more and more waste exchanges are being set up. At present, for example, there are regional recycling exchanges run by the chambers of industry and commerce. In this way, suppliers and demanders of raw materials obtained from recycling can find suitable trading partners. Already 20 per cent of all enterprises use waste exchanges of this kind. Transportation distances are falling and the potential for bunching can be exploited.

3.6. New information technologies

A reduction in transport intensity as freight and passenger transport can be achieved through greater use of information and communications technologies.

- With the existence of standards for the transmission of business data (e.g. Edifor – Electronic Data Interchange Forwarding) information technology can be used to exchange the documentation that accompanies shipments (shipping order, unloading certificate, etc.). Moreover, it is possible to track shipments using information technology. By optimising and pooling shipments it is possible to reduce stopping time and empty runs and also to prevent vehicles from making unnecessary detours.

- In order to optimise production processes, the exchange of information is required throughout the whole enterprise. Starting points include the electronic exchange of business data (EDI – Electronic Data Interchange), standardized message formats (Edifact, Edifor, Odette, etc.) and the transmission of information via the Internet. This would yield improvements in the way shipments were made up, route scheduling and the tracking of shipments, and the vehicle load factor would consequently be higher.

- In some areas telecommunications can be used to provide a substitute for transport. At present the number of teleworkers in Germany amounts to around 150 000. The potential is estimated at 2.9 million[10]. Teleworking from home can however lead to a rise in traffic due to other factors. Shopping trips, originally combined with travel to and from work, increase with working at home. With the reduction in commuting, there is an increase in disposable income and a consequent increase in travel during leisure periods. However, until now a quantitative assessment of these arguments has not been possible.

- Business travel can be reduced by video-conferencing. The enterprises making increasing use of this alternative are predominantly those operating internationally. For example, with the use of video-conferencing at the Ford production plants in Great Britain and Germany it has been possible to achieve considerable reductions in travel costs and travel time (up to 40 per cent)[11]. Empirical surveys show that business travel has so far fallen by an average of 10 per cent as a result of video-conferencing[12]. At present the potential saving is thought to be as high as 30 per cent of all business trips.

- Electronic commerce over the telephone, ISDN or Internet offers an alternative to travelling to shops and other utilities. Electronic commerce encompasses purchasing (teleshopping), banking transactions (telebanking) and advisory services (teleconsulting). Until now the existing potential could only be realised within a limited area. A mere 0.03 per cent of retail turnover in Germany was earned in the teleshopping sector[13]. In particular, payment options and the ability to compare prices are lacking, and problems of data protection and concerns about loss of social contact are impeding its development. According to a study by Scientific Consult, there is considerable potential for the future. The latter maintain that 5-10 per cent of all retail turnover will be derived from on-line or teleshopping over the next 10 years.

- Another way in which modern communications technology may be used to reduce traffic is to be found in the "virtual town hall", that is to say, that information and services offered by local authorities will be available through the Internet. Until now local authority services on the Internet were limited to providing information, about their opening hours, for example, or dealing with formalities that do not require a legally binding signature. However, various towns, such as Cologne, Leipzig and Nuremberg, are already working on wider-ranging ideas.

3.7. Spatial and regional issues

An attempt can be made to reduce transport intensity arising from the distance factor by the establishment of regional centres of specialised economic activity. With economic structures in the regions, decentralised and close to the markets, transportation distances in the production chain are shortened and there is less need of transport services. The "decentralised concentration" model provides the basis for this. This concept encompasses the geographical distance between enterprises, the distance between plant locations and transport facilities (seaports, inland ports, goods stations, etc.), the distance from traffic nodal points (transshipment centres and integrated transport facilities) as well as the distance from consumer markets and other sales outlets[14].

The regional concentration of economic activity can produce positive economic effects. On the one hand, "localisation economies" are made by companies in the same sector (e.g. from the existence of specialised supply or service companies in the region or the availability of a potential workforce with experience in the sector). On the other hand, "urbanisation economies" occur as a result of the concentration of companies in different sectors (e.g. proximity advantages, advantages stemming from differentiated labour and sales markets, a wide-ranging offer of services and a well-developed infrastructure)[15].

- In addition to the increasing internationalisation of procurement operations, a trend towards regionalised procurement can also be observed. Increasing demands on commercial practice (just-in-time procurement, modular sourcing, etc.) are producing an increase in quantities procured within the region. This trend is particularly marked in Japan. Toyota, for example, obtains around 80 per cent of its materials from suppliers based within a radius of less than 40 km from the production facility. By comparison, suppliers have to travel an average of about 350 km to Volkswagen's Wolfsburg plant and about 320 km to Ford's Cologne plant.

- At times "parallel internationalisation" occurs, whereby relocation abroad by manufacturing companies is accompanied by a parallel relocation of supply companies' production facilities. In this way logistical risks (congestion, waiting time at border posts, etc.) are avoided.

- There is a growth in industry of interrelated production at international level. It is often uneconomical to manufacture complete products in plants located abroad. Manufacturers therefore endeavour to interrelate plants in different countries to form an international manufacturing consortium. A global manufacturing consortium divides the whole production chain between different countries. In this way a global manufacturing strategy and global sourcing are integrated. The individual manufacturing sectors in the overall production chain are a long way from each other, which calls for transportation over great distances. For links between production facilities located in different continents, consignments are carried by ship as well as by plane. Within the same continent the use of the train in the transport chain becomes more probable as transportation distances increase. Over short runs the lorry will prevail owing to its inherent advantages.

- In recent years it has been possible to find production zones at traffic junctions. The reason for this is the increasing division of labour in the production sector[16]. If a production concept is to be realised, it is necessary to have a transport system that runs smoothly, and this can be better guaranteed at nodal points than elsewhere. These traffic interfaces include transhipment centres, integrated transport terminals, inland and sea ports and also airports. Transport by rail and inland waterway or integrated transport is becoming more attractive with the siting of production facilities at transshipment centres.

4. TRAFFIC IMPACT ANALYSIS

The repercussions for traffic of the structural changes in the industrial and service sectors are still largely unknown. Above all it remains to be seen which enterprises will make use of which restructuring possibilities and to what extent the implementation of certain developments is to be expected. Accordingly, this study cannot indicate the scale of the potential for systematic easing of traffic. Nevertheless, some quantitative information on the effect of individual measures on reducing traffic levels is set forth below. It will be necessary to conduct further empirical research into this matter.

4.1. Impact complex analysis

The investigation will consider how far certain structural changes have raised or lowered transport intensity. To that end information from a survey by the Institut für Verkehrswissenschaft at Cologne University will be presented; this survey was conducted in an enterprise in 1995[17].

- The changes in transport intensity over the period 1985-1995 will be ascertained from the data given;
- By segmentation of the answers, the extent to which changes in the industrial structure have taken place will be calculated;
- By comparing the scale of each of the changes it will be possible to establish how far given structural developments coincide with changes in transport intensity.

For the sectors examined, electrical engineering and electronics industries, and automobile industries, the changes in transport intensity can be seen from the figures given in Table 2[18].

Table 2. **Rates of change in transport intensity**

	Rates of change
Automobile and supply industries	+32%
Electrical and electronics industries	-5%
All enterprises	+15%

Source: Author's own research.

In industrial production technologies, developments that reduce traffic levels (e.g. smaller batch sizes) are offset by the use of modern information and communications technologies.

Table 3. **Production technologies and transport intensity**

	Change in parameters*	
	Enterprises with increasing transport intensity	**Enterprises with falling transport intensity**
Use of CA-X systems (e.g. CAQ computer aided quality assurance etc.)	+1.35	+1.71
Use of telecommunications systems	+1.47	+2.12
Use of systems for electronic exchange of business data (EDI)	+1.24	+1.71

* -3 = greatly reduced; +3 = greatly increased

Source: Author's own research.

Also apparent are connections between product innovation and traffic intensity. Falling transport intensity can be observed in enterprises that have reduced the volume or weight of products, that have used natural or secondary raw materials and material production processes have been replaced with immaterial ones (e.g. simulation).

Table 4. **Product innovation and transport intensity**

	Change in parameters*	
	Enterprises with increasing transport intensity	**Enterprises with falling transport intensity**
Use of resources	-0.21	-0.59
Volume/weight of Products	+0.24	-0.35
Use of natural raw materials/biomaterials	+0.06	+0.29
Use of recycled materials	+0.35	+0.65
Replacement of "material" processes with "immaterial" processes	+0.65	+0.88

* -3 = greatly reduced; +3 = greatly increased

Source: Author's own research.

In the area of industrial procurement, increasing transport intensity is linked to an increase in transportation distances and a fall in vertical range of manufacture.

Table 5. **Procurement and transport intensity**

	Change in parameters*	
	Enterprises with increasing transport intensity	**Enterprises with falling transport intensity**
Average transportation distance	+0.82	+0.56
Vertical range of manufacture	-0.87	-0.29
Single and double sourcing	+0.76	+1.25
Euro sourcing	+1.24	+0.94
Short-cycle just-in-time-procurement	+0.20	+0.41

* -3 = greatly reduced; +3 = greatly increased

Source: Author's own research.

The use of luK technologies in distribution and logistics lowers transport intensity through route scheduling, shipment tracking, outsourcing transport services and awarding complex logistics services to outside companies.

Table 6. **Distribution and transport intensity**

	Change in parameters*	
	Enterprises with increasing transport intensity	**Enterprises with falling transport intensity**
Product commissioning automation	+0.82	0.94
Use of luK technologies in shipment tracking	+0.71	+1.24
Outsourcing simple transport services	+0.53	+0.82
Outsourcing higher value logistic services	+0.35	+0.82

* -3 = greatly reduced; +3 = greatly increased

Source: Author's own research.

4.2. Empirical experiences

The potential for relieving traffic through structural developments that reduce transport use in the industrial sector can be illustrated by numerous experiences (Table 7). The results of such experiences are regularly reported in the specialist press. The examples are valid for the respective industries. They give an impression of the potential traffic reduction effects.

Table 7. **Examples of applications that reduce the need for transport in industry**

Reduction in packaging materials	
Concentration of products (Henkel):	- 4 200 t packaging material per year - 50% of packaging weight
Alternative packaging materials (Henkel, e.g. Öko-Leicht-Pack):	- 2 000 t packaging material per year - 30–65% of packaging weight
Introduction of ordinance on packaging (1992-93):	- 423 000 t = - 3.4%
Use of innovative materials	
Automobile construction:	
Use of innovative steels:	- 150 kg per car
Plastic instead of glass in headlights:	- 50% of weight of part
Replacement of metal with synthetic fibres in car tyres:	- 30% of weight of part
Manufacture of drink containers:	
Replacement of glass bottles with several-way containers:	- 70 g per bottle - $^{1}/_{3}$ of distribution lorries
Lighter drinks cans made of tin plate:	- 30% weight
Replacement of material products with software	
Telephone directory, mail-order catalogue on CD-ROM:	
Simulation of crash tests:	- 900 g per catalogue - 1 000 kg per test
Improvement of product quality	
Recall action in car construction (Opel, VW):	First half of 1995: 4.2 million private cars (Astra and Golf, Jetta) recalled.
Reduction potential:	- 42 million private car-km
Decentralisation of distribution	
Decentralisation of storage (Henkel):	- 22 000 lorry journeys + 13 500 use of rail carriages - 6.6 million vehicle-km in road haulage.
Logistics-Outsourcing	
Nissan:	- 0.4 million lorry-km
Grohe/Bauknecht:	- 0.8 million lorry-km - 70% of lorry journeys
Hub and Spoke	
Ford/Menke:	- 22 million lorry-km - 90 000 lorry journeys
Regionalisation of economic activity	
VW: 80% of suppliers based within a radius of less than 40 km from the production plant:	- 65.5 million vehicle-km - 71 % kilometre performance
Reduction of waste disposal abroad	
Duales System Deutschland (DSD):	- 225 000 t transboundary waste transport
1994: around 325 000 t domestic disposal:	
1997: around 550 000 t domestic disposal:	

Source: Author's own compilation.

5. IMPLEMENTATION POLICIES FOR DECOUPLING

5.1. Market *vs.* political allocation

Traffic decoupling is a result of the way the economy and the population have behaved, making less use of vehicles in the conduct of their affairs. Innumerable initiatives and concrete measures can be taken up and used by transport demanders. The impulse towards decoupling comes from the market. Alternative ways of reducing traffic are then taken up if they are worthwhile in operational conditions. In this respect, decoupling is not dependent on state intervention. There are, however, market weaknesses, as a result of which the regulatory power of the market and the competitive process is not sufficient to implement decoupling. In this event it is justifiable that transport and economic policy should have a supportive and encouraging influence on decisions made by enterprises and households. In this respect, decoupling is not a variant of the economic intervention that runs counter to market-economic principles.

- The excessive size of the transport service sector is partly due to state intervention in the market. Examples include the EU agricultural market subsidies, the structural conservation of old industries, regulation of the land market, and the environmental conditions to which land use is made subject. The re-establishment of market and competitive forces provides for structural changes that entail a reduction in traffic. Causal factors of this kind involve no conflict between decoupling and the market economic system.

- Consequently, the potential for decoupling is often not realised owing to imperfections in the market. The processes of innovation are thus slowed down by restraint of competition (notably concentration, artificial barriers to market access, sunk costs, networks) and the requirements for rationalisation are weakened. Prices for non-renewable resources (such as coal and oil) often give only an imperfect picture of future shortages, so that technologies that save on resources are not implemented to the appropriate extent.

- It cannot be assumed that the market is completely transparent either to companies or the population at large. As a result, certain decoupling strategies remain unused.

- New technical knowledge leads to other applications outside the enterprise. Investment in real and human capital leads to a spread in commonly available knowledge. Other enterprises receive the knowledge input in the absence of any co-ordinated market transaction. The weakening of the exclusive right to the proceeds of intellectual property can, on the other hand, lead to a situation where investment is below the optimal level. State support for R&D work and incentives to public investment can help fill technological gaps.

These market weaknesses justify a decoupling strategy supported by economic policy. Nevertheless, in the choice of instruments, systemic considerations must be taken seriously. The concept of an ideal free market must be used as a yardstick to ensure that decoupling does not give leverage to the idea of controlling industry so that a structural plan directed towards the goal of reducing transport intensity is introduced. This can be achieved through economic and transport policies that provide a framework, do not interfere with the system (prohibiting, commanding) but leave enterprise free to choose between alternatives. The main focus of the measures would be on providing incentives, offers, complementary investment, training and information, promoting co-operation and providing institutional frameworks.

5.2. Policy areas

Transport policy opens up the potential for decoupling offered by the transport sector. The starting points for transport policy consist in opening up and guaranteeing competition in the transport market, in assessing economic data accurately (e.g. taking account of external costs), promoting innovation in transport flow management, and reducing institutional and legal impediments.

A decisive impetus to decoupling economic growth from transport intensity must come from economic policy, which should promote economic and technical structures that bring about a reduction in the increase in transport and transport intensity.

- Environmental policy can contribute to a reduction in transport intensity in the following ways: by raising recycling quotas, improving awareness, reducing amounts of waste, using natural raw materials and biomaterials and reducing the amounts of packaging materials.

- The object of technology policy is to promote products and policies that require lower traffic levels, by such means as research, creation of infrastructure, speeding up the transfer of information and standardization.

- Structural policy can promote less transport-intensive industry, for example, by research and development into high technology and new product areas, by extending centres of innovation instead of maintaining "old" industries, by developing technology centres, by making more venture capital available for innovative projects and by promoting inward investment.

- Regional policy can help to promote more vigorous economic activity, so that transportation distances between different points on the production chain are shortened, through such measures as improving the regional economic structure, establishing decentralised industrial production clusters by encouraging service providers connected with the manufacturing sector to set up locally, and by providing regional information and co-ordination agencies.

- Labour market policy might contribute by promoting industries that require fewer resources, implementing measures to improve professional qualifications and further education, and introducing training in quality assurance.

5.3. Concerted action between transport and economic policy

The move towards decoupling requires co-ordination between transport and economic policy. The object is to promote such structural developments as may be expected to result in traffic reduction, while also being compatible with the growth and business objectives of economic policy.

In order to bring about decoupling, concerted action is necessary in transport and economic policy. Transport policy must demonstrate which structural developments could entail a fall in the rate of traffic increase. Economic policy must explain which policies are needed to promote structures that reduce traffic. In so doing, economic policy brings no influence to bear on the way in which businessmen use transport, but rather on economic and technical decisions that have an effect on the rise in traffic levels and on transport intensity.

NOTES

1. For the strategic orientation of decoupling, cf. Baum, H., Heibach, M. (1997), Industrieller Strukturwandel und Verkehrswachstum – Entkopplungsmöglichkeiten durch Wirtschafts- und Technologiepolitik. Forschungsvorhaben für das Bundesministerium für Bildung und Wissenschaft, Forschung und Technologie, Köln;
   German Council of Economic Experts on environmental questions (1994), Für eine dauerhaft umweltgerechte Entwicklung, in *Umweltgutachten 1994*, Bonn.

2. Baum, H., Heibach, M. (1997), *Entkopplung von Wirtschaftswachstum und Verkehrsentwicklung*, Köln, pp. 3 ff.

3. An assessment beyond 1990 is not possible at present owing to the need to adjust data in Germany. In 1990 the information was distorted owing to German reunification. In 1993-94 fundamental corrections were made to the statistics for traffic performance (from 1994 on the basis of sampling).

4. German Council of Economic Experts on the appraisal of macroeconomic development in *Standortwettbewerb – Jahresgutachten 1995-96*, Wiesbaden, 1995.

5. Kessel and Partner (1998), *Kapazitätsauslastung und Leerfahrten im Gütertransport*, Frankfurt am Main, pp. 9 ff.

6. Baum, H., Kling, Th., Sarikaya, M.H., Thiele, P. (1995), *Verringerung von Leerfahrten im Straßengüterverkehr*, Düsseldorf;
   Baum, H., Maßmann, C., Pfau, G., Schulz, W.H., Gesamtwirtschaftliche Bewertung von Rationalisierungsmaßnahmen.

7. Tempelmeier, H., Günther, H.-O. (1994), *Produktion und Logistik*, Berlin, *inter alia*;
   Dreher, C. (1995), Neue Produktionskonzepte in der deutschen Industrie: *Bestandsaufnahme, Analyse und wirtschaftspolitische Implikationen*, Heidelberg;
   Wildemann, H. (1998), *Das just-in-time-Konzept – Produktion und Zulieferung auf Abruf*, Frankfurt/M.;
   Wenke, M. (1993), *Konsumstruktur, Umweltbewußtsein und Umweltpolitik*, Berlin.

8. Kummer, S., Lingau, M. (1992), Global Sourcing und Single Sourcing – Strategie des Versorgungsmanagements, in: *Wirtschaftswissenschaftliches Studium*, 21, No. 8, p. 419;
   Hanke, J. (1992), *Hybride Koordinationsstrukturen: Liefer- und Leistungsbeziehungen kleiner und mittlerer Unternehmen der Automobilbranche aus transaktionstheoretischer Sicht*, Köln;
   Schulte, C. (1991), Trends in der Beschaffungspolitik, in: *Wirtschaftswissenschaftliches Studium*, 20, No. 7, p. 364;
   Ono, T. (1993), *Das Toyota-Produktionssystem*, Frankfurt/Main, New York.

9. Pfohl, H.-C. (1993), Die Bedeutung der Entsorgung für die Unternehmenslogistik, in: Pfohl, H.-C. (Ed.), *Ökologische Herausforderung an die Logistik in den 90er Jahren*, Berlin;

Henkel, KG aA (Ed.), *Ökologistik – Das Henkel Logistik-Konzept, Wasch- und Reinigungsmittel für die 90er Jahre*, Düsseldorf o.J.

10. Cf. Dostal, W. (1996), Telearbeit – Stand und Entwicklung, in: *Personalführung*, No. 8, 28, p. 652.

11. Höller, M. (1994), Informations- und Kommunikationstechnologien – Techniküberblick über das Potential zur Verkehrsvermeidung, in: Höller, M. *et al*., *Die Bedeutung von Informations- und Kommunikationstechnologien für den Verkehr*, Göttingen, pp. 49-50.

12. Köhler (1994), Interdependenzen zwischen Telekommunikation und Personenverkehr – Theoretische Überlegungen und empirische Befunde am Beispiel der Auswirkungen von Videokonferenzen auf den Geschäftsreiseverkehr, in: *Zeitschrift für Verkehrswissenschaft*, 65, p. 205.

13. Müller, St., Geppert, D., Teleshopping – Mangelnde Begeisterung, in: *Absatzwirtschaft*, No. 2, 39. Year 1996, p. 89.

14. Goeudevert, D., Die Rolle der Zulieferindustrie angesichts der weltweiten Wettbewerbsverschärfung, in: Mendius, H.-G., Wendeling-Schröder, U., *Zulieferer im Netz – zwischen Abhängigkeit und Partnerschaft*, Köln, 1991, p. 107.
    Mitchener, B., Europe´s auto makers step up their drive to conquer the world – Emerging markets are targets for new plants, in: *The Wall Street Journal Europe*, No. 220, 11.12.95, p. 1;
    McKinnon, A.C., Woodburn, A., Logistical restructuring and road freight traffic growth – An empirical assessment, in: *Transportation*, Vol. 23, 1996, No. 2, p. 151.

15. Jürgensen, H., Regionalpolitik, in: Issing, O., *Spezielle Wirtschaftspolitik*, Munich, 1982, p. 22.

16. Ihde, G.B., Hartmann, H., Merath, F., Anforderungen der Produktions- und Logistikstrategien – Die Bedeutung der Verkehrsinfrastruktur für die Sicherung des Industriestandorts Baden-Württemberg, in: *Internationales Verkehrswesen*, 47, 1995, No. 9, p. 519.

17. Baum, H., Heibach, M., Entkopplung ..., a.a.O., pp. 105 ff.

18. The structural changes in the industry obtained from the enterprise survey were measured in terms of changes ranging from -3 (greatly reduced) to +3 (greatly increased).

TRANSFORMATION OF THE ECONOMIC AND INSTITUTIONAL STRUCTURES OF TRANSPORT AS A RESULT OF THE FURTHER ENLARGEMENT OF THE EUROPEAN UNION: SURVEY - OUTLOOK

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SUMMARY

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INTRODUCTION

It is not easy to visualise what the world will be like in the third millennium, especially if the aim is to imagine the possible course of events beyond the initial decades of this millennium. The round date of the year 2000, so long awaited, is an occasion to try to produce something more wide-ranging than conventional forecasts. It is difficult to imagine such long-term changes and nobody can build a model of the world as it will be in the year 3000 and determine such figures as the number of inhabitants, the value of industrial production, energy consumption, personal mobility, etc. The future image of our world is interesting above all as regards the qualitative changes. We can make a list of present-day phenomena that will disappear in the future and another list of phenomena not yet experienced. It is particularly important to have a vision of the first quarter of the 21st century as this is the period of the continuation of existing economic and political systems. Our decisions of today may influence events in the short and medium term, but there is no reason to believe that we can change anything at a horizon of over fifty years.

It is certain that even after a thousand years man will need to travel and to transport goods despite the development of computer and telecommunications networks and technologies. Transport demand will change as regards both volume and structure. These changes in demand will require certain transformations in the supply of transport services and in the organisation of the sector. Future industrial production will be quite different from that of the end of the 20th century and this will cause significant changes in transport demand. Many new industrial products will be manufactured on the basis of raw materials and intermediates unknown today. The volume and structure of the goods carried will change: there will be less traditional materials such as coal, cement, oil, agricultural products, etc., and more new products, including dangerous goods.

Looking forward 50 or 100 years, when the frontiers between countries will have disappeared or become symbolic[1], international transport demand will be much greater than today. The disappearance of physical and administrative barriers between countries will lead to more trade. Economic integration and globalisation will mean that average freight transport distances will increase, bringing new challenges and new opportunities for the sea and air modes. Already today, sea or air distances of the order of 10 or 15 thousand kilometres do not constitute an economic barrier to trade thanks to cost reductions. The enlargement of the European Union to the east will also increase the volume of trade over distances of the order of 1 or 2 thousand kilometres, meaning new opportunities for the railways.

It is probable that the third millennium of our civilisation will not change the role of conurbations very much. A return to a rural society seems to be an attractive situation only for a very limited group of people remote from financial and industrial circles. Our economic activity will thus be even more heavily concentrated in the conurbations where transport is already perturbed by congestion of the roads and streets. Great technical and economic efforts will have to be devoted to the solution of transport problems in the towns and conurbations of the future. The large-scale development of short-distance transport that does not congest the urban networks - automated and underground modes - is becoming urgently necessary. All this will cause changes in the structure and organisation of urban transport too.

It can be postulated that by the year 3000 cars, trains and aircraft as we know them will be found only in encyclopædias. Waterway craft and sea-going vessels have no real substitute and have already survived for millennia, while the land and air transport modes seem to be transitory technical solutions sensitive to the availability of energy and subject to environmental constraints and congestion. These solutions will be replaced by others based on totally new technical concepts. It would be strange indeed if the history of land transport knew no technical solutions other than the cart, the car and the train.

The date 2000 seems to divide the 20th and 21st centuries in a less revolutionary way than the date 1500 divided the 15th and 16th centuries. After the discovery of America by Christopher Columbus in 1492 world trade began to grow very rapidly. After the year 2000 no new territories will be discovered, but it will be possible to transform the economic and political systems, further the process of European integration, and eliminate divisions and discriminations. In 20 years the concept of "the Central and Eastern European Countries" (CEECs) will be a purely geographical one with no political connotations. It is interesting to visualise the disappearance of these divisions in Europe.

There are at present great differences between the transport systems in the EU Member countries and the CEECs, despite ten years of transformation. Certain central European solutions are archaic and not compatible with the market system, but there are solutions that can survive European integration: the greater role of the railways, less bureaucracy in transport policy, greater freedom of access to the profession of road haulier.

1. THE INFLUENCE OF INTEGRATION AND GLOBALISATION ON TRANSPORT DEMAND

International economic integration is based on the development of special commercial, financial, economic and social relations between a certain number of countries[2]. This integration consists in eliminating all the obstacles to trade between Member States (negative integration)[3], setting up supranational structures and achieving a real convergence of the economies (positive integration). The elimination of all obstacles to trade within a given economic area facilitates sales and thus favours increases in production. The elimination of obstacles to trade (technical standards, fiscal differentiation, compartmentalisation of public markets) makes it possible to produce greater quantities with given production facilities[4]. Observation of the progress of European integration reveals that at the beginning there was an acceleration in the development of intra-Community trade and transport and then in the past decade an increase in trade flows with third countries, above all with the Central and Eastern European Countries.

The success of economic integration depends on a number of factors, the most important of which appears to be the solidarity between the countries concerned. A collectivist integration (such as the former COMECON) and forced centralisation without respect for ethnical and cultural differences and divergent economic interests leads to failure. It is not possible to successfully complete this process without respecting freedom, democracy, the market economy and national traditions. In Europe, the European Union has now become a genuine integration structure, a grouping open to new member countries and capable of being successful in the strategy of unifying existing structures and bringing peoples to work together. The enlargement of this grouping and the consolidation of its functions has far-reaching consequences for both trade and international transport in Europe. As a result of the progress of this integration the transport sector has gone through a series of changes: regulatory (access to the profession and to markets, competition rules) functional (operations, investment), managerial (public service, commercial activity), economic (volume and structure of traffic) and other (taxation, safety, environment, etc.). With each decade these changes differ in intensity and orientation.

Trade and transport are very much influenced by the process known as “globalisation” or “internationalisation”. Regional integration is an offshoot of the global processes which include international investment, the diffusion of technologies and co-operation in production and trade. As a result of the globalisation of the markets for goods and labour, the technological systems and financial markets of the entire world are becoming integrated[5]. Many products have an identical utility on all continents: CDs, computers, McDonalds, Coca-Cola, certain makes of car. Transport services too are provided in an increasingly global fashion, examples being: the reservation of aircraft seats, maritime transport safety procedures, the technical characteristics of containers, etc.

While international integration is actively pursued by the states concerned, globalisation is a result of the activity of big business - multinational enterprises which are complexes of production units connected by financial, technical or commercial links to a common decision centre. It is estimated that only one-third of international transactions are not associated in one way or another to the activity of the multinationals, which have establishments in different countries and develop financing, production and trading networks that constitute a threat to traditional international trade[6].

In the economic literature we also find the concept of “internationalisation” which means the type of activity generally pursued by medium enterprises, with production units in selected countries only and no global ambitions. These enterprises set up production units abroad not only to benefit from cheap labour but also to win new local markets and increase their production[7].

In 1995, according to UNCTAD, transnational enterprises were to be found mainly in Germany (7 003), Japan (3 967) and Sweden (3 520)[8], but most of the big multinationals, as measured by turnover, had their headquarters in the United States or Japan[9].

In analysing the problems of regional integration and globalisation a few basic questions arise: what contradictions are there between regional integration and globalisation?; is globalisation the model for future international relations?; which power (EU, USA, Japan) will benefit most from continuing globalisation?

Regionalisation contributes to the dynamic of globalisation since each example constitutes a kind of “scale model”, itself capable of shaping the whole. The acceleration of internationalisation coincides in fact with the emergence of new regional groupings (AFTA, APEC, EEE, ALENA, MERCOSUR, etc.) It can be considered that regionalism and globalism are constituents of regionalisation and globalisation. The trade disputes that arise between the Union and each of its two main partners result in compromises or bilateral sectoral agreements, or again to arbitration in the world trade body, formerly the GATT, now the WTO[10].

It should be recalled here that Community integration has increased the flows of intra-Community trade at the expense of extra-Community trade. This trend is clearly shown by the following figures[11]:

	1958 (%)	1980 (%)	1986 (%)	1990 (%)	1995 (%)
Extra-Community imports	65	50	43	41	40
Intra-Community imports	35	50	57	59	60
Extra-Community exports	65	44	43	39	39
Intra-Community exports	35	56	57	61	61

The increase in the volume of intra-Community trade is in contrast with the observation that the Community is suffering from a relative erosion of its industrial power. Facing fierce competition on the developed markets, it tends to achieve its best trade results with the less developed countries (Africa, Middle East, Eastern Europe)[12]. The EU share of world trade in goods remains high, in the order of 30 per cent, but has declined somewhat since the beginning of the 70s. This decline is explained to some extent by the small proportion of Community exports in the high technology sectors, characterised by strong demand, and by the fact that only a relatively small share of EU exports goes to rapidly growing markets (newly industrialised countries). The Union is well placed, however, to benefit from the anticipated strong growth in trade with the Central and Eastern European countries (CEECs) with the possibility of the value of these exports increasing by something like 15 to 20 per cent a year[13].

1.1. Freight transport trends

Transport sector structures in Europe will have to be adapted to the future volume, structure and flows of freight and passenger traffic. It is therefore necessary to answer the question: how will the consolidation and enlargement of European integration and the globalisation of the economy transform transport demand within the EU and in links with third countries?

The growth in demand for land freight transport in Europe in the period 1985-95 was very uneven: positive in the EU and negative in the CEECs. The beginning of this period was still marked by the political disintegration in Central and Eastern Europe which had a significant impact on the volume of trade and international transport.

Table 1. **Freight transport in selected CEECs in the period 1985-95**
(billion tonne-km)

Year	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
Rail	208.6	210.0	209.9	217.4	196.6	159.4	122.5	111.5	110.9	109.3	112.9
Road	70.8	72.3	73.1	76.0	76.2	77.9	78.9	82.3	84.0	93.0	100.7
Inland waterway	7.9	8.3	8.3	8.4	8.4	7.2	6.3	5.4	4.4	4.2	5.0
Pipeline	30.9	31.6	32.2	32.2	31.2	26.6	21.6	21.5	21.4	23.5	23.0
TOTAL	**318.2**	**322.2**	**323.5**	**334.0**	**312.4**	**271.1**	**229.3**	**220.7**	**220.6**	**230.0**	**241.6**
Index (1985=100)	100.0	101.3	101.7	105.0	98.2	85.2	72.1	69.4	69.3	72.3	75.9
t-km/Euro of GDP	2.07	2.04	1.97	1.95	1.73	1.54	1.45	1.42	1.40	1.40	1.39

Source: EU Transport in Figures. Statistical pocketbook. 2nd Issue 1997, Luxembourg;
Statistical Yearbook of the Republic of Poland 1998, GUS, Warsaw, 1998.

The political reunification of Europe after 1989 and fall of the Berlin Wall had enormous economic, social and trade consequences. The crisis situation of the former CMEA economies[14] now in transition is shown by the negative GDP growth, the appearance of large-scale unemployment and the significant decline in foreign trade and freight transport. This crisis, which had already existed in a hidden form since the 80s, suddenly became visible with the opening up to the market economy[15]. In this decade the transport of the CEECs has been characterised by a fall in volume in terms of tonne-kilometres (see Table 1, showing the figures for Poland, the Czech Republic, Slovakia and Hungary). While between 1985 and 1988 there was still slight growth, between 1989 and 1993 the volume of transport fell by over 30 per cent. Since 1994 these four countries have recorded a revival of economic growth and an increasing volume of transport, but the volume of transport in 1995 was only 75.9 per cent of that in 1985. In 1996, 1997 and 1998 the volume of freight transport grew at a rate of 1 per cent to 3 per cent[16]. It should be noted that even in the year of the biggest fall in GDP (1991-92) in these four CEECs the volume of road transport continued to grow, permitting the creation of thousands of new private enterprises. Table 1 also gives figures for the intensity of freight transport demand expressed in t-km per Euro of GDP. In the CEECs there was a falling trend: from 2.07 to 1.39 t-km per Euro of GDP between 1985 and 1995, but the present figure is still six times that of the EU.

The transport situation is quite different in the case of the 15 EU Member countries. Over the same period these countries recorded an overall growth in the volume of land transport of almost 31 per cent (see Table 2).

Table 2. **Freight transport in the European Union in the period 1985-95**
(billion tonne-km)

	1985	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
Rail	280.5	268.6	265.2	275.3	270.3	255.5	234.5	219.0	205.3	219.3	220.1
Road	711.3	728.4	770.1	824.6	859.3	914.5	944.5	965.8	966.4	1065.8	1102.4
Inland waterway	103.5	106.2	102.8	107.8	108.1	112.7	108.5	108.1	106.3	114.9	116.0
Pipeline	71.8	71.9	72.0	72.3	72.5	72.9	81.1	82.5	83.8	86.5	85.7
TOTAL	**1 167.1**	**1 175.1**	**1 210.1**	**1 279.9**	**1 310.2**	**1 355.6**	**1 368.6**	**1 375.4**	**1 361.8**	**1 486.5**	**1 524.2**
Index (1985=100)	100.0	100.7	103.7	109.7	112.3	116.2	117.3	117.8	116.7	127.4	130.6
Tkm/Euro of GDP	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23

Source: EU transport in figures. Statistical pocketbook. 2nd Issue 1997. Luxembourg 1997*;*
Statistical Yearbook of the Republic of Poland 1998, GUS, Warsaw 1998.

This growth in transport in the EU (15 countries) ran in parallel with GDP growth, since the intensity of transport demand remained practically stable (0.22-0.23 t-km per Euro of GDP). This overall figure conceals substantial differences, however, as in the EU over the period 1985-95 the intensity of demand fell from 0.05 t-km to 0.03 t-km per Euro of GDP in the case of the railways and increased from 0.13 t-km to 0.17 t-km in the case of road haulage. In the CEECs in 1995 the intensity of rail transport demand (0.65 t-km/Euro) was 20 times that in the EU, whereas the intensity of road transport demand (0.58 t-km/Euro) was only 3.5 times that in the EU. It is therefore logical that the restructuring of the central European economies should lead to a reduction in the intensity of transport demand, above all for rail transport.

The future transformation of the economic and institutional structures of freight transport in Europe will result from the future trend in transport demand. This trend will differ from one country to another but, according to R. Pischinger and G. Sammer[17], the growth in world transport will be much greater than that in European transport (1995=100):

	World	OECD Europe
1995	100	100
2020	236	186
2050	411	275

This hypothesis seems unlikely if we take into account the fact that the non-OECD countries have a high intensity of transport demand, which should fall. Without this fall the increase in the world volume of freight transport of the order of 300 per cent should be accompanied by an increase in GDP of over 500 per cent. In 1995 the volume of transport in the European OECD countries amounted to about 15 per cent of the world total and, according to the forecasts cited by G. Sammer, this share should fall to less than 10 per cent - too small a percentage. The above figures imply the following annual growth rates:

World-wide transport 2.6%

Transport in OECD Europe 1.9%

As compared with the period 1985-95, when the EU growth rate was 2.7 per cent, future growth may be less dynamic but should still be higher than the above-mentioned 1.9 per cent.

Globalisation (the implementation of the rules adopted in the framework of the "Uruguay Round" and other factors) does not prevent the growth of transport within the EU or between the EU and third countries. It is true that in western Europe the industrial sector accounts for an ever smaller share of overall economic activity, and this could mean that in the future the role of industrial production as a generator of freight transport is likely to decline, but this will be compensated by a general intensification of trade, so that overall freight transport demand could well continue to grow[18].

Several bodies in Europe are working on models to help forecast future demand for freight transport. The results obtained differ and are difficult to check. In the study carried out by DG VII of the European Commission for the launch of the TINA (Transport Infrastructure Needs Assessment) the freight transport growth forecasts for the ten CEECs to horizon 2010 are as follows[19]:

Rail freight 5-6% between 2000 and 2005; 8-9% between 2005 and 2010

Road freight 7-9% between 2000 and 2005; 14-17% between 2005 and 2010

These rates of growth are 3-4 times those cited above for OECD Europe and seem to be too high. It is better to take the forecasts made in the CEECs themselves, despite the differences in methodology. The specialists in these countries have a good knowledge of the factors for development in their own countries.

Recent forecasts of freight transport in Poland, Hungary and the Czech Republic are presented in Table 3. The growth rates are 2-3 times lower than those estimated by DG VII.

Table 3: **Freight transport forecasts for Poland, Hungary and the Czech Republic**
(1995=100)

Year	**Minimum variant**			**Maximum variant**		
	Poland	**Hungary**	**CZ(*)**	**Poland**	**Hungary**	**CZ(*)**
1995	100	100	100	100	100	100
2000	116	103	116	122	107	116
2005	125	110	140	137	121	140
2010	137	124	151	157	144	151

(*) For the Czech Republic minimum variant = maximum variant.

Source: J. Burnewicz, M. Bak (1997), *Prévision complexe du transport en Pologne 1995-2020.* Ministry of Transport and the Maritime Economy, Warsaw; M. Murány (1998), "Road transport policy in the context of the Hungarian transport policy, tarification and network development concept", *Séminaire "Scénarios et méthodes d' évaluation dans les pays en voie d'accession à l'Union européenne.* Barbizon, 23-25 November; M. Pichl (1998), "Forecast of the transport market of the Czech Republic until the year 2015", same seminar.

The average transport growth rates for Poland, Hungary and the Czech Republic as shown in Table 3 are: 2.24 per cent for the minimum variant and 2.92 per cent for the maximum variant. The trend in freight traffic for the period 1995-98 shows that actual growth is even more modest than this: in Poland traffic grew by only 1.7 per cent[20], despite GDP growth of over 5 per cent per annum.

It is still too early to answer the question as to how European integration and globalisation will influence international transport in the CEECs. The transition period for the economic systems of these countries is distorting the typical trends as seen in the countries with a consolidated market economy. The closer links between the CEECs and the EU should theoretically intensify international transport. However, in Poland between 1995 and 1997 there was a fall in international freight transport from 109.5 to 107.7 million tonnes (down 0.8 per cent). The integration of the CEECs into the EU is leading to the collapse of the rail freight market (a decline each year of 5 to 8 per cent in total tonnes carried) and strong growth in road haulage (over 10 per cent annual growth). Globalisation could revive the maritime transport of the Central and Eastern European countries, now in deep crisis. A slight increase in the volume of cargo (1 per cent or 2 per cent a year) is to be seen, but this does not match either GDP growth or the increase in foreign trade of these countries. It is probable that the effects of globalisation will become visible in the CEECs a few years after they accede to the EU.

1.2. Passenger transport trends

The nature of passenger transport demand is radically different from that of freight transport demand. Passengers are motivated to travel by factors other than supply and distribution considerations. Economic integration and globalisation may have some influence on long-distance mobility but this is nowhere near as important as such factors as car ownership rates, lifestyles, the amount of leisure time, road congestion, etc. The construction of econometric models of passenger transport demand has revealed that the sensitivity of passenger traffic to changes in GDP (and prices) is much lower than in the case of freight traffic[21]. In countries with strictly controlled frontiers the trends resulting from European integration and globalisation are almost completely suppressed and have little impact on the passenger transport market. The preparation of these countries for membership of the integrated grouping is starting to change this situation: less difficulty in crossing frontiers and the contrasting markets on either side of the frontier is leading to an explosion in general mobility.

Passenger transport demand in Europe in the period 1985-95 increased more rapidly than freight transport demand - respectively 3.3 per cent and 1.75 per cent a year. Tables 4 and 5 show this trend in selected CEECs (Poland, Hungary, Czech Republic, Slovakia) and in the EU.

Table 4: **Passenger transport in selected CEECs in the period 1985-95**
(billion passenger-km)

Year	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
Rail	84.8	80.6	80.6	82.8	87.4	81.9	69.2	60.1	53.0	49.8	47.9
Inter-city coach	111.6	114.5	117.6	122.1	124.2	117.4	112.2	108.3	105.8	99.5	99.4
Air	6.0	6.5	7.1	7.4	8.5	8.2	7.0	7.2	7.5	8.4	9.3
Car	104.6	111.3	117.9	125.1	132.0	141.8	152.0	163.1	197.3	247.8	303.7
TOTAL	**307.0**	**312.9**	**323.2**	**337.4**	**352.1**	**349.3**	**340.3**	**338.6**	**363.7**	**405.6**	**460.4**
Index (1985=100)	100.0	101.9	105.3	109.9	114.7	113.8	110.9	110.3	118.5	132.1	150.0
Pass-km/Euro of GDP	2.00	1.98	1.97	1.97	1.95	1.98	2.15	2.17	2.31	2.47	2.66

Source: *EU Transport in Figures*. Statistical pocketbook. 2nd Issue 1997, Luxembourg, 1997; *Statistical Yearbook of the Republic of Poland 1998*, GUS, Warsaw, 1998.

Table 5: **Passenger transport in the EU in the period 1985-95**
(billion passenger-km)

Year	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
Rail	261.5	257.4	260.8	267.3	267.3	274.1	271.8	274.4	267.2	268.9	270.7
Inter-city coach	340.7	344.2	347.8	351.6	355.6	359.4	361.8	363.1	359.7	360.4	361.1
Air	200.6	209.1	217.7	245.1	272.0	284.9	299.1	313.3	338.4	355.1	383.1
Car	2 546.0	2 666.6	2 793.4	2 926.9	3 067.4	3 216.8	3 285.3	3 416.9	3 466.4	3 511.2	3 592.2
TOTAL	**3 348.8**	**3 477.3**	**3 619.7**	**3 790.9**	**3 962.3**	**4 135.2**	**4 218.0**	**4 367.7**	**4 431.7**	**4 495.6**	**4 607.1**
Index (1985=100)	100.0	103.8	108.1	113.2	118.3	123.5	126.0	130.4	132.3	134.2	137.6
Pass-km/ Euro of GDP	0.63	0.64	0.65	0.65	0.66	0.67	0.67	0.69	0.70	0.69	0.69

Source: *EU Transport in Figures.* Statistical pocketbook, 2nd Issue 1997, Luxembourg; *Statistical Yearbook of the Republic of Poland 1998*, GUS, Warsaw, 1998.

Passenger transport growth in the period 1985-95 was stronger in the CEECs (4.1 per cent a year) than in the EU (3.2 per cent a year). The difference is due to the explosion of car ownership in the CEECs (growing by 11.2 per cent a year). This trend is likely to last until the car ownership rate in Europe becomes more balanced (400-500 cars per 1 000 inhabitants). In the EU all passenger modes recorded some growth (the lowest being the railways: up 0.35 per cent) while in the CEECs only car and air transport grew, rail traffic falling by 5.5 per cent a year and coach traffic by 1.1 per cent a year). Attention should also be drawn to the differences in the intensity of passenger transport demand - very high and growing in the CEECs: up from 2.0 to 2.7 passenger-km per Euro of GDP over the period; and more modest and stable in the EU: about 0.7 passenger-km per Euro of GDP.

According to R. Pischinger and G. Sammer, already cited above, the future growth of passenger transport in OECD Europe will be slower than in the world as a whole (1995=100)[22]:

	World	OECD Europe
1995	100	100
2020	187	146
2050	290	172

These forecasts imply annual passenger traffic growth rates of 1.9 per cent for the world as a whole and 1.0 per cent for the European OECD countries. This would be a fall to only one-third of the growth rate achieved in the decade 1985-95 - a very unlikely scenario. It is probable that in the next quarter of a century the Fifteen will see growth rates closer to those of freight transport, between 1 and 1.5 per cent a year.

According to the study carried out by DG VII[23], in the period 1995-2010 the volume of rail and intercity coach traffic in the CEECs will fall by some 30-40 per cent, with the chance of a revival after 2005. The "alternative" forecasts prepared by CEEC specialists are more optimistic: in the minimum variant there is weak growth of the order of 0.4 per cent a year and in the maximum variant a growth rate of 1.0 per cent a year. Table 6 shows the overall forecast figures for all modes, including private cars.

Table 6: **Forecast passenger transport, public and private, in Poland, Hungary and the Czech Republic (1995=100)**

Year	**Minimum variant**			**Maximum variant**		
	Poland	**Hungary**	**CZ(*)**	**Poland**	**Hungary**	**CZ(*)**
1995	100	100	100	100	100	100
2000	122	106	116	128	108	116
2005	141	115	138	154	123	138
2010	156	125	156	179	144	156

(*) For the Czech Republic minimum variant = maximum variant.

Source: J. Burnewicz, M. Bak (1997), *Prévision complexe du transport en Pologne 1995-2020*. Ministry of Transport and the Maritime Economy, Warsaw; M. Murány (1998), "Road transport policy in the context of the Hungarian transport policy, tarification and network development concept", *Séminaire "Scénarios et méthodes d' évaluation dans les pays en voie d'accession à l'Union européenne.* Barbizon, 23-25 November; M. Pichl (1998), "Forecast of the transport market of the Czech Republic until the year 2015", same seminar.

As shown by Table 6 the forecasts are most optimistic for Poland: growth of 3 to 3.9 per cent a year, more moderate for the Czech Republic (3.0 per cent a year) and fairly pessimistic for Hungary: 1.5 to 2.5 per cent a year. These differences result from the anticipated growth in car ownership: growth of 3.9 to 4.9 per cent in Poland, 2.7 per cent in the Czech Republic and 2 to 3 per cent in Hungary. As compared with the period 1985-95 (4.1 per cent a year) - the growth rate of 2.8 to 3.6 per cent in the period 1995-2010 would mean a real slowdown in all three countries.

Since the Treaty of Maastricht greater emphasis has been placed on European citizenship, but the progress of the Europe of the peoples can be really seen only in the field of freedom of movement. The right of establishment to exercise a professional activity and the right of residence for any other reason are recognised only to nationals of Member States of the European Union or the European Economic Area. Before the further enlargement of the EU the conditions of entry and residence are governed by national legislation, subject to the realisation of the objectives of the Schengen Agreement[24]. In reality the movement of persons between the EU and the CEECs began to increase rapidly just after the fall of the Berlin Wall. This phenomenon is difficult to analyse precisely because the tourist arrivals statistics in the CEECs are not reliable (the concept of "tourist" has been changed a few times). It suffices here to cite the case of Poland, where between 1985 and 1995 the number of foreigners crossing the frontiers into the country increased from 3.4 to 82.2 million[25] (37 per cent growth a year and as much as 100 per cent between 1990 and 1991!).

The right of establishment to exercise a professional activity by citizens of the new Member States of the EU will not have any significant influence on passenger transport demand. If an inhabitant of Prague or Warsaw has the right to work in Vienna or Berlin he will change his domicile. It is difficult to imagine any large-scale daily or weekly travel for work purposes between the major European conurbations even if there are very frequent high-speed trains. People's desire for tourism seems to be the most important factor for increasing passenger transport demand, but full satisfaction of this desire requires decades. If tourism between the CEECs and the EU is going to be part of future household demand, we must expect continuing growth in car ownership rather than in public transport. Following the enlargement of the right to exercise a professional activity across frontiers, the car will take on new importance in the border zones between the CEECs and the EU.

2. TRANSFORMATION OF THE STRUCTURES PROVIDING TRANSPORT SERVICES

At the beginning of this chapter we need to ask whether the existing transport structures are efficient or not. If not - we must propose new solutions.

In implementing the common transport policy the European Union did not focus sufficient attention on the problems of the structures providing transport services. Among over 630 legal texts concerning transport (of which some 320 are in force) there are virtually no solutions for the transformation of transport enterprises or market structures. In creating the model for the European transport enterprise (an entrepreneur of good repute, with adequate financial resources and professional competence) the authorities overlooked the problems of the relative importance of small, medium and large enterprises, ancillary activities, infrastructure management, the existence of rail monopolies, etc. According to P. Bauchet, a general movement is underway in the EU towards commercially oriented management without public subsidies and the reorganisation and hiving off of activities, sometimes going as far as privatisation[26]. In the works on transport economics published in western Europe there are not many pages devoted to the problems connected with transport structures.

2.1. The market importance of SMEs and large enterprises

In the European road haulage industry small, medium and large enterprises (Danzas, Schenker, Ziegler, etc.) coexist. This mosaic is present in both the EU and the CEECs. Inland waterway transport is less atomised than road haulage, but the existence of thousands of very small enterprises leads to fierce competition on the waterways. Sea and air transport services everywhere are provided by a very limited number of enterprises with various capital structures. Rail transport, with very few exceptions, remains in the hands of national railway undertakings in a monopoly position.

On the air transport market, despite the existence of other companies and the competition opened up by the introduction of the “fourth freedom”, each of the flag-carrier airlines is still strongly hegemonic on its national territory. International competition is now making the maintenance of a national airline by the State difficult, however, and in addition to alliances and agreements between companies there are likely to be mergers in the near future. British Airways is the only flag-carrier to have been privatised (1997), the others remaining dependent on the State[27].

Although the European Union does not take a position on the legal form which railway undertakings should take, there is a strong tendency towards privatisation (United Kingdom, Germany, Italy, Austria). Separation between infrastructure management and the train operating companies is now a reality in Sweden (1988) and the United Kingdom (1994). Major reforms in Germany (1995) and France (1997) also go in this direction, while leaving considerable powers in the hands of the State. In addition, the European Union is in favour of facilitating the access of third parties to rail networks[28].

The future of transport structures depends on the activity of the operators and the future situation on the markets, as well as national and European Union policies. The probable demand trend, described in the previous chapter, requires structural changes. In 2020, when the volume of road haulage traffic will be double that of 1995 - what kind of market structure will be best suited: atomised or concentrated?; more common carrier and less own account?; with or without subcontracting? At the same time, with the European railways handling an additional 200 billion tonne-kilometres of future demand - will there be fifty, five hundred or five thousand operators present on the market?

The number of road haulage enterprises in Europe in the period 1985-92 increased less rapidly than transport demand. In the EU (excluding Greece) this number increased by 6 per cent[29], while traffic increased by 36 per cent. But the enterprises of 1985 and 1992 are not comparable: there was an increase in the average size by about 10 to 12 employees[30] and in fact the number of tonne-km per worker did not increase sufficiently to ensure adequate turnover, though it is true that the increase in the size of the enterprises reduced unit costs slightly.

It is also necessary to take account of the trend in the average number of lorries operated by an enterprise, though their vehicle fleets may vary: one may operate heavy vehicles only, another both lorries and vans. In 1997, the vehicles run by very small operators (with one to five vehicles) accounted for the following percentages of the total fleet: Spain, 98; Finland, 96; Italy, 95; Sweden, 91; Denmark, 84; Germany, 83; United Kingdom, 83; France, 82; Belgium, 68; Netherlands, 57[31]. For purposes of comparison, we can cite the CEEC statistics.

The future trend in the structure of the road haulage industry in the EU will be marked by a reduction of the percentage of small enterprises (operating one to five vehicles). The fiercer competition on an enlarged market will lead operators to seek the economies of scale that can be achieved in a given sector by having at least the minimum technically efficient size at a favourable point on the cost curve[32]. Small enterprises are compatible with the nature of local markets while the enlargement of the international transport market in Europe offers better opportunities for medium and large enterprises.

In the past decade, Central and Eastern Europe was the scene of revolutionary changes in the road haulage sector. Before 1989, these were the countries where the LNE[33] dominated, but after this date the SMEs became dominant. In Poland in 1994, 96.5 per cent of the total of over 82 000 enterprises in the sector were private enterprises employing on average only 1.5 persons and generally operating one or two lorries[34]. In Hungary in 1993, the SMEs in the sector made up 97 per cent of the total number of enterprises[35]. In this country in 1993, some 80 per cent of the enterprises operated only one to five vehicles as compared with 87.7 per cent in the Czech Republic[36]. The average size of an EU haulage enterprise is not much bigger, however: in Belgium (1988) 5.9 vehicles; Netherlands (1985) 5.3 vehicles; Spain (1986) 3.2 vehicles; Italy (1985) 2.1[37]. Comparing the average workforce in road haulage (LNE + private enterprises), in 1992, in Poland there were 3.9 persons/enterprise[38] and in France 7.3[39]. In the CEECs, excluding Bulgaria and Romania, the size dispersion of the haulage sector now seems to be greater than in the EU.

The future evolution of the haulage sector in the CEEC candidates for EU membership will be characterised by a certain return to the concentration of the vehicle stock. The number of enterprises will fall by about 20-30 per cent as a result of the liberalisation of cabotage and fiercer competition. In order to be competitive central European enterprises will have to consolidate their structures and create full service networks.

Another structural change in the road haulage sector in the Europe of the 21st century will be a certain reduction in own-account traffic. In the EU the own-account share of transport operations is not high: 26 per cent of the total (10 per cent in international traffic and 30 per cent in domestic traffic), as against 45 per cent in the United States[40]. In the CEECs this share is similar to that of the United States: some 46 per cent in 1994[41]. Between 1990 and 1994 this share fell from 78 per cent to 69 per cent in terms of tonnes carried and from 56 per cent to 46 per cent in tonne-kilometres. This trend is connected above all with the crisis in the construction industry and the enormous drop in the amount of building materials carried. The increase in the number of haulage enterprises operating for hire and reward and the improvement in the quality of their services is also contributing to the decline in own-account transport. It is probable that after 2020 in the enlarged European Union the own-account share will be reduced to less than 10 per cent in international traffic and less than 25 per cent in domestic traffic.

After the CEECs join the European Union the division of the road haulage market may change in favour of Community operators. The activity of Eastern European operators has been closely followed by the European Commission which has published three reports on this subject[42]. The observations and analyses for the period 1981-86 did not reveal any perturbation of the market nor any excessive domination by East European carriers, who held about 55-59 per cent of the market between the CEECs and the EU. Since 1989, it has been the CEECs who fear the activity of the big western freight forwarding and haulage groups, such as: Danzas (turnover of 30 billion FF, 15 300 employees), Ziegler (turnover of 12 billion FF, 4 500 employees), Schenker (turnover of over 2.6 billion DM), NFC (turnover of 14 billion FF), LEP (turnover of 13 billion FF), Kühne & Nagel, Panalpina[43]. The activity of these groups is not yet very visible on the CEEC markets, but it is considered that after the forthcoming opening of the frontiers these big groups will be a threat to the SMEs there.

The present breakdown of this market between Poland and other countries is shown in Table 7.

Table 7: **International road haulage in Poland 1995-97**

	Thousands of tonnes			Structure in %		
	1995	**1996**	**1997**	**1995**	**1996**	**1997**
TOTAL EXPORTS	**11 302**	**11 641**	**13 050**	**100.00**	**100.00**	**100.00**
Polish vehicles	7 833	8 138	8 778	69.30	69.91	67.26
- Polish common carriers (firms >5 persons)	*3 741*	*3 845*	*4 323*	*33.10*	*33.03*	*33.13*
- Polish own-account and Polish common carriers firms <5 persons	*4 092*	*4 293*	*4 455*	*36.20*	*36.88*	*34.14*
Foreign vehicles (common carrier + own-account)	3 469	3 503	4 272	30.70	30.09	32.74
TOTAL IMPORTS	**7 714**	**9 318**	**11 346**	**100.00**	**100.00**	**100.00**
Polish vehicles	4 806	5 642	6 881	62.30	60.55	60.65
- Polish common carriers (firms >5 persons)	*2 385*	*2 803*	*3 349*	*30.92*	*30.08*	*29.52*
- Polish own-account and Polish common carriers firms <5 persons	*2 421*	*2 839*	*3 532*	*31.38*	*30.47*	*31.13*
Foreign vehicles (common carrier + own-account)	2 908	3 676	4 465	37.70	39.45	39.35
EXPORTS + IMPORTS	**19 016**	**20 959**	**24 396**	**100.00**	**100.00**	**100.00**
Polish vehicles	12 638	13 780	15 659	66.46	65.75	64.19
- Polish common carriers (firms >5 persons)	*6 126*	*6 648*	*7 672*	*32.22*	*31.72*	*31.45*
- Polish own-account and Polish common carriers firms <5 persons	*6 512*	*7 132*	*7 987*	*34.25*	*34.03*	*32.74*
Foreign vehicles (common carrier + own-account)	6 377	7 179	8 737	33.54	34.25	35.81

Source: Compiled on the basis of: *Transport - Results of Activities for 1995, 1996, 1997.* GUS, Warsaw, 1996, 1997, 1998.

In the period 2000-2020 a major structural revolution is to be expected in rail transport. The prospect of renewed growth in rail traffic cannot justify the conservation of monopolies in this sector. British experience in this field should be closely observed and analysed. Competition on the railways could solve (or diminish) such problems as the provision of costly services, operating deficits, over-employment and unproductive assets. The splitting up of monopolistic railway structures may also give rise to certain fears: will integrated national passenger train timetables disappear?; will private operators respect the environment?; will infrastructure use charges really be non-discriminatory?; how to set the priorities for the modernisation of tracks from the standpoint of the interests of the different parties concerned?, etc. This rail revolution will be delayed for a long time yet by the very active unions in this sector opposing any redundancies among railwaymen.

We have to agree with P. Bauchet[44] that we are far from achieving the integrated organisation of European rail transport, despite the existence of the UIC, Interfrigo and Intercontainer. It would appear that the creation of transnational railway groupings will also require the creation of a multinational network management system.

Structural changes in the air transport sector are encouraged by the very strong growth in demand for both passenger and freight services, liberalisation of the market in the United States and Europe, increasing international competition, denationalisations, the existence of national regulation, the issue of most tickets by travel agencies, differences in operating costs and very diversified alliance policies.

The changes are likely to go in different directions according to the country, but it is unlikely that the above factors will lead to the creation of many new airlines. One exception is the former Soviet Union where Aeroflot has lost its monopoly and over 200 companies now share these markets. The United States is trying to maintain an open skies policy and opposes international regulation and bilateral agreements to reserve traffic. In the context of the Common Market, countries have been constrained to open their domestic markets and pursue privatisation policies. Japan is deregulating the domestic market and privatising public enterprises[45]. The types of change seen in the past decade are: privatisation, concentration (groupings, absorption of small carriers by large ones), acquisition of holdings (international purchases of shares), co-operation agreements. The creation of multinational airline companies remains rare (Air Afrique, SAS).

Future changes in air transport in Europe will be above all under the pressure of Asian and American competition. In international traffic there will be:

1) consolidation of the individual position of airline companies such as British Airways, Lufthansa and Air France ;
2) various agreements and alliances between Alitalia, Swissair, KLM, SAS, Iberia and other airlines ;
3) purchases of shares in Central and Eastern European airlines (CSA, Malev, LOT) by European Union airlines. Several small regional airlines will be threatened with bankruptcy if they receive no aid from state or territorial authorities.

In the CEECs it will require a great deal of patience and determination to successfully privatise airline companies. The financial situation of these enterprises is bad and getting worse. In international traffic these countries want to keep their flag-carriers on the market despite their lack of competitiveness. Domestic traffic could be opened to international competition but in a situation where the number of passengers is at present very low foreign airlines are not very interested in this market.

In maritime transport future changes will be influenced by both the situation on the world market and by strong public intervention. This sector is very sensitive to the world-wide economic situation, which is difficult to predict. In the 21st century European shipowners (both EU and CEECs) will have to consolidate their position on the market and learn to do better against competition from third countries. The role of maritime transport will remain more important in trade between Europe and overseas countries than in intra-European trade. In 1985 intra-Community sea-borne traffic amounted to 240 million tonnes, while sea-borne imports from overseas countries amounted to 896 million tonnes and exports to these countries 317 million tonnes[46]. In 1995 this volume was estimated to be 10 per cent greater but the proportions of intra-Community and extra-Community trade had not changed. In the period 2000-2020 this volume will increase more slowly than in the case of land transport as a result of the enlargement of the EU to continental countries (the CEECs).

After the fall of the communist regimes the CEECs had a tremendous desire to redirect their trade towards the west, resulting in the collapse of trade between themselves and with the CIS. Maritime transport has become a victim of this reorientation. In a situation where, for Poland and the Czech Republic, Germany is the biggest trading partner (30-40 per cent of trade), it is natural that road freight traffic should increase very sharply and sea trade should decline. The biggest flow of CEEC-EU maritime traffic in 1995 was from and to Poland: 25 million tonnes (44 per cent of total Polish trade with the EU). In the period 2000-2020 this traffic will probably decline to 22-23 million tonnes, or 18-22 per cent of total trade[47].

The future trend in maritime transport in Europe will reflect the change in the breakdown of world trade according to the nature of the cargoes. In 2020, oil tankers and bulk carriers will account for a smaller share of total traffic than they do today. It is container ships that will increase their market share most, despite the sophisticated handling gear necessary on board and above all in the ports.

The structure of the world fleet underwent pathological changes in the period 1970-95: the developed market economy countries' share of total dead-weight tonnage fell from 65 per cent to 27.8 per cent, while that of flags of convenience increased from 27 per cent to 44.8 per cent and that of the developing countries from 7 per cent to 23 per cent. Evaluated in terms of European-owned vessels, the European fleet still represented 31 per cent of the world fleet in 1997, over 57 per cent of it being under third country flags, and the majority of European-owned vessels are manned by foreign crews[48]. At the same time, the share of the developed market economy countries in world trade remained fairly stable at about 68-72 per cent[49]. It is no longer acceptable that, because of stringent technical standards and high social charges, the majority of American, British, Japanese, German, Greek and other vessels should be operated under flags of convenience. The future structure of the world fleet should return to normal, with over half of all vessels flying the flags of the developed countries and respecting the civilised laws of maritime transport.

2.2. Greater presence of multinational and multimodal operators

European transport is not for the moment an area of activity of the big multinationals, despite the tendency to conclude international agreements (AGR, ADR, AGC, AGTC, etc.) and to develop common networks of services. One barrier to the transfer of the activity of subsidiaries of transnational transport companies to cheap labour countries is the lack of finished products which could be stored and distributed on other markets.

One may ask whether the activity of multinationals would be compatible with the philosophy of European integration which is in favour of the existence of competing independent enterprises. The creation of multinationals would mean the concentration of transport operations in the hands of a few giants and a new distribution of the roles of SMEs and large firms. The big multinational can set prices different from those charged on domestic markets as has been done by the maritime subsidiary of the Korean Hyundai group, considered by the EU to be dumping in order to win European markets. Any priority given to the creation of multinationals would lead to the expansion of the subcontracting system. It is questionable whether extensive subcontracting is the ideal solution for the future transport market in Europe.

The advance of European integration in the 21st century and the increasing importance of international transport may bring more motivation for creating multinational enterprises in modes other than sea and air transport. The road haulage sector is already formally open to the existence of such structures (with the examples of Danzas, Ziegler, Schenker, etc.). The ongoing process of Europe-wide liberalisation of access to the rail network should naturally lead to the creation of structures able to offer and sell access to this network to any operator, above all transnational train operators. There is very little reason to develop multinational structures in inland waterway transport.

In the CEECs the process of creating multinationals is already underway. In the 90s it has been limited to co-operation and shareholding agreements, above all in air transport (LOT-British Airways, Malev-Alitalia, CSA-Air France, etc.) and in ancillary services. While alliances between airlines are considered desirable, the acquisition of national freight forwarding firms by foreign interests is often seen as a threat to the interests of national carriers. Future membership of the EU may open a wider field for the activity of these countries' firms in all transport modes.

Today the transport industry goes beyond the frontiers of individual states and beyond the boundaries of individual transport modes. The railways already own road haulage firms (France) and airlines compete for the right to run railways (United Kingdom)[50]. But a new quality of service can be created by the construction of intermodal and multimodal structures.

Multimodal transport is developing fairly slowly in Europe, despite the priorities established by the common transport policy[51] and by national transport policies. In 1995, the three main types of multimodal transport (semi-trailers, rolling road, swap bodies) accounted for only 25 000 million tonne-km (1.6 per cent of total land traffic)[52]. Between 1985 and 1990, a growth rate of 7-8 per cent a year gave rise to hopes for the construction of a pan-European combined transport system but the slower growth of 5-6 per cent[53] a year in the period 1990-95 seems to indicate that these plans will come to nothing.

Paradoxically, the organisation of combined transport in Europe is far from being an integrated structure. Combined transport exists thanks to co-operation between several partners, the most important being the railways which provide the network, the locomotives and the personnel. The wagons are owned roughly fifty-fifty by railway enterprises and combined transport operators. Terminals may be owned by railway enterprises, combined transport operators or local private terminal operators[54]. The operations in the complete road-rail-road chain are carried out by rail container companies, members of Intercontainer/Interfrigo (ICF), and road hauliers, members of the International Road-Rail Union (IRRU). There are also some private, own-account, combined transport operators working either over certain links or handling certain categories of goods. Regardless of who is responsible for the overall combined transport chain, the operation depends on railway enterprises with suitable networks. In the future it would be desirable to merge the decision centres but this will be difficult to achieve.

In the CEECs combined transport activity still remains modest, but there is strong growth in places. The leader on this market is Hungary, where in the period 1993-97 the number of trailers (swap-bodies) transported in the rail-road system increased from 28 903 to 95 000 units (up 229 per cent) and the combined transport share of rail traffic reached 7 per cent[55]. Hungary has succeeded in switching a considerable part of its traffic onto the railways and has decided to establish good connections between its network and the North Sea ports, Romania, Ukraine, Bulgaria, Turkey and Greece. All these countries have set up combined transport companies: Hungarocombi (Hungary), Bohemiakombi (Czech Republic), Polkombi (Poland), Adria Kombi (Slovenia), etc. - affiliated to the IRRU.

In the future, combined transport in the CEECs may develop more rapidly than in the European Union, the reason being the poor road network and the existence of a fairly good rail network, half of it electrified.

2.3. New structures in the Europe without frontiers

International integration requires qualitative changes in the organisation of transport systems. Among the various possibilities, a greater presence of multinational and multimodal operators seems to be the most appropriate. The atomisation of the transport sector is not compatible with the general concept of integration. In the enlarged area of European integration, transnational infrastructure managers and transnational transport operators would be better able to satisfy demand than the existing atomised structures. Such a structural change requires the acceptance of a change in the philosophy of European integration, still based on the principle of free activity and competition between national firms. The common transport policy now pursued, which takes a modal approach to problems, tends to marginalise logistical and full service solutions and hence the creation of a truly integrated transport system. There is too much bureaucracy in the efforts to harmonize the activity of the transport modes on the European level and make them more environment-friendly. This policy should evolve in line with the new idea of "service of general economic interest". As P. Bauchet says, the Member States of the Union agree that the market mechanism alone does not suffice because it takes no account of social needs and activities that cannot be economically viable, and gives preference to the short term over the long term[56].

If we want to promote European transport integration in the 21st century a number of questions arise: is it reasonable to build separate high-speed rail networks rather than creating a transnational entity to ensure interoperability? Are the national combined transport companies (Novatrans, Cemat, Kombiverkehr, Hupac, Ökombi, etc.) really capable of creating a multimodal system in Europe? Is the idea of a common maritime flag (Euro Register) not compatible with the interest of shipowners in joining together to develop worldwide services? Might the tendency towards mergers in air transport end up with the creation of a common operator capable of beating Asian and American competition?

A positive reply to these questions might shock the supporters of the existing Community regulations, but in the 21st century it will be necessary to abandon the policy of tinkering with existing structures and start to create transport structures of a new type.

The enlargement of the EU to the CEECs may create new opportunities for setting up multinational and multimodal transport structures. The countries of central Europe are open to foreign investment, above all in infrastructure, combined transport and sea and air transport.

3. INSTITUTIONAL CHANGES IN THE TRANSPORT FIELD

In the 21st century Europe will include a number of states formed after the political upheavals of 1989. It is unlikely that more new states will appear on the map of our continent, but the organisation and integration of these states is likely to bring constant change.

Integration and decentralisation are complementary trends in the transformation of the European economy. It would be mistaken to consider integration as mere centralisation. The disappearance of frontiers between states does not mean the creation of a super-state. The European Union brings together sovereign states which have delegated certain powers to common institutions, and these states also agree on the need to strengthen the role of the regions in Europe.

When considering the institutional future of Europe it is important to try to forecast the general trends of integration. With 43 countries, will the Europe of the 21st century still be politically and economically divided? How many European Union Member countries will there be in 2010, in 2050? The answer will depend on the choices made: integration will be either motivated by trade-offs between interests or it will be a matter of the harmonization and unification of national systems.

The new wave of European Union enlargement (2002 or 2006?) will have major political and economic consequences. When the group of former socialist countries joins the European Union this will finally put an end to the division of Europe decided in Yalta and be proof that this division was artificial and unjustifiable. The entry of the CEECs into the club of integrated European countries may be a catalyst for accelerating the reform of the European Union, which is at present too bureaucratic, formalised and inflexible. The experience of the CEECs during the period of their political and economic transition may be of interest to Eurocrats seeking more efficient structures and procedures.

The construction of post-Maastricht Europe is still based on a framework which is essentially that of 1957, and the coming enlargement requires its redefinition. The EU institutions still have much the same method of functioning as in the beginning, with the number of members redefined with each new accession. The enlargement of the Union could therefore considerably slow the consolidation of its institutional coherence[57]. The strict parallel between the trend in the number of inhabitants and the number of national representatives in the common institutions should be replaced by qualitatively transformed structures.

3.1. Evolution of the role of international, national and regional authorities

Future public structures in the European transport sector should be adapted to both the evolution of international integration and the changes in the administrative structures of states. On the international level the need for standardization, respect of quality standards, the development of networks, regulation of access to markets, etc., is not possible without the intervention of international and intergovernmental bodies. On the national level the financing of infrastructures, social protection and the maintenance of a certain level of public service is not possible without a reasonable sharing of powers and responsibilities between central, regional and local authorities.

Centralised decisionmaking and state interventionism is not compatible with the existence of liberalised markets penetrated by tens of thousands of private enterprises. The reduction of state intervention on the transport market is therefore necessary, but in the future the State will nevertheless be obliged to retain certain powers in the fields of legislation, safety, environmental protection, etc. The inequality of forces on transport markets resulting from inadequate harmonization between modes and between nations may hamper real deregulation and encourage a return to protectionist measures. To avoid such a threat it is necessary to strengthen co-operation between states in the different international forums.

The activity of the ECMT, the EU, the United Nations Inland Transport Committee and the dozens of international transport organisations results in a mosaic of legal solutions and technical standards bringing national systems closer together. The disappearance of the political divide in Europe after 1989 means that it is not enough to integrate transport technically (infrastructures, rolling stock) **-** it is necessary to create a **common transport market** embracing all the 43 countries of our continent. This market was formally created on 1 January 1993 in the European Union, but it remains a structure closed to third countries. It is necessary to respect this structure, created through years of bringing national systems together and harmonizing the conditions of competition, but it should be open to the countries applying the same legal, fiscal and technical solutions and other standards that the European Union Member countries have jointly decided upon. Countries which do not aspire to join the EU cannot be excluded from a free market. The role of ECMT is to find a political solution: how can all 43 European countries freely provide international transport services on the basis of a minimum set of uniform legal solutions?

European transport systems are developed and financed mainly at national level. The post-Maastricht EU has launched the idea of trans-European networks (TEN) and is trying to create new financing sources for them. The pan-European Conferences of Ministers of Transport (Crete, Helsinki) have launched the idea of trans-European corridors covering above all the CEECs. The legal instruments in this field find somewhat limited application: unification of the technical parameters of infrastructures, standardization of project evaluation methods, research tools (intelligent networks, etc.). There have been no real attempts to create a pan-European infrastructure network management system or to decide how responsibilities should be shared between central, regional and local authorities.

In the 21st century responsibility for transport infrastructures will surely remain mainly in the hands of states. The inevitable changes are as follows: the rail infrastructure will become a true public good, accessible not only to a transport monopolist but to different users for both common carrier and own-account operations - and will therefore remain under the management of a single entity without any regional splitting; the road infrastructure will be 5-10 per cent the responsibility of the central government (national roads) and 90-95 per cent that of regional and local authorities (half); airport infrastructure will remain under the three main existing management regimes: autonomous public establishments (with the State as the majority shareholder), airports managed by local authorities, private airports - with a tendency for the number of private airports to increase; port infrastructures will be most effectively managed as municipal undertakings (as is now the case with the biggest EU ports) but the status of autonomous public establishments (the result of decentralisation) will also develop.

In the CEECs the range of infrastructure management structures will be similar to that of the EU with the exception of public roads. In Poland since 1999, since the reform of the country's territorial structure, the management of the roads has been shared between four types of authority: the State (national roads), *voivod*, district and municipality. The problem with this system is that the financing system does not correspond to the real needs: the national roads (16 800 km, 4.7 per cent of the network) receive 40 per cent of the budgetary resources, while the rest of the network (95.3 per cent) receives only 60 per cent[58].

In the provision of future transport services, power will be shared between the international bodies (access to markets, TIR permits, transit, technical standards, etc.), central governments (legislation, social policy, taxation) and regional and local authorities (authorisations, environmental protection, safety). The balance of this power sharing will shift towards increasing the role of the international bodies (creation of the rules of the game on the market) and the regional and local authorities (law enforcement).

3.2. Relations between public institutions and private structures

The past quarter of a century has shown that in the transport sector there can be three types of situation: depending solely on public institutions; created solely by private individuals or legal entities; the result of public-private partnership. In the 21st century European transport will need solutions increasingly based on the idea of public-private partnership. These solutions will be especially useful in activities connected with the construction and modernisation of infrastructures.

The internal rate of return on infrastructure investments is low, and in any event lower than that required by a private operator. The partnership appears necessary because there are limits to completely private financing due to the inadequate financial return or the high risk associated with certain public facilities. Furthermore, private investors and lenders cannot take account of the externalities, i.e. the non-financial economic and social costs and benefits, whereas the public authorities, on the other hand, have to take them into consideration, and this may induce these authorities to wish to implement a project of general utility even if the financial return is low[59].

Public-private partnership is possible provided that clients or users can be made to pay for certain public services (traditionally provided free in the past). For various political reasons the public authorities might feel unable to accept any further socio-economic losses stemming from an inadequate transport supply. It is relatively easy to evaluate a series of choices between the anticipated additional losses and public aid required to improve the situation (initial construction grant or subsidy, interest-free loans, tax deductions, exemption from fees, soft loans, state guarantees, subordinate loans or operating subsidies). Whatever the type of public-private partnership, the legal bases drawn up and expressly accepted by the public sector partner must offer adequate security and guarantees to all involved in the project. The international organisations should take the initiative and play a pilot role by making an inventory of projects which lend themselves to public-private partnership[60].

The shortcomings of transport infrastructure in Europe, especially in the CEECs, together with budgetary constraints, mean that advantage should be taken of all forms of public-private partnership which are acceptable from the legal standpoint. There is no difference here between the type of infrastructure: road (BOT, BOOT, BOO systems), rail, air or maritime. The future success of this type of partnership seems to depend on a fairly courageous commitment by states (no less than 30 per cent of the necessary funds) and adequate guarantees for the private partners.

3.3. Responsibilities of the public authorities, employers and unions

A number of sophisticated structural transformations and technical solutions cannot be successfully incorporated into transport systems without taking account of their social aspects. The market economy provides only imperfect economic freedom, because it results in only fairly limited possibilities for giving transport sector workers reasonable pay and working conditions, since fierce competition between transport service providers forces enterprises to cut their costs and hence considerably reduces the room for manoeuvre regarding pay and working conditions. There are no examples of national policies or of any European social policy which ensures a reasonable balance between an acceptable level of transport service costs and a satisfactory standard of living for transport workers[61].

There are industrial relations problems in all transport modes. There has been no lack of disputes and strikes among railwaymen, airline pilots, boatmen, etc., and the seriousness of the problems depends on many factors: the financial condition of the sector and the enterprises in it, state social policy and aid, the stringency of the regulations, the unemployment rate, the structure of the sector (concentration or atomisation), the fierceness of the competition, working conditions.

From the macroeconomic standpoint, a sector characterised by a high degree of automation leads to a reduction in the number of jobs, increasing unemployment and creating social problems. Intensive automation, desirable for purely economic reasons, is contested by those responsible for social policy, who are fighting a losing battle against unemployment. In the industrial sector there are many examples of industries where technical progress has led to a technological leap (robotisation, computerization, etc.), making it possible to considerably reduce the workforce and cut costs. From this standpoint the transport sector is by no means homogeneous and technical progress differs greatly from one mode to another. Pipeline transport is extremely automated and requires very little labour, whereas in road haulage no delivery, even of the smallest quantity of goods, is possible without the involvement of at least one person[62].

The transition of the Central and Eastern European countries creates social problems which are absent in the countries where the market economy is well established. These problems are most visible in the declining sectors (steel industry, mining, etc.). Road haulage in Poland, the Czech Republic and Hungary, despite a sharp fall in employment, has not known any protest action by drivers like that in France in 1991 and 1996.

The economic and social interests differ between the heads of large enterprises and their employees, between large and small enterprises, between the heads of small and large enterprises and the State, and between the State and employees. Tensions are least between owner-operators and the employees of large enterprises (who have quite different positions vis-à-vis industrial relations). The differences concern incomes in the first place, but factors such as working hours, overtime, holidays, retirement age, conditions of access to the profession, subcontracting, etc., very often trigger disputes.

In the Europe of the future the roles of the public authorities and the two sides of industry in the transport sector will be fairly similar: they will be obliged to better protect the interests of transport workers from the negative social consequences of the increasingly fierce competition on the enlarged market. The rules of the market economy are not entirely compatible with the ideals of equality and fairness. States, the EU, the ECMT and the other international bodies will no longer be able to stand by and passively observe the trials of strength between employers and workers. It is necessary to create an outline European labour code to ensure greater equality and fairness and reduce the opposition between unions and employers.

More intervention by the public authorities is to be expected in the social aspects of the entire transport sector, but this intervention is required most urgently in road haulage. Those who work hard and make progress in this sector are often deprived of the possibility of enjoying the fruits of their work. The fierceness of the competition on road haulage markets has no equivalent in the other transport modes. The situation is bad where there is no competition (in rail transport, for example) but an excessive number of competitors is equally harmful. It is necessary to restructure the road haulage sector so that it has the possibility of offering cheap services and at the same time ensuring decent working conditions for those employed in it[63]. The scale of the social and labour relations problems in road haulage results from the fact that some 6.5 million people work in this sector in the EU and over a million in the CEECs.

A start has already been made on calculating the external costs of transport resulting from pollution, accidents and congestion, but these studies seem to neglect the social costs of transport connected with the strikes and other perturbations of traffic resulting from the desperation of the workers. While external costs will continue to appear, the costs of industrial disputes can be totally eliminated as soon as a decent level of pay and working conditions for the employees is guaranteed. A European social policy in the transport sector is just as important as the development of networks, the liberalisation of the markets, the harmonization of technical standards, etc. Certain experiences with this kind of policy in the CEECs could usefully be analysed and taken into consideration on the pan-European level.

4. INSTRUMENTS OF CHANGE REQUIRED TO ENSURE A SATISFACTORY FUTURE TRANSPORT SECTOR

An arsenal of economic and institutional instruments of change is essential in a situation where the transformation process is no longer spontaneous and is programmed according to a model. Transformations obviously always take place, even in a situation where there is no organising force for this process, no strategy and no instruments. But their nature and the dynamics of the process change radically after a decision to implement a programme - the proof of this is the transformation of the CEECs in the period 1989-99, when the changes were epoch-making. The construction and choice of instruments for this purpose is more difficult than in the case of mere public intervention on the markets. The transformation of a system is an action that does away with often very strong traditional links, eliminating very complex constructs and requiring enormous resources and efforts.

In the Europe of the 21st century the transformation strategies will become more targeted and less diversified. After the enlargement of the EU (accession of the CEECs) there will be fewer differences between countries as regards the nature of economic and structural changes. The problem is to create a vision of the economic and institutional structure of the future Europe. The European Union is aware of the inadequacy of the existing structures, but it still lacks a blueprint for a future structure.

The existence of a concrete programme of transformations facilitates the choice of the necessary instruments. The lack of such a programme means that we can analyse only the types of instruments that may be useful for this operation. In this report it is possible only to present a review of the possible solutions.

European transport in the 21st century must have transformation instruments of different types - political, legal and financial. No change will be possible without a political consensus and without acceptance by society as a whole. Most of the transformations can be encouraged by national and international legislative action, but several of the solutions will require very substantial financial resources.

4.1. Political and administrative instruments

On the political level European transport suffers no lack of institutions: OECD, ECMT, EU, United Nations Inland Transport Committee and dozens of international transport organisations. Their activity ensures that despite everything, the situation is fairly good as regards technical regulations and transport safety, but the creation of enterprises, provision of services, organisation of markets and the competition on these markets are subject to national solutions that are very far from being homogeneous. In recent decades the activity of the international institutions has focused mainly on the problems of transport markets. The notion of “transport system” has remained virtually absent from the legal texts of the EU. However, the functioning of markets is closely linked with the development of transport systems: with infrastructure networks, the organisation of ports and airports, etc. The greater interest shown in markets could be explained by the fact that in their case it suffices to enact and enforce a number of legal texts, whereas in the case of transport systems it is necessary to find sources of financing.

For the integration of the European transport system it would be best if the number of countries accepting the European Union conditions and solutions were as large as possible. The application of Community *acquis* makes it possible to standardize transport systems quickly and effectively. While the international conventions and agreements concerning transport can be ratified separately, the Community *acquis* have to be accepted in their entirety. In practice the most probable scenario is that after the year 2002 the EU will be enlarged to 20 countries and a new wave of enlargement will follow after 2010. This situation, where a good many European countries (over half) will remain outside the European Union for many years to come, may tend to delay the integration of European transport. The ECMT will have a very important role to play in encouraging these countries in their efforts to liberalise the provision of transport services and standardize all the components of their transport systems.

The administration of transport in Europe differs from one country to another. It would be rather difficult to standardize it without considering the national factors that determine the specific characteristics and composition of the ministries. The implementation of a common policy will be more effective if it is done by ministers who all have the same status. However, while in some countries there are ministers responsible solely for transport, in other countries the ministers concerned also have other responsibilities (communications, regional development, construction and housing, maritime affairs, etc.). It can even happen that the ministry of transport disappears[64]. What is more, the sharing of powers between central, regional and local government differs greatly between countries. In the future these disparities could be reduced while still respecting the specific characteristics of small, medium and large countries. In Europe the economic integration should be accompanied by administrative harmonization.

As the former Polish Finance Minister, G. Kolodko, put it, there are lobbies everywhere fighting by every available means for their particular interests, but nowhere are there powerful lobbies fighting with equal determination for economic growth and the realisation of long-term economic policy objectives. It is the State that has to fight for these objectives[65].

4.2. The legal framework

The functioning of transport markets and structures in Europe is based on extensive legislative and other texts, both national (dealing with some 80 per cent of the problems) and international - conventions, agreements and Community *acquis* (some 20 per cent of the problems). The Community *acquis* comprise legal texts of different origins: both specific solutions developed in the course of the integration process and solutions taken from conventions, international agreements and United Nations regulations. Being a compromise between different national ideas and interests these *acquis* are of an evolutive nature and adaptation to new countries often requires derogations and transition periods (due to the need for heavy investment and for structural changes which cause social problems, etc.). Having several sources of law means that there is a lack of harmonization, of homogeneity. Comparing the transport legislation systems of 5 CEEC candidates for EU membership with the Community *acquis* in 1999 has shown that the degree of harmonization is of the order of 30-50 per cent[66]. Even within the EU the legal solutions are differentiated and the adoption of the Community *acquis* does not exceed 90 per cent (proof of this lies in the list of national references attached to EU Directives).

In Europe at present the knowledge of transport law in the responsible institutions (government) and transport enterprises is very poor. It is impossible to know all the texts (tens of thousands of pages), but a basic knowledge of the law should be required of all transport operators and all employees of the public institutions concerned. In the future, access to this knowledge can be considerably enhanced thanks to the development of computerized legal databases and the translation of the international texts into all European languages.

The development of European law in the field of transport should first be focused on the elimination of certain gaps to be seen in the fields of public-private partnership, ancillary services, infrastructure management, working conditions in the transport sector, privatisation, etc. It is very difficult to lay down legal solutions in these fields at Community level. Certain problems are of a specifically national character (methods of privatisation, for example), but European integration is gradually leading to an homogenisation of solutions in many areas.

4.3. Financial resources and taxation

The transport sector, which is based to a large extent on infrastructure, is very dependent on public financing. Almost all of the transformations connected with transport infrastructures are possible only as and when the financial resources become available. The separation of rail infrastructure management from train operation does not automatically lead to a reduction in the sum of money necessary for the maintenance and modernisation of the rail network if the least used lines are not closed. The reduction of the number of kilometres of national roads does not lead automatically to savings in central budget expenditure on roads because it is necessary to increase the subsidies to regional and local authorities responsible for maintaining an enlarged network. But it is true that the decentralised administration of infrastructure is less costly than centralised administration.

The creation of a European transport network requires the existence of a new system of financing and financial management. The financing of the TEN[67] was officially recognised as a Community priority by the Treaty of Maastricht of the European Union. At present, the creation and operation of the Trans-European Networks is above all a matter for national governments and, of course, the operators themselves. The European Union for its part should play the role of catalyst. In the future it will be necessary to create an international financing structure for the TENs, funded by the contributions of EU Member States. Since expenditure on transport at present constitutes a negligible percentage of the EU budget (less than 0.5 per cent), it should be possible to increase it considerably in the future. It is rather astonishing that the heading “transport” does not even appear on the expenditure side of the EU budget (this sector being concealed under other headings).

At national level the ranking of transport in financial and fiscal policies differs from one country to another. It seems that the more aggressively “liberal” circles are less inclined than those of other political persuasions to give high priority to transport in investment policy. There are no examples of the existence of special funds for the development of the road network, which remains dependent on the interplay of parliamentary pressures during budget debates. It is a fact that duties on gasoline and diesel fuels are used not so much to fund road works as to finance the general budget.

CONCLUSIONS

Future transport in Europe will be the continuation of what was created in the 20th century. Transport systems will be dominated by the road sector. There will be an increasing number of transport operators, but concentration will also be a visible trend (above all in air transport). In the field of infrastructure, their management will be more oriented to market requirements, with the accent on equality of access for new operators.

Responsibility for transport will be shared between international, national, regional and local authorities, with a tendency towards and increased role for the international institutions and the regions. Greater activity of private partners in the sphere of investment (infrastructure and rolling stock) should be encouraged and supported by transport policy.

After their accession to the European Union the CEECs will adapt their transport structures to the Community system, but they will also have an influence on the changes that come about in existing structures: the sharing of markets between operators, modal split, proportions of common carrier and own-account traffic, etc. The more integrated Europe will be an area where trade and transport will develop more rapidly than overall economic growth.

NOTES

1. These changes may lead to a situation in which after 2050 structures such as the European Union, the OECD and NATO will disappear too.

2. A. Buzelay (1996), *Intégration et Désintegration européennes*. Economica, Paris, p. 5.

3. M.-L. Herschtel (1997), *L´économie de l´Union européenne*. Armand Colin, Paris, p. 17; Ch. Hen, J. Léonard (1998), *L´Union européenne*. Éditions la Découverte, Paris, p. 16.

4. A. Buzelay: *Intégration et Désintegration européennes, op. cit.*, pp. 27-28.

5. J. Meyer-Stamer (1997), Globalisierung, Standortkonkurenz und Enwicklungspolitik. *Internationale Politik und Gesellschaft* ("International Politics and Society"), No. 4, pp. 378-380; E.M. Plucinski (1999), Makroekonomia gospodarki otwartej. Dom Wydawniczy ELIPSA, Warsaw, p. 68.

6. P. Bauchet (1998), *Les transports mondiaux, instrument de domination,* Economica, Paris, p. 19.

7. R. Gordon (1995), *Globalization, New Production System and the Spatial Division of Labour*, W. Littek, T. Charles, Berlin-New York, pp. 167-190.

8. E.M. Plucinski, *op. cit.,* p. 71.

9. P. Bauchet: *Les transports mondiaux, op. cit.,* p. 21.

10. J. Trotignon (1997), *Économie européenne. Intégration & politiques communes*. Hachette Supérieur, Paris, p. 236.

11. M. Berthiaume (1993), *La Communauté européenne. L´Europe dans la tourmente*. Vuibert, Paris, p. 25; Ch. Hen, J. Léonard, *op. cit.*, p. 70.

12. M. Berthiaume, *op. cit.,* p. 33.

13. Ch. Hen, J. Léonard, *op. cit.*, p. 71.

14. CMEA = Council for Mutual Economic Assistance (USSR, GDR, Bulgaria, Hungary, Poland, Romania, Czechoslovakia, Mongolia, Cuba and Vietnam).

15. G. Chatelus (1994), Les transports en Europe Centrale. In: *Comment définir des priorités en transport: quels critères et quelles procédures?* Ch. Reynaud and M. Poincelet (eds.), Paradigme, Caen, p. 15.

16. A. Rathery (1998), Évolution récente et situation économique. Évolution des transports dans les pays en transition Membres de la CEMT. In: *Le rôle des transports dans la perspective d´une Europe élargie*. Ch. Reynaud and M. Poincelet (eds.), Paradigme, Orléans, pp. 16-22.

17. G. Sammer (1999), What transport policy guarantees sustainable mobility (road safety, environment)? In: *What changes for the transport of the next century?* 14th International Symposium on Theory and Practice in Transport Economics, ECMT, Paris, p. 202.

18. H. Meersman, E. Van de Voorde (1999), Is the growth of freight transport avoidable? In*: What changes for the transport of the next century?* 14th International Symposium on Theory and Practice in Transport Economics, ECMT, Paris, p. 42.

19. M. Gaspard (1998), Analyse des évolutions des trafics ferroviaires et routiers et projections à l´horizon 2010 dans les pays d´Europe centrale en voie d´accession à l´UE. Séminaire "Scénarios et méthodes d´évaluation dans les pays en voie d´accession à l´Union européenne". Barbizon, 23-25 November.

20. Calculated on the basis of information in the *Statistical Yearbook of the Republic of Poland 1998,* p. 389; *Przeglad Komunikacyjny* (Communications Review), Warsaw, 1999, No. 4.

21. M. Gaspard, *op. cit.*, p. 12.

22. G. Sammer, *op. cit.*, pp. 199-202.

23. M. Gaspard, *op. cit.*, p. 19.

24. M.-L. Herschtel, *op. cit.*, pp. 89-90.

25. *Statistical Yearbook of the Republic of Poland,* 1985, 1998. Warsaw 1996, 1998.

26. P. Bauchet (1996), *Les transports de l´Europe. La trop lente intégration*. Economica, Paris, p. 23.

27. M. Le Duc (1997), *Transports et voies de communication*. Centre Européen de la Culture, Arles, p. 33.

28. *Ibidem*, pp. 22-23.

29. Calculated on the basis of: *Transport Statistics 1965-92,* ECMT, Paris, 1997, pp. 49-53.

30. Data available for Belgium, Germany, France, Finland and the Netherlands.

31. P. Hamelin (1999), The social aspects of road transport: driver working hours. In: *Social aspects of road transport,* ECMT, Paris, p. 75.

32. J. Trotignon, *op. cit.*, p. 49.

33. LNE = Large National (state-owned) Enterprises.

34. J. Burnewicz (1996), Privatisation and deregulation of road transport in Poland. Report for the ECMT, January.

35. The Concept of Hungarian Transport Policy. Ministry of Transport, Telecommunications and Water Management. Working Paper, Budapest, April 1994, p. I/12.

36. *Conditions of European Integration of Central and Eastern European Hauliers*. KTI, Budapest, April 1995, p. 81.

37. Combien d´entreprises? *L´Officiel des Transporteurs* 1989, 1559, pp. 19-20.

38. Rocznik Statystyczny, *GUS* 1993, Warsaw, 1993, pp. LXIII and 113.

39. *Mémento de statistiques des transports*. OEST, Paris, December 1994, p. 131.

40. P. Hamelin, *op. cit.*, p. 75.

41. *Transport routier de marchandises pour compte propre dans les pays d´Europe centrale et orientale*. Study under the direction of J.Burnewicz, IRU, Sopot-Geneva, July 1996, pp. 40-41.

42. COM(84) 349 final; COM(87) 32 final; and COM (89) 78 final.

43. A. Artous (1991), Grandes manoeuvres dans les grands groupes. *Camions Magazine*, No. 89, pp. 62-71.

44. P. Bauchet: *Les transports en Europe, op. cit.*, p. 53.

45. P. Bauchet: *Les transports mondiaux, op. cit.*, p. 218.

46. J. Burnewicz (1991), *Transport EWG*, Warsaw, p. 193.

47. J. Burnewicz, M. Bak (1997), *Prévision complexe du transport en Pologne 1995-2020*. Ministry of Transport and Maritime Economy, Warsaw.

48. P. Bauchet: *Les transports mondiaux, op. cit.*, p. 134.

49. *Wspolczesna gospodarka swiatowa* (Contemporary world economy). Ed. A.B.Kisiel-Lowczyc. University of Gdansk. Gdansk 1999, p. 81.

50. M. Le Duc, *op. cit.*, p. 56.

51. See the PACT programme of the European Commission.

52. EU *Transport in Figures 1997, op. cit.*, pp. 39 and 48.

53. EU *Transport in Figures* 1997, op. cit., p. 48.

54. *Regard sur le Transport combiné*. UIRR, Brussels, December 1995, p. 6.

55. L. Ruppert (1999), The CEECs and the new transport market created by the transition. The case of Hungary. 14th International Symposium of the ECMT, Innsbruck, OECD, Paris, p. 139.

56. P. Bauchet: *Les transports en Europe*. *op. cit.*, p. 187.

57. M. Berthiaume, *op. cit.*, pp. 188-202.

58. J. Burnewicz, M. Bak (1999), *La gestion du réseau routier en Pologne à l´aspect de l´intégration européenne et la réforme territoriale du pays*. Sopot, June, p. 19.

59. M. Sarmet (1993), Le financement de projet appliqué aux equipements collectifs. In: *L´Expérience française du financement privé des équipements publics*. Economica, Paris, pp. 73-74.

60. A. Timar (1996), The role of public sector-private sector partnership and cofinancing in the implementation of transport infrastructures of pan-European significance. Special Round Table on European Transport Policy, ECMT, Paris, May, pp. 3-7.

61. J. Burnewicz (1999), Social aspects of road transport: introduction to the analysis of the problems. In: *Social aspects of road transport*. ECMT/OECD, Paris, p. 33.

62. *Ibidem*, p. 34.

63. *Ibidem*, *op. cit.*, p. 46.

64. In Poland in 1998 there was a plan to create a Ministry of Infrastructure responsible for transport, telecommunications and energy networks - fortunately abandoned.

65. G. Kolodko (1999), *Du choc à la thérapie. L´économie et la politique des transformations*. Poltext, Warsaw, p. 149.

66. Questionnaire on the main problems in legal approximation and adjustment of transport systems in CEECs (in selected ECMT Member States), February 1999.

67. TEN = Trans-European Networks.

BIBLIOGRAPHY

Transport Statistics 1965-92, ECMT, Paris, 1997.

Artous, A. (1991), Grandes manoeuvres dans les grands groupes, *Camions Magazine,* No. 89.

Bauchet, Pierre (1998), *Les transports mondiaux, instrument de domination,* Economica, Paris.

Bauchet, Pierre (1996), *Les transports de l´Europe. La trop lente intégration,* Economica, Paris.

Berthiaume, Marc (1993), *La Communauté européenne. L´Europe dans la tourmente,* Vuibert, Paris.

Burnewicz, Jan (1999), Social aspects of road transport: introduction to an analysis of the problems. In: *Social Aspects of Road Transport,* ECMT/OECD, Paris.

Burnewicz, Jan (1996), Privatisation and Deregulation of Road Transport in Poland. Report for the ECMT, January.

Burnewicz, Jan, Monika Bak (1999), *La gestion du réseau routier en Pologne à l´aspect de l´intégration européenne et la réforme territoriale du pays,* Sopot, June.

Burnewicz, Jan, Monika Bak (1997), *Prévision complexe du transport en Pologne 1995-2020*. Ministry of Transport and Maritime Economy, Warsaw.

Burnewicz, Jan (1991), *Transport EWG*, Warsaw.

Buzelay, Alain (1996), *Intégration et Désintegration européennes,* Economica, Paris.

Chatelus, Gautier (1994), Les transports en Europe Centrale. In: *Comment définir des priorités en transport: quels critères et quelles procédures?* Co-ordination: Ch. Reynaud and M. Poincelet, Paradigme, Caen.

Combien d´entreprises?, *L´Officiel des Transporteurs*, 1989, No. 1559.

Conditions of European Integration of Central and Eastern European Hauliers, KTI, Budapest, April 1995.

Gaspard, Michel (1998), Analyse des évolutions des trafics ferroviaires et routiers et projections à l´horizon 2010 dans les pays d´Europe centrale en voie d´accession à l´UE. Seminar: *Scénarios et méthodes d´évaluation dans les pays en voie d´accession à l´Union européenne*. Barbizon, 23-25 November.

Gordon, R. (1995), *Globalization, New Production System and the Spatial Division of Labour*. W. Littek, T. Charles, Berlin-New York.

Hamelin, Patrick (1999), The social aspects of road transport: Driver working hours. In: *Social Aspects of Road Transport*, ECMT, Paris.

Hen, Christian and Jacques Léonard (1998), *L´Union européenne*. Éditions la Découverte, Paris.

Herschtel, Marie-Luise (1997), *L´économie de l´Union européenne,* Armand Colin, Paris.

Kolodko, Grzegorz (1999), *Du choc à la thérapie. L´économie et la politique des transformations*. Poltext, Warsaw.

Le Duc, Michel: *Transports et voies de communication*. Centre Européen de la Culture. Arles 1997.

Meersman, H. and E. Van de Voorde (1999), Is the growth of freight transport avoidable? In: *What Changes for Transport in the Next Century?*, 14th International Symposium on Theory and Practice in Transport Economics, ECMT, Paris.

Mémento de statistiques des transports, OEST, Paris, December 1994.

Meyer-Stamer, J. (1997), Globalisierung, Standortkonkurenz und Enwicklungspolitik. Internationale Politik und Gesellschanft, *International Politics and Society,* No. 4.

Plucinski, Eugenius Maciej (1999), Makroekonomia gospodarki otwartej. Dom Wydawniczy ELIPSA, Warsaw.

Rathery, Alain (1998), Évolution récente et situation économique. Évolution des transports dans les pays en transition membres de la CEMT. In: *Le rôle des transports dans la perspective d´une Europe élargie*. Co-ordination: Ch. Reynaud and M. Poincelet. Paradigme, Orléans.

Regard sur le Transport combiné, UIRR, Brussels, December 1995.

Ruppert, Laszlo (1999), The CEECs and the new transport market created by the transition. The case of Hungary, in: 14th International Symposium of the ECMT, Innsbruck, *What Changes for Transport in the Next Century?,* OECD Publications, Paris.

Sammer, Gerd (1999), What transport policy guarantees sustainable mobility (road safety, environment?), in: *What Changes for Transport in the Next Century?,* 14th International Symposium on Theory and Practice in Transport Economics, ECMT, Paris.

Sarmet, Marcel (1993), Le financement de projet appliqué aux equipements collectifs. In: *L´Expérience française du financement privé des équipements publics,* Economica, Paris.

Statistical Yearbook of the Republic of Poland 1998.

The Concept of Hungarian Transport Policy. Ministry of Transport, Telecommunication and Water Management. Working Paper, Budapest, April 1994, p. I/12.

Timar, Andreas (1996), The role of public sector/private sector partnership and cofinancing in the implementation of transport infrastructure of pan-European significance. *Special Round Table on European Transport Policy*, ECMT, Paris, May, pp. 3-7.

Transport routier de marchandises pour compte propre dans les pays d´Europe centrale et orientale. Study under the directioin of J.Burnewicz, IRU, Sopot-Geneva, July.

Trotignon, Jérôme (1997), *Économie européenne. Intégration & politiques communes*, Hachette Supérieur, Paris.

Wspolczesna gospodarka swiatowa (Modern world economy). A.B. Kisiel-Lowczyc (Ed.), Les Éditions de l´Université de Gdansk, Gdansk, 1999.

Topic 2

TRANSFORMING ECONOMIC AND INSTITUTIONAL STRUCTURES AND TRENDS IN TECHNOLOGY: EXPERIENCE AND PROSPECTS

b) Intermodality

THE COMPETITIVENESS OF INTERMODAL FREIGHT TRANSPORT NETWORKS IN EUROPE

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SUMMARY

Mons/Louvain, July 1999

1. INTRODUCTION[1]

Freight transport is on the increase throughout Europe for a number of reasons: economic growth in many countries; technological progress and the economies of scale that can be achieved through the specialisation of production units; market globalisation, which – underpinned by the liberalisation of market institutions – has made it possible to exploit these economies of scale; the regional concentration of the distribution industry around centrally located "hubs" which facilitate the globalisation of production; and, lastly, the relatively low cost of transport in the organisation of production and distribution.

The strong growth in freight transport is putting so much strain on the various modal networks, particularly on rail and road networks, that their capacity is no longer adequate at certain points. In addition, very strong growth in road freight transport causes pollution of various kinds as well as congestion at the expense of private cars. It is also making Europe's roads more dangerous.

The problem is becoming more acute every year and is likely to be solved only by using a range of remedial measures: better land-use planning of economic activities, construction of new infrastructure in addition to a variety of regulatory and pricing measures that may be able to channel traffic flows to some extent and make more efficient use of infrastructure by taking the external effects of transport into account. However, another important aspect to consider is the reorganisation of the services provided by the various transport modes. For instance, the organisation and promotion of intermodal alternatives could also help to solve these problems and would, in fact, make it possible, to some extent, to substitute rail and inland waterway transport or short sea shipping for road.

In addressing intermodal transport, two main aspects must be considered: its efficient organisation, through the active co-operation of all the parties involved and the institution of an adequate market structure; and its basic competitiveness as compared with other transport options, bearing in mind transport costs, time, volumes to be carried and the geographical layout of the networks. These two aspects will be dealt with separately in Sections 3 and 4. First, it is shown how important it is to try to rethink and better organise freight transport, so as to rectify the two problems outlined above, *i.e.* strong growth in road traffic and its impact in terms of the social costs it imposes on the public.

2. THE NEED FOR NEW SOLUTIONS

The problems of the rise in road traffic and related external costs are illustrated mainly by a case study of Belgium, the country for which the authors have the most detailed and original information. However, Belgium is very typical and clearly demonstrates the problems that already affect a fair number of the regions of Europe and threaten to affect others in the process of economic expansion.

2.1. Road traffic growth

Table 1 shows that road traffic in Belgium increased by 5.9% a year from 1970 to 1997. In contrast, rail and inland waterway traffic both declined slightly. This is reflected in the sharp fall in the modal share of the latter two modes. However, it will be noted that from 1990, growth of road traffic has fortunately slowed and is now increasing at a rate of only 0.09%. At the same time, inland waterway traffic has picked up slightly, although rail traffic is still declining.

Table 1. **Transport trends on networks in Belgium in million tonne-km**

	1970	**1980**	**1990**	**1994**	**1995**	**1996**	**1997**
Road	13 100	18 300	32 050	32 925	34 551	31 432	34 096
Rail	7 880	8 000	8 350	8 084	7 287	7 244	7 465
Waterways	6 730	5 850	5 450	5 575	5 806	5 795	6 120

Trends in modal share

	1970	**1980**	**1990**	**1994**	**1995**	**1996**	**1997**
Road	47.3%	56.9%	69.9%	70.7%	72.5%	70.7%	71.5%
Rail	28.4%	24.9%	18.2%	17.4%	15.3%	16.3%	15.7%
Waterways	24.3%	18.2%	11.9%	12.0%	12.2%	13.0%	12.8%

Source : *Institut National de Statistique* (INS) and ECMT (1999a).

Table 2 shows much slower trends, with the tonnage carried by road increasing by only 1.3% a year since 1970, and by 1.8% from 1990. The tonnage carried by rail declined steadily throughout the period, while the figures for inland waterways remained flat, at least from 1990. In comparison with the tonne-km figures given in the preceding table, the tonnages in Table 2 suggest that the distances travelled by road increased on average over the period in question and that the loads carried by HGVs were probably smaller. This would mean, first, that HGVs were used for transport over longer distances and, second, that more deliveries were made to producers and distributors.

Table 2. **Transport trends on networks in Belgium in million tonnes**

	1970	**1980**	**1990**	**1994**	**1995**	**1996**	**1997**
Road	335	371	397	454	488	421	448
Rail	71	71	67	63	59	57	58
Waterway	91	101	100	103	106	107	100

Trends in modal shares

	1970	**1980**	**1990**	**1994**	**1995**	**1996**	**1997**
Road	67.4	68.3	70.4	73.2%	74.7%	72.0%	73.9%
Rail	14.3	13.1	11.9	10.2%	9.0%	9.7%	9.6%
Waterway	18.3	18.6	17.7	16.6%	16.2%	18.3%	16.5%

Source: Institut National de Statistique (INS) and ECMT (1999a).

Table 3 gives additional data for selected European countries for which sufficiently long time series are available: Austria, Germany, Belgium, France and the Netherlands. It shows very strong growth in road traffic at 11% per year since 1985. Rail traffic remained flat, while inland waterway transport increased slightly. Overall, the modal share of road transport is slightly lower than that obtained for Belgium. At present rates, it should increase further.

Table 3. **Trends in transport in selected European countries in million tonne-km**[a]

	1985	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Road	235 200	305 900	336 800	394 700	435 100	454 200	491 500	515 200
Rail	141 721	136 453	154 758	142 159	130 709	142 471	140 415	140 436
Waterway	95 922	105 157	105 781	105 945	101 725	110 110	114 957	112 047

Trends in modal share

	1985	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Road	49.7%	55.9%	56.4%	61.4%	65.2%	64.3%	65.8%	67.1%
Rail	30.0%	24.9%	25.9%	22.1%	19.6%	20.2%	18.8%	18.3%
Waterway	20.3%	19.2%	17.7%	16.5%	15.2%	15.6%	15.4%	14.6%

[a] Countries for which a full series is available: Austria, Belgium, France, Germany and the Netherlands.
Total domestic and international transport by domestic vehicles.

Source: ECMT (1999b).

While one might wish to be able to separate intermodal traffic trends and shares from overall traffic trends, it is unfortunately not easy to identify intermodal transport. In fact, a fair proportion of rail and inland waterway transport is intermodal, in the broadest sense of the term, since road transport is often required for the initial and terminal hauls. However, this traffic also includes conventional transport, in which freight is not carried in a single transport unit, container, trailer or swap body that can be transferred from one mode to another without intermediate handling of the goods. Basically, conventional transport is not considered as intermodal transport, although it may be just as useful a solution to current transport problems. The problem of definitions is returned to below. Clearly, however, the main advantage of intermodal transport, in the strict sense of the term, is that freight can be carried in the same transport unit by different modes, and this should make intermodal transfer more efficient and less costly.

Difficult as it may be to isolate intermodal flows, some data on volume trends are available from the statistics maintained by the International Union of Rail/Road Combined Transport (UIRR) and INTERCONTAINER, two major players in this sector. The trends for both are very different: the UIRR saw a sharp rise – 10% a year – in overall volume between 1989 and 1998 and an almost 20% increase in international traffic; INTERCONTAINER's growth rate was only 5.7% a year, mainly in continental container traffic, which increased by 8.8% a year. It is difficult to compare these incomplete data with the figures in the tables above. However, they do indicate that although road-rail intermodal transport is not necessarily increasing faster than road transport, it is still a rapidly expanding market segment for the railways.[2]

Furthermore, according to the statistics in the European Commission's Green Paper on Sea Ports and Maritime Infrastructure (1997b), container traffic in European ports increased by almost 11% a year from 1980 to 1994. It is unlikely that growth – dependent as it is on a healthy global economy – will be maintained at the same rate. Nevertheless, continued growth – even at the lower rate of 5% a year for the next 5-10 years – would pose enormous problems for ports and railways. This said, one must be objective about the relative scale of intermodal transport, in the strict sense of the term, since it may well account for less than 5% of international intra-European trade[3].

Table 4. **Trends in UIRR consignments (thousands)**[a]

	1989	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
International	422	538	588	649	674	852	969	1 048	1 140	1 167
Domestic	578	640	639	640	623	677	646	663	724	715
Total	1 000	1 178	1 227	1 289	1 297	1 529	1 615	1 711	1 864	1 882

[a] One consignment is equivalent to the capacity of one HGV, or 2.3 TEU.

Source: UIRR Annual Statistics, 1998.

Table 5. **Trends in the number of containers handled by INTERCONTAINER (TEU, thousands)**

	1985	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
Sea	513	492	496	494	611	661	676	623	655	738	700
Continental	330	340	380	429	463	447	524	571	493	549	619
Total	843	832	876	923	1 074	1 108	1 200	1 194	1 148	1 287	1 319

Source: SERV (1998).

This report does not venture to forecast the future growth of traffic volumes in Europe. Growth will depend, in the first instance, on the economic growth of the continent as a whole and on the recovery of the economies of Central and Eastern Europe. It will also depend on the transport and land-use planning policies adopted. Still, it is hard to imagine the economies of Europe not growing and generating proportionately larger volumes of traffic. However high growth eventually is, it will have to be dealt with appropriately by organising transport more efficiently. As things stand, transport absorbs quite substantial economic resources that add up to far more than infrastructure and operating costs. It also generates social costs that should be kept under firmer control and more fully taken into account in the organisation of transport. These external costs are dealt with in the next section.

2.2. External costs of the various modes

Freight transport is part of the production logistics chain and is therefore indispensable to the process of wealth creation. It requires the use of a range of economic resources for which the market sets the price: the amount of resources that transport requires is reflected in prices and charges. These prices influence the transport decisions and choices made by producers, shippers and forwarders, for whom they represent a cost. However, over and above these covered costs and the productive activity they relate to, transport also generates external effects that directly affect other activities whose costs are not covered. These can be significant effects and can vary from one mode or means of transport to another. This section gives some estimates of the external costs of transport in Belgium, particularly road transport costs, which clearly confirm the benefits to be gained from substituting inland waterway and rail transport for road transport wherever feasible and give some idea of what is economically justifiable.

The estimates are based partly on the findings of a number of recent studies conducted under research programmes initiated by the European Union and the Organisation for Economic Co-operation and Development (OECD) and partly on the work of the Group on Transport and Mobility (GTM), which earlier analysed trans-European freight transport networks. The NODUS software used to generate GTM's model allocates transport flows to the mode and means of transport used and to routes that minimise the generalised costs of transport operations as defined by an origin-destination matrix.[4] The generalised costs include the value of time and take the value of goods transported into account. Each individual transport operation at every point on the geographical networks, including intermodal transfer points, is identified separately by systematically generating a virtual link. This technique enables an in-depth analysis of intermodal alternatives. For the purposes of this report, some results of a study conducted jointly with STRATEC, a consulting firm, for the Walloon Region Ministry of Transport (1999) are included. In this study, Belgian road, rail and inland waterway freight networks, as they currently connect with European networks, were modelled in detail on the basis of the ten NST/R categories.

Pollution costs are the first category of external cost that must be estimated. Calculating the effect of pollution on health is a difficult exercise and there is much ongoing research in this area. The estimates are based partly on medical research into morbidity and mortality rates for concentrations of pollutants and partly on an economic evaluation of the costs generated by these effects. Without going into the studies in great detail, Table 6 shows an estimate of the effects of airborne particulate concentrations and tropospheric ozone on the Belgian population. Other effects could doubtless be included, but cannot be estimated owing to insufficient data. The monetary valuation of deaths is based on a statistical life valuation in 1995 of ECU 4 452 955;[5] losses due to a range of illnesses are evaluated on the basis of treatment and hospitalisation costs, while others are assessed on the basis of reduced productivity.[6]

Table 6. **Cost per gram of pollutant emissions in Belgium (mECU in 1995[7])**

Pollutant: **Effect on health:**	**PM_{10}**	**NOx**	**VOC**	**SO_2**	**CO**	**CO_2**
Concentration of PM_{10}	88.745	8.061	1.606	100.005		
Concentration of O_3		5.537	1.419			
Effect on global warming					0.009	0.006
Effect on vegetation		1.167		1.834		
Total per gram of pollutant emitted	88.745	14.765	3.026	101.839	0.009	0.006

Source: Authors' calculations based on the ExternE Report and Mayeres *et al*.

Table 7 gives emissions of a range of pollutants per t-km for three modes.

Table 7. **Pollutant emissions for three modes (gram per t-km)**

Pollutant: **Emissions from:**	**PM**	**NOx**	**VOC**	**SO_2**	**CO**	**CO_2**
HGVs	0.039	0.647	0.089	0.045	0.174	53.703
Rail	0.007	0140	0.016	0.021	0.027	19.422
Inland waterway craft	0.020	0.232	0.009	0.041	0.098	44.027

Source: COST 319 (1999) and RIMV (1998).

Based on these two tables, the total cost in 1995 of pollution generated by road transport can be valued at ECU 18.2 million per t-km, compared with only ECU 5 million per t-km for rail and ECU 9.5 million per t-km for inland waterway. Using the results of the analysis of freight traffic on Belgian networks for these three transport modes,[8] the costs of pollution by road transport can be valued at ECU 570.585 million in 1995, rail transport at ECU 36.324 million and inland waterway transport at ECU 53.5 million.

Road congestion at peak hours is another source of external costs, since it slows traffic and increases journey times. This, in turn, means longer working hours and vehicle running hours and also adds to the inventory costs of the freight carried. A breakdown of the generalised costs of road transport by freight category estimates these induced costs at ECU 34.354 per vehicle-hour on average for 1995, taking into account the total cost of running a vehicle (labour, diesel, insurance, cost of vehicle and servicing) and the value of the different types of freight carried. Based on the peak hour traffic flow estimates on various roads from the authors' analysis of Belgian networks, the overall loss for road transport is estimated at ECU 743.1 million at such times. This estimate does not include a value for time lost by the various passenger transport modes. The actual costs of congestion due to road freight transport are therefore much higher than this estimate. While congestion may be more characteristic of road transport, capacity on certain lines of the rail network is also a problem.

However since a more systematic approach and more detailed data would be needed to analyse rail transport, no attempt was made to assess this mode. In contrast, there is no congestion on Belgium's inland waterway network.

Other costs to be factored in are the external costs generated by accidents, *i.e.* the portion of social costs that is not borne by those responsible for accidents. In the case of road transport, these are basically police and ambulance costs which are borne by local authorities. In accidents involving pedestrians, the loss to those injured and their families should also be taken into account. In Belgium, given the frequency and severity of accidents involving HGVs outside built-up areas, external costs for 1995 can be estimated at ECU 0.1295 per t-km, or a total cost of ECU 406.1 million for the Belgian public.

The same valuation methodology was used for accidents occurring at railway level crossings. In this case, as for road accidents involving pedestrians, all losses were factored in. The external costs amounted to ECU 0.00243 per t-km, a total of ECU 17.550 million in 1995. On inland waterways accidents are extremely rare.

Table 8. **Accident risk per t-km and by degree of severity in Belgium**

Mode: **Severity:**	**Road**	**Rail**
Fatal	4.473E-09	4.2536E-10
Serious	2.2935E-08	7.9755E-10
Minor	7.004E-08	1.8344E-09

Source: INS, SNCB, authors' calculations.

The figures for noise are taken from the OECD report, *The Environmental Effects of Freight* (1997). On this basis, the total cost of noise generated by road freight transport in 1995 in Belgium was estimated at ECU 208.51 million. For rail, the total was only ECU 22.403 million. Noise nuisance for inland waterway transport is probably negligible in Belgium.

Some of the findings are given in Table 9 and show that the average external costs per t-km for freight carried by HGVs are about six times higher than for inland waterway transport and rail transport (for which congestion costs could not be given). Based on the volumes transported by each of these modes in Belgium, total estimated external costs for road transport amount to ECU 1 928.432 million for 1995, compared with only ECU 76.277 million for rail and ECU 53.5 million for inland waterway. These figures clearly show the scale of the problem posed by road transport in Belgium. Of course, the reason that road transport is used so extensively is because it provides an efficient, high-standard service to producers and distributors. It therefore makes a substantial contribution to the country's productive activity. Nevertheless, these findings demonstrate that transport also generates major costs which decision makers do not always take into account. There are therefore serious grounds for concern that the use of road transport on such a scale is not an efficient use of the country's productive resources. It is important to consider how far intermodal transport solutions could help to alleviate these problems.

Table 9. **External costs per t-km for the three modes (ECU 1995)**[9]

Mode: / External costs:	Road	Rail	Inland waterway
Congestion[10]	0.02370	?	0
Pollution	0.01820	0.00503	0.00955
Accidents	0.01295	0.00243	0
Noise[11]	0.00665	0.00310	0
Total	0.06150	0.01056	0.00955

Source: OECD, 1997, for road and rail noise, and GTM calculations.

3. COMBINED TRANSPORT PROBLEMS

3.1. Definition and general problems

At this point, it may be useful to define the terms "multimodal transport", "intermodal transport" and "combined transport". The following are the definitions proposed by the ECMT[12], which has also attempted to standardize terminology in different languages.

The broadest term is of course "multimodal transport", which refers to the carriage of goods by at least two different modes of transport. Intermodal transport also uses several modes of transport, but in this case, the goods are carried in the same loading unit or vehicle throughout, without intermediate handling of the goods at transfer points. They may be carried in a road vehicle, for example, an HGV or trailer, or an intermodal transport unit (ITU), such as a container or swap body. According to the European Commission, however, this definition is too restrictive, since unitisation is only one possible, although important, means of facilitating the modal transfer of goods[13]. Indeed, the basic problem is how to replace road transport by rail and inland waterway transport. Intermodal transport, in the strict sense of the term, is one good alternative, but others should also be considered, especially since a number of problems can arise with intermodal transport. We address these problems below.

Combined transport is a more limited form of intermodal transport in which the major part of the European (in the broadest sense) journey is by rail, inland waterway or sea, and any initial and/or terminal haul carried out by road is as short as possible. In this case, in contrast, the European Commission is proposing a more restrictive definition under which the road transport leg would be no more than 20% of the total distance covered. This is the form of intermodal transport – limited to European journeys but inclusive of European short sea shipping – addressed here, since the focus of this report is inland freight transport problems. Intercontinental maritime/road transport, another type of intermodal transport, is therefore outside the scope of this report. However, the pre- and post-shipment haulage of maritime intercontinental freight by rail, inland waterway and feedering are covered, especially since they often overlap with intra-European combined transport and the two flows are increasingly handled by the same operators. Moreover, port terminal operations and transfers to vessels or goods trains from other continents are one of the problem areas of intermodal transport that warrant close attention.

Combined transport can take a variety of forms: piggyback transport, which combines road and rail modes; rolling motorways, which allow full road vehicles (accompanied or unaccompanied) to be carried on low-loader wagons; roll-on/roll-off (Ro-Ro) transport, which enables road vehicles to drive straight on and off ferries and finally lift-on/lift off (Lo-Lo) methods, which use lifting gear to load transport units onto and off vessels.

There are many forms of combined transport, then, particularly considering that further distinctions can be added depending on the type of equipment used: special wagons and vessels, different container designs, loading gauges and transfer techniques. The organisation of modal and intermodal networks and their geographical layout are also factors that play a key role in defining competitive intermodal transport.

In order to compare the costs of transport by different modes, it is essential to base the analysis on the concept of generalised costs. These obviously include all the costs of freight movements, including the movement of the necessary loading units, such as containers; the costs of loading, unloading and transfer, as well as the costs of any other handling operations at groupage and break-bulk points. They also include a value for damages that can occur to goods during transport, and particularly transhipment, the capital cost of the goods and depreciation during transport. They further include inventory costs to the consignee, which will depend not only on the speed of turnover, but also on transport procurement and organisation costs, the quantities transported per unit of transport, delivery times, time in transit and reliability. Finally, the concept should include other more qualitative factors such as relative responsiveness to variable flows, information available during transport and ease of administration[14].

Modern logistics management seeks to minimise all of these costs, particularly inventory costs, by setting up a permanent communications system with suppliers to ensure that deliveries arrive as and when needed on a virtually continuous and extremely reliable basis. This is “just-in-time” distribution, which reduces, through more frequent deliveries of small quantities, the inventory that customers have to carry. It opts for the methods of transport with the shortest delivery times, since it enables a reduction in the total value of stocks held at the consignee's plant and during transport. Shorter transport times make it possible to tailor supply more rapidly to needs and also tend to reduce variations in delivery times.

In order to keep better track of deliveries of goods to customers and the quality of their distribution service, firms also tend to centralise customer information services and to have fewer distribution centres (Colin, 1992). This has led to more deliveries of smaller quantities over longer distances. Sometimes transport is outsourced to specialist firms that provide a full range of services and shipment tracking via their own networks.

Compared with road, combined transport is generally handicapped by the extra costs of transfer, either at the point of origin – where goods are first loaded onto an HGV before transfer to a wagon or vessel – or at the destination, where a terminal haul by road is still needed. A further transfer may also be necessary during the line-haul leg, for example, if part of the transport operation is by inland waterway vessel and another part by train, HGV or short sea shipping. Transfers are expensive, increase the risk of damage and add to transit time[15]. According to a report by A.T. Kearney (1990), the commercial speed of combined transport is only 37 km/h on average, whereas road transport can reach speeds of nearly 70 km/h.[16] This average performance does not seem to have improved over the last few years. Furthermore, compared with road transport, where goods are necessarily accompanied, reliance on several different operators for unaccompanied goods transport poses co-ordination and communication problems and results in less regular shipments. This is a complex problem and its solution will require much more sophisticated methods than are needed for solving road transport problems. Currently, information systems are generally designed for a single mode and railway information systems for only one network with no links to other railways along the same corridor. All of this considerably complicates procurement management for firms, which have to increase their reserve stocks. As Rothengatter (1999) aptly puts it, the success of intermodal chains hinges on the quality of transfer points and the ability of the transport chain to withstand disruptions.

Another aspect of the problem is the need to co-ordinate departure and arrival times of rail shipments with the normal working hours of firms' production and distribution activities as well as with train path availability for rail freight. Documentation, groupage and loading operations at the forwarder's premises and at terminals take time, with the result that combined transport is often an impractical solution for some firms, particularly for small shipments.

Consequently, combined transport is competitive mainly for transport over long distances for which better rates per kilometre by rail, short sea shipping or inland waterway transport can make the difference. Distances of at least 500 km are frequently mentioned[17] in the literature. Another reason why combined transport is competitive over long distances is that, by law, drivers cannot work more than eight hours a day. After eight hours, equivalent to a journey of around 600 km, HGVs have to stop or continue with another driver. This adds substantially either to journey time or to costs, unless driving times are falsified, which can be difficult to verify in international transport. The savings that can be made by falsifying driving times on these journeys can be anywhere up to 30%.[18]

This said, one should be wary of generalisations about the distances over which combined transport is competitive, since transport times and regularity depend to a great extent on the nature of the route, the borders and natural obstacles to be crossed, network characteristics and standardisation, equipment used and efficiency at terminals. The value of goods is also important, since it determines the opportunity costs of carrying inventory. The type of goods, their fragility and the packaging used can also be major factors, as can the organisation of the customer's production and distribution services and its tolerance for late deliveries.[19] In addition, several intermodal rail and inland waterway shuttle services departing from Rotterdam and Antwerp have reported very high volumes over quite short distances. In such cases the economies of scale make combined transport profitable.

Of course, problems in organising the logistics of combined transport are easiest to solve if there are high volumes on links between given terminals. In these cases, frequent regular shuttles of direct shipments can be run to strict timetables; it is also easier to put in place appropriate commercial services. In fact, combined transport by rail and inland waterway can often operate on an economical scale only by consolidating flows of goods and setting up appropriate bundling networks.[20] Where this is done, some savings on transport costs are possible, for instance by using larger transport units with a higher load coefficient and more frequent services. These advantages can, to some extent, offset any added costs, detours or time lost on consolidation and transfer.

Be that as it may, combined transport is generally only competitive over long distances, while most transport by road is now over distances of much less than 500 km. Indeed, an estimated 85% of freight transport in Europe is over distances of less than 150 km. Combined transport could only ever take on a small fraction of that traffic. However, longer average transport distances principally resulting from industrial relocation, will go some way towards increasing the tonnages likely to switch to multimodal transport.

This analysis of the problems of combined transport highlights the three factors that warrant attention, if combined modes are to be more of an alternative to road-only transport: the reduction of transport costs and transport times through efficiency improvements as well as the improved service quality that can be achieved by an integrated approach to combined transport. In fact, these three aspects are closely linked.

Since most combined transport is long-distance transport, it follows that the competitiveness factors should be approached from the viewpoint of a European or world network. They will necessitate standardization or, at the very least, compatibility of network technologies and equipment, uniform network clearances, the promotion of standard loading units, efficiently organised terminals and the development of high-performance, integrated commercial services throughout the international logistics chain. All the countries of Europe must reach agreement if these problems are to be resolved.

3.2. Combined transport by rail

3.2.1 Costs and technologies

As regards the efficiency of the railways, the results of comparative studies on the operation of European railways[21] show that some railways are twice as efficient as others. Of course, operating conditions vary from one country to another, but factors such as population density or geographical features do not appear to explain the disparities in efficiency. In contrast, differences among companies in terms of the independence of management seem to be a significant factor. Undoubtedly, certain railway companies have made progress, particularly by developing better terminal and hub facilities capable of meeting growing demand for combined transport, but there is still plenty of scope for improvement both in handling operations and in transport itself.

In addition to improving overall productivity in the rail sector, some streamlining on a Europe-wide scale could reduce the costs of combined transport. Moves in this direction by associations of transport operators - the International Union of Railways (UIC), the Community of European Railways (CCFE) and the International Union of Rail/Road Combined Transport (UIRR) – and policy institutions such as the European Conference of Transport Ministers, the European Commission and the United Nations Economic Commission for Europe are to be welcomed.

It was under the aegis of the United Nations that the European Agreement on Important International Combined Transport Lines and Related Installations (AGTC) was signed. The European Union, for its part, defined a European combined transport network, listing around 50 rail and waterway links that will need to meet certain standards for combined transport. In practice, this means standards for clearances, for track gauges and gradients, speed limits, length of emergency sidings, axle loads, electricity supply, signalling, driving regulations and control, train formation and performance, radio communication with trains and terminal equipment. Some of the discrepancies between national networks require a change of driver and locomotive at every border, which causes further delays. Needless to say, standardisation of the above elements would benefit all types of rail transport.

Obviously, not all of these differences can be eliminated rapidly, since the relevant infrastructure and equipment are often expensive and have a long service life. In fact, it is more sensible to aim at making equipment compatible as soon as practicable rather than at standardisation in the short term. This is also the more prudent course, since transport technology is changing and in certain cases specifying a single technology may prove to be a mistake.

Furthermore, differences in standards and equipment are the result of national industrial transport and equipment policies that have been implemented for over a century by public sector services with a domestic monopoly. This is an economic problem, because national industries are necessarily affected by new infrastructure equipment policies. Last but not least, it is a psychological and political problem that will require much time and effort as well as strong political determination to overcome.

It should be noted, too, that the railways are affected by congestion along some major corridors that are used both by slow freight traffic and by fast passenger trains which have priority during the daytime. The establishment of freight priority routes, better traffic control and faster goods trains, such as the new "cargosprinter" rolling stock, could go some way towards alleviating the problem, although the number of tracks should also be increased on certain routes. Fast passenger train networks are already doing this indirectly to a certain extent. Another problem is that practically all high-capacity European railways are electrified. In most cases this seriously complicates transfer operations, which must take place off the electrified network after a change of locomotive for marshalling.

3.2.2 Loading gauges and loading units

To build an integrated European network, all the technical points referred to above are important. It would be particularly helpful to increase width and height clearances on certain major routes so that larger loading units (containers, swap bodies and trailers) could be used without the need for costly special vehicles. This would reduce the unit costs of transport and would also integrate rail more closely into the intermodal chain. Increasing clearances is quite practicable on new lines but unfortunately extremely costly for old infrastructure, where this would be possible only in the distant future. In the meantime, the use of low-loader wagons is an acceptable alternative on certain corridors. The new freight transport companies recently set up in the United Kingdom appear to be leaning towards this alternative.

The clearance problem is closely linked to the choice of intermodal transport technology and to the choice of loading unit capacity. Among the piggyback technologies, the carriage of full road vehicles may have advantages on certain links, particularly where there are natural barriers. This technology uses lighter terminal equipment but requires a lot of parking space and the use of more expensive wagons. It is an expensive system, especially where vehicles are accompanied. It may not be a solution for future large-scale combined transport in Europe, especially as it requires lines with high height clearances. The carriage of semi-trailers is less problematic but costs more than transporting swap bodies and containers with no chassis or suspension system.

Discussions at international level on the dimensions of loading units are proceeding with difficulty. It seems that no one solution satisfies all the parties concerned. There are two different types of containers: continental containers developed for rail and road transport, which are compatible with palletised loads, but need special handling equipment; and ISO/sea containers, which are widely used throughout the world and can be stacked high. Given the trend towards the use of larger containers, especially in the United States, and the fact that the commonest sea container sizes are not really compatible with the standard palettes used mainly in Europe, the International Organization for Standardization (ISO) has proposed larger standards for new containers which would solve both problems. However, the new standards have met with almost universal opposition: sea and inland waterway operators thought that they would substantially reduce the capacity of existing vessels; rail operators were concerned about clearance problems and also thought that wagon capacity would be reduced; terminal operators were afraid that they would have to replace some of their installations and most European countries could not allow such wide, high and long containers to be routinely transported on their roads because of insufficient bridge and tunnel clearances and safety considerations. Lastly, the developing countries were also opposed to the new standards, since a new generation of intermodal units would only serve to exacerbate the trend towards a two-tier worldwide intermodal system, which had already put them at a disadvantage. Similar reservations apply to the least developed peripheral regions of Europe. A related problem arises for swap bodies, which are used mainly in Europe and which have many different designs. The European Committee for Standardization (CEN) is currently drafting new compatible standards for continental containers and swap bodies to take account of the requirements of rail as well as road and inland waterway transport. Containers for these modes would all be stackable to a height of four containers, which is particularly important for inland waterway transport.[22]

It is to be hoped that a compromise solution that will enable the use of standard loading units for all modes can be reached before long. If not, there is a danger that changing and increasing logistics requirements will reinforce the trend towards non-standard transport units. This would prejudice intermodal solutions and make it difficult to reduce empty returns of loading units. If rail is to play a major role in combined transport, a compromise solution would have to allow specifically for railway clearances. It is also important for the dimensions specified, particularly unit width, to be compatible with the dimensions of standard palettes and enable the use of mechanised loading and unloading methods so that the entire transport chain, from producers' palette to retailers, via terminals and distribution centres, can be fully co-ordinated and efficient.

Only if these technical requirements are met will it be possible to achieve a substantial reduction in both costs and transit time for road-rail combined transport by reducing the number of transfer operations and the time required for them. However, a prerequisite would be to gear the organisation and integrated management of the logistics to supplying services tailored to the needs of shippers: trains as direct and fast as possible, regular services with satisfactory timetables and reliable delivery times, efficient terminals with sufficient capacity to reduce waiting times for the delivery or collection of loading units by road vehicles, full and accurate information, with clear pricing and easily understood documentation, a high degree of safety consciousness, clear definition of liabilities and convenient methods of insurance, an automatic identification system to speed up the handling and turnaround of loading units and vehicles, a parallel integrated information network on the goods transported to enable freight flow management and shipment tracking by the customer, etc. In addition, customers should be able to speak to one contact who can provide all the documentation necessary and make firm commitments on all transport matters and services.[23] To be able to deal with some of these problems, terminals should also take an active part, by becoming logistics service centres where goods are stored and distributed, shipments are bulked and deconsolidated and where all transport ancillary services are available.[24]

3.2.3 Outlook

This long list of the needs and expectations of potential combined transport customers leads naturally to the question of the organisational structure that could deliver this programme and make combined transport more competitive. Clearly, combined transport needs the kind of structure and determination that can provide an integrated logistics service, as exists for international parcels and express deliveries sector. With the European Union's current policy of liberalising the railways and making them accountable both financially and commercially, rail companies will have to seek new forms of organisation to meet these challenges. This process is already under way.[25] The organisation and commercialisation of combined transport will have to be geared to the markets to be served, *i.e.* the transport routes, rather than being modelled on the structure of transport providers or on the combined transport techniques used, as is still the case today.[26]

Clearly, however, the actual opening up of the railway networks to other rail companies and to other transport operators, in accordance with the decision taken by the European Community, should inject a further dose of competition and innovation that will be to the advantage of combined transport[27] at least in the long term. In the meantime, it is necessary to take care that the many local and private initiatives receiving support from public regional authorities do not create too many small facilities that would be insufficiently profitable. This would make it impossible to achieve the economies of scale that combined transport needs and would hinder its development.

3.3. Combined transport by inland waterway

This type of combined transport basically entails the carriage of sea containers from and to ports and their hinterland. It poses far fewer technical problems, although the overhead clearances under most bridges, with the exception of a few main inland waterways, reduce the number of containers that vessels can carry. For instance, on the lower Rhine, ISO containers can be stacked four high, but only two can be stacked on the Rhine-Main-Danube canal. This practically doubles the unit cost. The cost of transporting the swap bodies currently used, which cannot be stacked, is also higher. Similarly, given the dimensions of vessels and canals, loading unit dimensions can cause problems, as they can make a substantial difference to the number of containers that can be transported. The United Nations Economic Commission for Europe has also looked into the problems of inland waterway transport. Its work resulted in the signature by 17 European countries in 1997 of the European Agreement on Inland Waterways of Major Importance (AGN), which specifies minimum standards for inland waterways and transhipment terminals. In addition, as mentioned above, the CEN is in the process of drafting new standards for continental containers and swap bodies which will be compatible with palette loads and can be stacked up to four high. This development should encourage combined transport using inland waterways for the carriage of goods within Europe.

The types of problem encountered by combined transport with an inland waterway leg are fairly similar to the problems encountered by rail and road transport. Specifically, it is necessary to handle transfers in a cost-effective way. This requires appropriate equipment, which is financially justified only where there is sufficient traffic. Wherever feasible, terminals should serve both waterway and rail transport, so that traffic volumes will be sufficient and, at the same time, provide a broader range of services. If co-operation cannot be achieved, terminals may not be opened or maintained in regions with smaller volumes. As combined transport can benefit from a closely knit network, all operators stand to gain from co-operating.

Naturally enough, this type of combined transport centres mainly on port business. One of its advantages is therefore the possibility of transferring containers directly from ship to barge and barge to ship. This practice, which obviates the need for any intermediate handling, is already in use to some extent but could be better organised. Indeed, given the nature of sea shipping operations and the very high costs of waiting times and delays in this sector, it is essential for inland waterway services to be very regular and frequent or at least highly responsive. In this respect, longer lock operating hours would be desirable in many places so that arrival at a lock slightly behind schedule does not mean an eight-hour delay. We should note that the abolition of the chartering by rotation system for all inland waterway transport will improve the organisation and efficiency of this type of transport and facilitate its use in combined transport. Indeed, the substantial cost savings of approximately 30% that have been seen on previously protected waterways since the system was ended and the greater freedom that this affords charter firms are substantially improving the competitive position of inland waterway transport. These two factors are also behind the formation of co-operatives, which enable operators to offer better services to shippers and forwarders.

Combined transport by inland waterway has grown substantially on the Rhine from Basle and Strasbourg to Antwerp and Rotterdam, as well as on certain links from Hamburg in Germany, on the Seine and in the north of France, and in the Benelux countries. Not all of the terminals on the Rhine are far from these ports; Nijmegen and Emmerich, for instance, do substantial business. In some cases, therefore, combined transport by inland waterway can be profitable even over relatively short distances, provided that it is well organised, as it is between Antwerp and Rotterdam.[28] Efficient organisation is as important for this type of transport as it is for combined transport by rail. All of the successful ventures in this field are noted for the involvement and co-operation of all of the actors concerned – shippers, port authorities, maritime shipping lines, barge and river vessel operators – in establishing regular, frequent services with a straightforward, comprehensive pricing system and facility sharing by all operators.[29]

A final point is the potential offered by "inland waterway/sea" units with retractable ramps, which enable loading and unloading in inland ports such as Liege, for example, for transport by sea to ports in the United Kingdom or Scandinavia without transferring cargo to a larger vessel. In a combined logistics chain, this type of transport can be highly profitable on certain routes for bulk goods, wines as well as metallurgical products or paper. There is considerable potential for services to northern Europe with links to the Vänern, Mälaren and Saimaa lake systems and in Russia. On routes where overhead clearances allow boxes to be stacked three or four high, inland waterway/sea transport widens the range of ports that can be served.[30]

3.4. Combined transport by short sea shipping

Short sea shipping is defined as transport involving a sea or ocean leg without an ocean crossing. Combined transport with this mode is not necessarily limited to Ro-Ro carriage of goods vehicles or semi-trailers; it is also used to ship goods in containers or swap bodies. While it is difficult to estimate the share of combined transport in short sea shipping, it must be increasing with the use of containers, which are now beginning to be used for "break-bulk" consignments. However, as an indication of the scale of this type of transport, short sea shipping accounts for 38% of the business of European ports. Obviously, the smaller the port the proportionately greater share of short sea shipping. For instance, in Belgium, short sea shipping accounts for 40% of Antwerp's traffic, 38% of Ghent's (quite specialised), 60% of Zeebrugge's and 100% of Ostend's.

The European Commission will shortly publish a report on this mode of transport. Meanwhile, according to some estimates, short sea shipping accounted for 43% of intra-Community freight transport in 1997. In tonnage terms, however, its share is still only 6% (the difference between the two figures can be put down to the quite long average distance of intra-community shipments by sea). Plans for "maritime motorways" roughly parallel to the coast are on the increase, no doubt in response to congestion on certain land routes.[31]

As with all combined transport, the crucial aspect of this transport option is the transfer of goods in ports. Obviously, the problems differ from one port to another. Generally, they are that the infrastructure and handling equipment available for short sea shipping are not always adequate, administrative and customs procedures can be quite complex, working hours are often inflexible and productivity low, rates are high and information systems are inadequate and differ from one port to another. Regrettably, procedures also vary from port to port, which complicates the work of shippers and carriers.

3.5. Bundling networks and terminals

The problems of terminals have already been mentioned several times. The essential role they play in combined transport and bulking operations warrants special attention. Transfer and fast handling of swap bodies and containers requires well equipped or automated terminals that are organised so that no time is wasted in the logistics chain.

However, such terminals are costly and are warranted only for large volumes. To ensure operations on the requisite scale, flows of goods have to be consolidated and one can only recommend the sharing of terminal facilities by different operators and types of transport, including inland waterway transport. Furthermore, to reduce delays, the groupage, documentation and various handling operations of forwarders and agents would best take place at logistics facilities located within the terminals. This would also help to reduce nuisance from HGV movements for local residents.

Another way of ensuring sufficient transport flows to justify well-equipped terminals and efficient transport techniques is to establish bundling networks,[32] of which the best known is the dedicated spoke network around a central terminal or "hub". The hub is dedicated to swapping transport units between the vehicles of a single mode: its role is to consolidate units from different points of origin and distribute them to common destinations. A network structure such as this brings economies of scale for transport, but it is costly in terms of time lost in swapping transport units at the hub. Time spent at the hub commensurately reduces actual transit time and the distance that can be covered while the network is open for goods transport at night. Here again, it is important for the hub to operate as efficiently as possible.

Obviously, other types of bundling networks may be better suited to certain transport requirements. Indeed, the density of industry, its characteristics and topology, which vary from one region to another, rule out any simple recommendation for the organisation of networks and transfer techniques. Each case warrants a separate study to determine the configuration that will provide the services best suited to its needs. While this does not necessarily require sophisticated technologies, it inevitably requires painstaking organisation of all operations.

4. EUROPEAN POLICY

Given the increase in passenger and freight transport and the environmental costs generated, the European Commission proposed in its Communication to the European Parliament (1997) the promotion of a rational and balanced use of existing capacity within the European transport system, based on an integrated, comprehensive approach to the efficient use of the various modes. To this end, it considers that door-to-door intermodal transport solutions should be sought and promoted in order to optimise the transport system. It feels that it is no longer sufficient to pursue isolated modal-based policies. Optimisation should be based on an analysis of shippers' and forwarders' requirements so that the entire logistics chain – from producer procurement to product distribution and the transport and disposal of waste – can be efficiently organised.

The Commission points out that this policy cannot be implemented unless advanced information and communication services link the various components of the logistics chain. In addition, it notes that intermodality complements the European Union's other transport policies. In fact, it can only be developed if there are efficient connections between European networks and if transport markets are open to competition with prices that reflect the real costs of transport activities.

In its Communication, the Commission notes all of the problems discussed above – problems regarding the multimodal meshing of the trans-European network, the disparities between existing equipment and organisations in different modes and countries and the inefficiency of certain operators. It has put forward a series of recommendations and resolutions aimed at rectifying these problems: including network reviews, the redesign of interchanges and terminals, harmonisation of standards, the co-ordination of intermodal timetables, the integration of transport and logistics through integrated operators, the development of compatible telematics systems to co-ordinate and inform the markets, open access to infrastructure, the development of common pricing and charging principles, the supervision of the terms of competition and controls on state aid, support for technical, statistical and economic research on intermodal transport. Clearly, there is a great deal to be done to ensure that intermodal solutions are technically and economically efficient, but also to reorganise the entire European transport system.

5. COMPETITIVENESS OF INTERMODAL TRANSPORT

5.1. A few case studies

It is easy to see that intermodal solutions are being used, but extremely difficult to quantify their use, because the data available are so incomplete. First, it is not easy to identify intermodal traffic and much rail or inland waterway traffic, which is in fact intermodal, is not counted as such. Second, no doubt as a result, the category "intermodal transport" does not appear in official statistics. It is therefore difficult to gauge the scale of intermodal transport and intermodal transport trends. It is even more difficult to assess how competitive it is, since a great deal of information that would be useful in this respect is confidential, particularly where rail transport is concerned.

In its *Report on the Current State of Combined Transport in Europe* (1998), the ECMT attempted to estimate some of the costs of combined transport and documented the results of three case studies: two on unaccompanied combined transport between Brescia and Cologne and between Verona and Munich via the Brenner route and one on accompanied transport over a distance of 648 km between Austria and Hungary. The results are drawn from published rates and cost estimates. The report concludes that "unaccompanied combined transport is capable of competing on prices with road transport, especially in cases where road haulage costs are increased by transit charges, road usage fees, or motorway tolls, as in the case for transit through Switzerland and Austria. Unaccompanied combined transport operations that include an inland waterway and coastal shipping haul are also able to compete with long-distance road transport. The biggest challenge, however, is to provide the level of service which shippers require…". The report also points out that the inland waterway mode can be advantageous in intermodal transport operations, where waterways permit, and adds that intermodal solutions are the most competitive for bulk cargoes and where there are gross weight restrictions on of vehicles.

5.2. Some simulations

The results of several studies on transport problems on the trans-European network, using the NODUS model and software described in Section 2.2 above, illustrate and confirm these conclusions. In the first case, the study focused on the problem of crossing the Alps (Switzerland has imposed weight restrictions of 28t GWT on lorries[33]). Following protracted discussions with the European authorities, this restriction will soon be replaced by a tax. Since data on interregional flows of goods to and from Italy over the Alps in 1994 are available,[34] an attempt was made to assess the impact of the 28 tonne weight limit on the distribution of traffic between northern Europe and Italy on the three road or rail routes passing through France, Austria and Switzerland. An attempt was also made to assess the impact of the two levels of tax initially considered by the Swiss authorities, *i.e.* CHF .016 and CHF .03 per kilometre and gross authorised tonne. Table 10 gives the main findings in t-km.

Table 10**. Estimated modal share in tonne-kilometres per region (millions)**

		28 tonnes		**40 tonnes**		**CHF .016**		**CHF .03**	
		Million t-km	**%**	**Million t-km**	**%**	**Million t-km**	**%**	**Million t-km**	**%**
Switzerland									
	Rail	3 362	67	189	2	658	8	2 533	46
	Road	1 638	33	11 347	98	7149	92	2 929	54
	Total	5 001	100	11 537	100	7 808	100	5 462	100
Other countries									
	Rail	38 451	44	20 423	26	29 074	35	36 937	43
	Road	48 724	56	59 104	74	53 811	65	49 277	57
	Total	87 176	100	79 528	100	82 886	100	86 215	100
Total									
	Rail	41 814	45	20 612	23	29 733	33	39 470	43
	Road	50 363	55	70 452	77	60 960	67	52 207	57
	Total	92 176	100	91 064	100	90 694	100	91 676	100

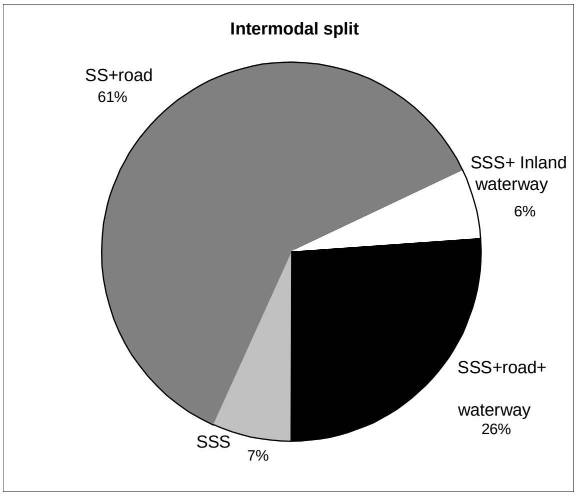
Source: GTM calculations, Demilie *et al.* (1998), Beuthe *et al.* (1999a).

Column (1) shows the tonne-kilometres and modal share estimates for 1994 obtained using the model; column (2) gives the figures that would apply if there were no 28 tonne weight limit; column (3) shows the results of a tax of CHF .016 per tonne-km with no 28 tonne limit and no road tax; and column (4) shows the results for a tax of CHF .03 under the same conditions.

First, the removal of the 28 tonne weight limit would have a substantial impact on traffic through Switzerland: rail usage would decline to negligible levels while road transport would increase so much that total traffic through Switzerland would double. This traffic would be diverted from current flows via Austria and Switzerland. However, rail transport would also decline in other countries, while road transport would increase more or less naturally. The CHF .016 tax would not be enough to reinstate the baseline situation. The CHF .03 tax would go some way towards restoring traffic flows, but the modal share of road would be much higher than previously. Taking into account the increase in capacity that a 40 tonne limit would allow, traffic through Switzerland – calculated in vehicle-kilometres – would increase by 19%. Since, in a context of increasing traffic throughout Europe, a regulatory instrument that would contain flows at roughly the same level as in the 1994 baseline situation would be desirable, additional taxes would still have to be levied on certain mountain passes.

The next case focused on dry bulk transport between Spain and Germany and between Spain and the Benelux countries[35]. Here, various combinations of four different modes were analysed simultaneously: rail, road, inland waterway and short sea shipping. Short sea shipping, in combination with other modes on the trans-European network, was clearly the principal mode for this type of market, where it holds a 95.9% share. Using the same methods and a trans-European origin/destination matrix constructed from Eurostat data for 1991, after calibration for overall market shares[36], the model was used to calculate the percentage utilisation of short sea shipping in combination with other modes. The following figure shows the results obtained and the inevitable complementarity of modes on this market.

Figure 1. **Intermodal split of short sea shipping (SSS) tonnage in 1991**



Source: GTM calculations, Demilie *et al.* (1997).

A series of simulations was also run using varying transport cost values for each mode. It was thus possible to calculate the impact of these variations on the respective modal shares as well as the relevant arc and cross-elasticities. Table 11 shows how modal share varies with road transport costs. The results are given in tonne-km, reflecting the actual activity of the different modes. When road transport costs fall, the modal shares of the other modes decline, but the reduction has to be substantial before there is any significant increase in the share of road haulage. The reverse occurs, to a certain extent, when road haulage costs rise. However, when the increase exceeds 10%, the share of short sea shipping decreases, while the share of rail continues to rise. The reason is that short sea shipping is more dependent than rail on road transport for terminal hauls. The main impact of variations in the cost of short sea shipping and in rail transport is on the share of rail transport. This suggests that rail has good potential for dry bulk transport over long distances. The table also shows the role that inland waterway transport can play in conjunction with short sea shipping for this type of transport.

Table 11. **Effects of variations in road haulage costs on modal split**

	Modal share (% of tonne-km)			
Relative cost of road haulage:	**Inland waterway**	**Rail**	**Short sea**	**Road**
0.5	2.4	0.0	72.0	25.6
0.9	4.3	0.0	85.4	10.3
1.0	4.6	0.2	85.7	9.7
1.1	5.5	0.6	85.9	8.1
1.5	6.9	3.0	85.1	5.1

Source: GTM calculations, Demilie *et al*. (1997).

From a more general standpoint, Table 12 gives the arc and cross-elasticities for variations of 10% in the baseline costs for the various modes. These elasticities take into account the topology of the trans-European multimodal network and all the factors that enter into the generalised cost function. They show what would happen in the event of immediate adjustments to the new relative costs, but under the strict condition that there are no competitive cost adjustments in other modes. Consequently, the results are not fully comparable to the price elasticities usually obtained by applying statistical procedures to recorded flows, which are influenced both by the speed of response to new conditions and by the adjustments made by all of the actors on the market. With these two qualifications, they bear more relation to adjustments that should take place over the longer term, which are based more on costs than on prices. These values do not differ a great deal from those given in the literature on price elasticities.[37] Values of less than 1 (absolute values) indicate that the variations in costs have relatively little impact on the use of a mode for a particular type of traffic. The costs of road transport thus have a substantial impact on the level of use of road transport and of inland waterway transport, both essentially in combination with short sea shipping. The elasticities for rail are very high. This is partly due to the very small market share of rail, but also indicates good potential for growth in the use of this mode for this type of market.

Table 12. **Arc elasticities of modal shares in tonne-km**

	Road	**Short sea**	**Rail**	**Inland waterway**
Road	η_{RR} : -1.2	η_{SR} : 0,02	η_{WR} : 10	η_{IR} : 1.27
Short sea	η_{RS} : 0.4	η_{SS} : -0.1	η_{WS}: 8.9	η_{IS} : 0.27
Rail	η_{RW} : 0.32	η_{SW} : 0.06	η_{WW} : -10	η_{IW} : 0.2

Source: GTM calculations, Demilie *et al.* (1997).

Lastly, there is the case study on freight transport in, to, from and through Belgium, which was used to calculate the external costs of transport. The method used made it possible to calculate traffic in tonne-km for each mode, separately or in combination with other modes, over distances of more than 300 km. Based on the results of the cost variation simulations for the various modes, it was possible to calculate other elasticities for the miscellaneous goods category (NST/R9), the most likely to be transported in containers over long distances. These elasticities are shown in Table 13.

Table 13. **Arc elasticities of modal shares in tonne-km**

	Road	**Rail**	**Inland waterway**
Road	η_{RR} : -1.47	η_{WR} : 1.69	η_{IR} : 4.09
Rail	η_{RW} : 1.60	η_{WW} : -1.62	η_{IW} : 0.71
Inland waterway	η_{RI} : 0.02	η_{WI} : 0.32	η_{II} : -10.72

Source: GTM calculations, Jourquin *et al.* (1999b).

In this case, we can assume that most rail and inland waterway transport is combined transport with a road leg, whereas a fair proportion of road transport is road only. Here, it is clear that in tonne-km, the modal share of the three modes varies more than proportionately to variations in the cost of road transport, since the elasticities (for rail and inland waterway) in the first row of the table are higher than 1 in absolute value. With the exception of inland waterway, this is also true of elasticities as a function of rail costs. Inland waterway transport costs have an impact only on inland waterway traffic, but the extremely high elasticity is the result of the very small share (0.53%) of inland waterway transport in this segment of the transport market.

These observations show once again that intermodal transport in a broad sense with either a rail or an inland waterway component could be more widely substituted for road-only transport, if the relative costs of the options it offers were more attractive (and if service quality were better).

6. CONCLUSIONS

This report first describes trends in freight transport over the past thirty years. It highlights the increasing use of road transport, which has by far the largest modal share of freight transport in Europe. If this trend becomes even more pronounced, it will cause substantial traffic problems on European road networks and will require investment on an enormous scale in new infrastructure to the extent that the public will tolerate it.

It is therefore important that European freight transport be as efficient as possible in order to ensure that Europe can compete internationally and guarantee the continued mobility of its population. However, the goal of economic efficiency requires that transport structures take into account all of the costs that traffic generates, not only the direct costs of operations and infrastructure but the external costs that are usually not taken into account in the decisions of the public and private sectors: the costs of pollution of various kinds, congestion, accidents, noise and traffic. This report gives estimates of the total external costs of freight transport in Belgium which amounted to at least BEF 8 000 per capita in 1995, or EUR 200, of which 93% is attributable to road transport. These costs have to be limited by trying to develop the use of rail, inland waterway and short sea shipping.

There is of course no simple solution to these problems. The only way to solve them is through a range of measures: better land-use planning of economic activity, regulations designed to alleviate and channel transport flows, pricing and tax policies that take into account all of the costs of the various transport modes and the promotion and better organisation of intermodal transport. When well organised, intermodal transport should ensure that rail and waterborne transport will become more competitive by integrating them efficiently into logistics chains.

However, intermodal alternatives face many problems, which this report outlines separately for each mode. It is essential for these problems to be dealt with if intermodal transport is to attract more users through cheaper and faster transport and better services. Since intermodal transport is competitive mainly for long-distance transport, its problems should be addressed at European or world network level. The problem areas are: technical, equipment and network compatibility, the standardisation of loading gauges and loading units, the efficient organisation of terminals and the development of integrated commercial services throughout the international logistics chain. An enormous effort of international co-ordination will be required, but the networks must also be freed from their traditional national actors in order to facilitate the development of genuinely competitive intermodal solutions. This is a task that the European Commission has taken on.

If successful, these efforts should enable a major shift of traffic from road to rail, inland waterway and short sea shipping, and to well-organised intermodal transport. Indeed, the economic studies referred to in this report clearly indicate the economic potential of alternative transport solutions.

NOTES

1. The authors wish to thank F. Degrandsart, who helped to assemble a great deal of the information needed for this study. Some of the findings referred to in this report are from research funded by the Belgian Federal Office for Scientific, Technical and Cultural Affairs (STC, Belgium) and by the Walloon Region Ministry of Transport.

2. A recent study by Ocean Shipping Consultants, quoted in Lloyds Register, 1 June, gives the modal share for sea container traffic to and from the company's hinterland as 19% for rail, 9.9% for inland waterway and 71% for road transport.

3. Reynaud (1998).

4. For further details see Jourquin and Beuthe (1996). For other applications see Beuthe *et al*. (1999a), published under Cost Action 328, and Jourquin *et al*. (1999a) published under the European Commission's TERMINET Programme (DG VII).

5. This is the value (adjusted for 1995) calculated by Mayeres *et al*. (1996), which is an average of the results of several reputable European studies. It includes the value placed on a life by relatives, loss of earnings and medical and police costs.

6. A great deal of further information can be found in the European Commission's ExternE report (DG XII) and in several other publications by De Borger, Mayeres and Proost.

7. mECU = ECU 1 000. The ECU became the euro in January 1999.

8. For further details, see Beuthe *et al.* (1999b), which is based largely on the results of the study conducted in conjunction with J-F. Geerts and STRATEC for the Walloon Region Ministry of Transport.

9. The pollution figures in the table are slightly lower than in the OECD report (1997). In contrast, the average external costs given are higher. This is because higher values were attributed to these external effects.

10. Average value for ten types of freight.

11. Average value taken from the OECD report (1997), adjusted for 1995 prices.

12. ECMT Declaration on Combined Transport [CEMT/CM(96)16].

13. Communication from the Commission to the European Parliament and the Council (1997a).

14. The *Report on the Current State of Combined Transport* (ECMT, 1998) is an excellent source of information on combined transport. It contains a detailed annex on the organisation of combined transport in selected European countries. See also Charlier and Ridolfi (1994).

15. The use of containers in combined transport is an added safety factor, but loading and unloading operations can damage the goods contained.

16. This is roughly the running speed of ICF Iberica's new "Transiberico" train from Barcelona to Lisbon. However, commercial speeds on the railways vary substantially from one link to another and can be a great deal lower than 37 km/h as in the case of some links between Scandinavia and Southern Europe.

17. This is also the figure given by Demilie *et al.* (1998).

18. ECMT (1998), p. 40.

19. On this point see Fowkes *et al*. (1991). Their stated preference analysis shows that, for transporting tubes, for example, the latter are willing to pay an extra 25% to gain a half day, an extra 6% for a 1% increase in on-time deliveries and an extra 14% to avoid transfer. See also the report by Nierat (1992).

20. The TERMINET project under the European Commission's Fourth Framework Programme (DG VII) is studying these bundling networks and terminal organisation.

21. Pestiau and Tulkens (1990) and Gathon (1991), for example.

22. On this point, see Binsbergen *et al*. (1998) and TERMINET report D 9 (1998).

23. On all these issues see also *Improvements in Main International Piggyback Links*, ECMT (1992).

24. See Van Roost (1992), *Logistique de distribution*, FUCAM.

25. See the UIC's "White Book" (1992), *Transformation of the International Railway System as Part of the New European Transport Policy*.

26. See Rühl, A., "Financial Relations between European Railways for their International Services", *Transportation Research* A, Vol. 25A, No.4, 1991.

27. See *Transport in a Fast Changing Europe*, a report by the Transport 2000 Plus Group, set up by the European Commission, December 1991.

28. *Report on the Inland Waterway Combined Transport Workshop*, July 1991, Organisation Européenne des Bateliers. The development of new terminals in Belgium and the north of France also bears this out.

29. See the report by Working Group 5 of the AIPCN, "Transport des marchandises par bateaux prote-conteneurs", *AIPCN Bulletin* 78/79, supplement.

30. For instance, there are direct containerised links from Zeebrugge and even Felixstowe to the Rhur and still further upstream using inland waterway/sea container vessels.

31. For example, the express Ro-Ro soon to be provided by the Belgian Shipowner Cobelfret between Gothenburg and Zeebrugge, which will make extensive use of rail at both ends to and from the port (*Journal de la Marine Marchande*, 11 June 1999).

32. See Report D6 (1998), TERMINET Research Programme and Notteboom (1998), Notteboom and Winkelmans (1998) and Reynaud (1998) for networks based on port activities.

33. Demilie *et al.* (1998) and Beuthe *et al.* (1999a).

34. These data were kindly provided by the Department of Transport and Energy, Transport Studies Service, Bern.

35. Demilie *et al.* (1997). Dry bulk was treated as NST/R categories 2, 4, 6 and 7.

36. The shares of road and rail were estimated at the border between France and Spain.

37. There are very few statistical studies on the elasticity of demand for freight transport. However, see Oum *et al.* (1992), Abdelwahb (1998) and Björner (1999).

BIBLIOGRAPHY

Abdelwahab, W.M., Elasticities of Mode Choice Probabilities and Market Elasticities of Demand: Evidence from a Simultaneous Mode Choice/Shipment-size Freight Transport Model, *Transportation Research E*, Vol. 34, No. 4, pp. 257-266.

Beuthe, M., L. Demilie and B. Jourquin (1999a), The International Impacts of a New Road Taxation in Switzerland, Cost 328 Research Action, in: M. Beuthe and P. Nijkamp (eds.), *New Contributions to Transportation Analysis in Europe*, Ashgate.

Beuthe, M., B. Jourquin and F. Degrandsart (1999b), External Costs of Belgian Freight Traffic: A Network Analysis of their Internalisation, paper presented at the Conference on Social Change and Sustainable Transport, organised jointly by the European Science Foundation and the National Science Foundation, Berkeley, March.

Björner, T.B., Environmental Benefits from Freight Transport Management: Freight Traffic in a VAR Model, *Transportation Research D*, Vol. 4, pp. 45-64.

Charlier, J. and G. Ridolfi (1994), Intermodal Transportation in Europe: of Modes, Corridors and Nodes, *Maritime Policy Management*, Vol. 21, No.3, pp. 237-250.

European Commission (1997a), Communication from the Commission to the European Parliament and the Council, *Intermodality and Intermodal Freight Transport in the European Union*.

European Commission (1997b), *Green Paper on Sea Ports and Maritime Infrastructure*.

European Commission (1999), COST 319, Estimation of pollutant emissions from transport.

ECMT (1999a), *Report on Current State of Combined Transport in Europe*, Paris, 1998.

ECMT (1999a), *Trends in the Transport Sector 1970-1997*, Paris.

ECMT (1999b), *Statistical Trends in Transport*, Paris.

De Borger, B. and S. Proost (1997), *Mobiliteit: De Juiste Prijis*, Garant.

De Borger, B., I. Mayeres, S. Proost and S. Wouters (1996), Optimal Pricing of Urban Passenger Transport, A Simulation Exercise for Belgium, *Journal of Transport Economics and Policy*, 31-54.

Demilie, L., B. Jourquin and M. Beuthe (1997), A Sensitivity Analysis of Transportation Modes' Market Shares on a Multimodal Network: The Case of Dry Bulk Transports between Benelux, Germany and Spain, in: C. Capinieri and P. Rietveld (eds.), *Networks in Transport and Communications*, Ashgate.

Demilie, L., V. Dupuis, B. Jourquin and M. Beuthe (1998), On the Crossing of the Alpine Chain and the Swiss Regulation of Trucking, in: A. Reggiani (ed.), *Accessibility, Trade and Locational Behaviour,* Ashgate.

European Commission, DG XII (1997), External Costs of Transport in ExternE, Final Report, Non-Nuclear Energy Programme, JOULE 3.

European Commission, DG XII (1995), TRENEN Project, Final Report, JOULE Programme, Verkehrwissenschaftliches Institut der RWTH-Aachen (VIA).

European Commission (1998), TERMINET Research Programme, *New Concepts of Networks and Terminals for Multimodal Freight Transport,* Deliverables 1-9.

Institut National de Statistique (INS), *Accidents de la circulation 1995*.

Jourquin, B. and M. Beuthe (1996), Transportation analysis with a GIS: The Virtual Network of Freight Transportation in Europe, *Transportation Research C,* Vol. 4, No. 6.

Jourquin, B., M. Beuthe and L. Demilie (1999a), Freight Bundling Network Models: Methodology and Application, *Transportation Planning and Technology,* forthcoming.

Jourquin, B., M. Beuthe, J.-F. Geerts and Ch. Koul à Ndjang'Ha (1999b), Intermodality and Substitution of Modes for Freight Transportation: Computation of Elasticities through a Geographic Transportation Network Analysis. Paper for presentation at the European Regional Science Association (ERSA) 39th Congress, Dublin, August 1999.

Mayeres, I., S. Ochelen and S. Proost (1996), The Marginal External Costs of Urban Transport, *Transportation Research C,* No. 6, 359-371.

Ministère de l'Équipement et des Transports de la Région Wallonne, *Plan Multimodal de Transport de Marchandise de la Region Wallonne*, SRATEC report in collaboration with ADE and GTM-FUCAM.

Notteboom, T. (1998), Land Access to Sea Ports, in: *Round Table 113*, *Land Access to Seaports,* ECMT, Paris, November.

Notteboom, T. and W. Winkelmans (1998), Spatial (De)concentration of Container Flows: The Development of Load Centre Ports and Inland Hubs in Europe, WTCR Conference in Antwerp, July.

OECD (1997), *The Environmental Effects of Freight*, Paris.

Reynaud, C. (1998), Land Access to Sea Ports: New Methods of Operation and Organisation for Container Transport, *Round Table 113, Land Access to Sea Ports*, ECMT, Paris, November.

Rijksinstituut voor Volksgezondheid en Milieuhygiëne (RIMV) (1998), Verkeer en vervoer in de nationale milieuverkenning 4, 1997-2020.

Société Nationale des Chemins de Fer Belges (SNCB), *Annuaire Statistique de la SNCB, 1995.*

Sociaal-Economische Raad van Vlanderen en Sectoriele Commissie Goederenvervoer (SERV) (1998), *Geactualiseerde analyse van het gecombineerd vervoer*.

Tae Hoon Oum, W.G. Waters II and Jong-Say Yong (1992), Concepts of Price Elasticities of Transport Demand and Recent Empirical Estimates, *Journal of Transportation Economics and Policy,* May, pp.139-154.

Union Internationale des Sociétés de Transport Combiné Rail-Route, *Statistiques Annuelles, 1998*.

Van Binsbergen, A.J., A.J. Klein Breteler, J.W. Konings and J. Rijsenbrij (TRAIL) (1998), J.Katgerman and D. Piebenga (RUPS), *Continental Loading Units for Intermodal Transport*, Ministry of Transport, Public Works and Water Management of the Netherlands.

Topic 2

TRANSFORMING ECONOMIC AND INSTITUTIONAL STRUCTURES AND TRENDS IN TECHNOLOGY: EXPERIENCE AND PROSPECTS

c) Public-private partnerships

A NEW APPROACH TO THE MANAGEMENT OF ROADS: A VISION FOR THE 21ST CENTURY

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SUMMARY

Lund, July 1999

EXECUTIVE SUMMARY

This paper envisages a significant transformation of the road sector during the next century. Firstly, there will be a new arrangement for the management of the road sector. It comprises two components. The first is a road manager , which is seen as an agent representing a "club", i.e. the road users, and providing road services on behalf of the members of the "club". It is envisaged that this agency will be a kind of association, which is allowed to operate with considerable independence from the state. The second component is a regulatory framework to ensure the effective functioning of this "club" arrangement. The regulatory framework will in turn comprise a number of elements, the most important of which is separate legislation, which will impose upon the agent and the board of directors the explicit requirement to manage the roads sector efficiently. Another element is the introduction of a regulator, the role of whom is to ensure that the agent actually strives towards economic efficiency. To promote effective regulation, the regulator may be empowered to collect road user charges (see below), and required to only make funds available to the road manager provided he is convinced that the road manager strives towards efficiency.

Secondly, a new arrangement for financing of the road sector by way of road user charges is envisaged. It is postulated here that self-financing is a fundamental requirement for the efficient functioning of the road manager. There are two reasons: the first is that self-financing is the opposite of the club approach. By enforcing self-financing, road users will wish to take charge, and will become active supervisors of the road manager, including the regulator. In addition, self-financing will allow the road manager to undertake long-term planning and also to realise these plans in a structured way.

Thirdly, the new arrangement envisages that private contractors be responsible for all construction and maintenance work. However, these contractors will not work as today, i.e. in terms of input specifications, but will be guided by contracts formulated in terms of output specifications. These contracts will be of a longer duration, and normally for a period of at least 10 years in order to allow for investments to be made in research and development in the road building and maintenance industry.

Fourthly, a new arrangement for paying contractors based on actual delivery of services according to set output specifications is envisaged. The outputs should be measurable and will focus on the availability of road capacity based on specific functional requirements for road user needs. As services will only be paid for when rendered and only if output specifications are complied with, it will be necessary for the private sector to mobilise the working capital required for the operations of the road sector. This new allocation of risks along with the private sector's need to mobilise working capital will make it desirable and necessary for the road manager to contract not with the traditional contractors, but with special purpose companies to be set up especially to implement investment projects or long term maintenance contracts.

As a result, a new relationship between the private and public sector is envisaged, whereby the state takes on the role of the regulator, and the private sector takes on the role of risk management, road building and road maintenance, and becomes responsible for providing the working capital for the operations of the road sector. A third partner – the road users -- will now be recognised in this partnership; they are envisaged to play a much larger role than today in the overall management of the sector, albeit at the price of having to pay directly for costs (including the cost of the market risk).

1. INTRODUCTION

1.1. The problem

In the vast majority of countries, roads are mainly financed with public monies and appropriations from state or local government funds[1]. The experience of public financing of roads is mixed. The following problems have been noted[2]: Public financing gives rise to the following risks:

- Annual appropriations will be uneven and insufficient, which (i) makes it more difficult to plan for the long term and also to implement long term plans; (ii) makes it more difficult to implement important actions at the right time, in particular maintenance actions; and (iii) sometimes results in investments having to be divided into smaller projects for funding reasons, thereby reducing the scope for exploiting economies of scale;
- Road management may not be guided by the public interest in the long run, and reflects more short-run political ambitions;
- Inefficiency in road management, including unnecessarily high cost of investment and maintenance, on account of poor methods for effecting accountability.

Whilst these problems often are highlighted, there is a further - less noted - problem, in that the contracting industry involved in road construction and maintenance shows a low level of innovation[3]. Ultimately this reflects the fact that the industry spends little on investment in research and development.

The shortcomings of the present arrangements have led to new approaches being introduced in some countries, often with an emphasis on the financing arrangements, but sometimes also linked to more fundamental reforms of the institutional arrangements in the sector. As a whole such reforms have resulted in an expanded role for the private sector, although the nature of the partnership between the public and private sectors varies considerably from case to case.

The most innovative country is New Zealand, where a self-financing system for the entire road sector has been introduced by way of road user charges[4]. The public road manager[5] in that country has also reduced its role to only include overall planning, contracting and contract management, whilst all maintenance and construction activities, as well as a substantial portion of regular planning and supervision activities, are contracted out.

A number of other countries have made use of the concession approach, whereby in general private interests are given the right to develop and operate parts of the road network for a specified time period. This approach has been used in, among others, France, Hungary, Italy, Portugal and Spain in order to develop and operate the motorway system. A variant of the concession approach entails BOT-projects (“build, operate transfer”), which is characterised by the concession being limited to more distinct parts of the road system, e.g. a large investment in a bridge, tunnel or a component of a motorway system. In a concession situation, including BOT-projects, the concessionaire can collect special charges from the users of the concessioned facility in order to finance investment and maintenance costs, and he depends on these revenues for his survival[6].

Concessions can be seen as an example of a new procurement method in the road sector. Another example of a new procurement approach, which has been developed in recent years, is when the road manager does not pay directly for the investment - as in a traditional procurement - but for the service that the investment yields over future years. This type of procurement is based on the premise that the road investment project will be competitively tendered including not only the works component but also the mobilisation of the project financing. This new type of procurement method thus entails a kind of instalment payment by the road manager to the contractor over a given period subsequent to the new road's completion[7]. In other words, the contractor provides the working capital required for the project, whilst the road manager only pays for the services rendered under the project.

This new approach is often referred to as a new method of road financing, although it is emphasised here as a new method of procurement; it has also recently been introduced for maintenance projects. There are at least two applied variants of this new procurement method for investment projects: One has been developed in the UK where it is referred to as Design Build Operate and Finance (DBFO), and hence also includes the design component of the project. A characteristic of this approach is that the payments made by the road manager to the contractor are in the form of shadow tolls, i.e. the payments vary with the amount of future traffic recorded on the road[8]. DBFO has also been applied in Holland, and Finland has recently procured a road investment using this approach. The other variant has been applied in Germany, where it is known as *Vorfinanzierung*[9]. Projects tendered under this approach in Germany have typically included neither a design nor a maintenance phase. Another difference is that the annual payments in Germany do not vary with the traffic volume.

The new procurement method has primarily been applied to road investments, including tunnels, but *Vorfinanzierung* has also been applied in Germany to investments in railway infrastructure. In Finland preliminary plans have existed for applying DBFO - including shadow toll payments, in a rail infrastructure project[10].

1.2. The vision

It is argued here that recent attempts to reform the road sector in various parts of the world reflect a growing realisation that it is necessary to improve efficiency and dynamism in the sector. Whilst the shortcomings of the classical arrangements in the road sector, (whereby roads are run by a roads directorate in a Ministry of public works or transport, with its own force account units to undertake construction and maintenance works) have been recognised as inefficient for a long time, and that therefore a substantial part of the contracts for construction and maintenance should be procured subject to competitive bidding, there is as yet no agreement on what the future arrangements in the road sector should look like.

On the other hand, it is also argued here that the attempts at road sector reform which can already be observed are not to be seen as isolated phenomena. Rather they may likely be seen as harbingers of what is to come during the 21st century. These new kinds of arrangements thus often point in the direction that the reform process will likely take during the coming few decades. They will eventually result in new institutional, procurement and financing arrangements in the road sector, which will be conducive to enhanced performance, more creativity, and therefore better efficiency and lower road user costs.

The vision of the future arrangements in the road sector comprises four building blocks:

1. *Self-financing by way of road user charges*. The current system in New Zealand, whilst not being a perfect model, at least serves as a harbinger of what is to come. New Zealand is one of very few countries in the world that has implemented road user charges, mainly based on a fuel charge and an annual licence fee. Large and heavy vehicles pay a weight-distance charge that varies with the size and weight of the vehicle. The current system design in New Zealand reflects the available techniques for imposing weight-distance charges. New techniques will in the near future make it possible to impose charges on any type of vehicle -- i.e. not only the heavy vehicles -- which vary with respect to the cost of different vehicles and/or the benefits derived by these vehicles when making use of the road network.

2. *An independent agency for managing roads subject to oversight by an independent regulator*. The future road manager will likely operate within an institutional framework similar to that of a state agency, but with considerable independence from the state and subject to clear accountability. The performance requirements imply that the road manager must strive to attain the goal of economic efficiency. The road manager will only be involved in key functions as concerns planning, procurement and contract management. The best example of what is to come may again be found in New Zealand, where the road manager, Transit New Zealand, may be seen as the new generation of road managers. The function of the regulator is primarily to ensure that the road manager strives towards economic efficiency in his operations, and that road user charges are also set so as to promote economic efficiency and equity. As concerns the role of regulator, the best harbinger is the Road Fund Administration, which was established in Namibia during 1999[11].

3. *Procurement of works based on output specifications*. Road works will be performed by private contractors. However, the current types of contracts, which typically are based on input specifications, will be replaced with contracts entailing output specifications. For about 10 years, output specifications (or performance-based contracts) have been used for maintenance contracts in a number of countries. A few countries, including Sweden, have also been working on the introduction of output specifications for investment projects for a number of years.

4. *Payment to contractors based on performance as measured by output specifications*. Payments are normally made when the contractor is delivering the inputs required by a works contract. In the future, contractors will be rewarded for delivering a service meeting specified standards (i.e. the output specifications). The new procurement methods in the UK and Germany referred to above may - albeit not necessarily intentionally - be seen as some of the first examples of applying this principle on investment projects in the road sector.

In order for this vision to materialise, it will not be necessary to put all the four building blocks in place at the same time. Building blocks one and two may come both before and after building blocks 3 and 4. However, building blocks one and two go together, and in the same way it may be argued that building blocks 3 and 4 can essentially be seen as two sides of the same coin. It may, however, also be argued that there is a relationship - albeit weaker - between building stones one and two, on the one hand, and three and four on the other. It is therefore most likely not possible to more regularly apply the new procurement approach introduced by building blocks three and four, unless the institutional arrangements in the sector are also reformed. The application of output specifications linked with paying for outputs on a regular basis requires that the road manager demonstrates a high level of professionalism and operates within a robust decision-making framework, which can only be developed provided that building stones one and two are being put in place.

1.3. The rest of the paper

The vision presented above can be seen as a new format for private/public partnerships. However, a point being made in this paper is that there is a need to also explicitly recognise a third player, that is to say the road user[12].

The remainder of this paper will now endeavour to present an outline of the relevance of the four building stones. The next chapter will focus on the overall institutional arrangements and the fundamental financing arrangements, i.e. building stones one and two. These are the building stones that provide for a new and better system of governance, and it is in this context that the road users enter the scene. Questions to be posed and answered include why there is a need for some kind of agency to act as a road manager and why there is a need for a regulator. Other questions to be addressed include why self-financing is appropriate, and how the road user charges are to be set. In this chapter, reference will be made to welfare economic theory, club theory and game theory.

Chapter 3 covers building stones three and four, and this will be done by reviewing the new procurement methods for road investments recently introduced in particular in the UK but also in Germany. To understand the significance of the new procurement methods, including the new method of paying for a contract, it will be necessary to make use of elements of the economics of uncertainty. The reason is that the new procurement methods change the incentive structure for the performance of road works as the risks are handled in a different way from what is common today; it is this changed incentive structure which makes it possible to achieve better economic efficiency in road works, and indeed also to increase the level of innovation in the contracting industry. Today it is normally the road users and tax-paying public that carry most of the risks. Better incentives can be achieved by transferring certain risks from the public to the private sector, i.e. to the private capital market. The questions to be addressed include *which types of risks* should be transferred and *how* this should be done.

Part of the answer to the question *how* is that output specifications must be introduced, and for this reason, Chapter 3 also contains a review of various types of contracting methods employed in the road building industry. Whilst the emphasis in Chapter 3 is on road investments, the principles developed are also applied to road maintenance contracting.

2. GOVERNANCE

2.1. Introduction

Practically all countries in the world operate the road sector based on a “centralised” model[13], i.e. under full control of the public sector. Although it is possible to find elements of decentralisation in some countries, such delegation normally only applies to actual operations and not to investment decisions, maintenance policies and payments to be made by road users to the public. An additional characteristic of current arrangements is the low level of road user involvement, although some schools of reform now put heavy emphasis on stakeholder participation[14].

The question that, hence, must be asked before considering road sector reform is the following: Why is the "centralised" model used? Whilst the short answer to that question appears to be that it has been difficult to establish functioning operational objectives and effective regimes for enforcing accountability in the road sector, there are a number of more fundamental reasons; two of them are particularly important. The first is that roads are not perfect economic goods. They have characteristics that give rise to so-called market failures. The second is that road investment and maintenance activities have important distributional consequences. Before moving on to the question of whether alternative governance regimes exist, these aspects will be reviewed briefly.

2.2. The economic nature of roads

One of the problems of roads stems from their cost structure; there are two aspects to consider. The first is that roads are characterised by economies of scale. It is thus normally cheaper to build only one road between two places, A and B, rather than to build two roads, although this may change when there is a lot of traffic between the two places. The second is that once investments have been made in a road or a bridge, the investment costs have to be viewed as sunk costs. This means that the road market is not normally a contestable market. Roads thus tend to be natural monopolies.

Furthermore, whilst for example the railway can be shown to be subject to strong competition from the road sector (as well as other means of transport), the reverse does not apply. The available evidence indicates that the price elasticity of road use is low reflecting that road users often have limited opportunities for using alternative means of transport. A road is thus not only a natural monopoly from the point of view of the road sector, but also when placed in the context of the entire transport sector[15].

In addition, it is normally cheaper to build and maintain one common road to be used by all modes than to build separate roads for (i) cars; and (ii) trucks and buses, i.e. roads are characterised by economies of scope. The presence of economies of scope also makes it difficult to establish competitive or contestable arrangements.

Another characteristic of the cost side is that a road service is not produced by the road alone; it is produced jointly by the (i) road, (ii) vehicles, and (iii) drivers and passengers of the vehicles and/or the goods carried. The costs of these three elements are not independent, as lower road maintenance costs may result in higher vehicle costs and costs to the people and goods carried by the vehicle. All investment and maintenance activities hence have important effects on parties "external" to the entity responsible for managing the road sector.

A third aspect of roads is that they - at least in part - take on the shape of a public good in that they are characterised by (i) non-excludability (one cannot prevent someone from consuming it); and (ii) non-rivalry (the consumption by one person does not reduce the supply available to others). The first property is reflected in the problems encountered when trying to introduce a price system in the road sector. The available means, e.g. the fuel charge, does not, in principle, discriminate between on- and off-road use, and in many countries, off-road use of vehicles, for example in farming, is important. Various mechanisms can be used to take this into account, but they are difficult to operate and often result in evasion problems. Another related issue is the problem of differentiating the charges adequately to consider the costs imposed by different types of vehicles. Technical development will in the future allow these problems to be tackled, but only at a cost.

Also the non-rivalry aspect needs to be qualified, as road users are not necessarily independent of each other. Vehicles making use of the same road at the same time interfere with each other, and give rise to congestion and therefore to higher costs for each vehicle user. And at very high levels of demand in relation to the available supply, an additional vehicle effectively reduces the supply of road space available to other vehicles.

The nature of road services, i.e. the cost structure of roads, the role played by users of roads in producing road services, the fact that roads take on the shape of public goods, and the absence of effective competition from other modes of transport can be seen as economic efficiency reasons why the road sector is normally not managed in terms of the profit criterion or on commercial terms[16]. These conditions can, in principle, also be seen as a possible motive for managing the road sector as part of the public sector, as is normally the case around the world.

However, as everyone can testify who has been involved in the road sector, the principle of economic efficiency actually tends to play a limited role in guiding road planning and maintenance at present. One important reason for this is the distributional consequences of investments in roads and maintenance activities. This in turn is explained by the fact that various specific activities in the sector may yield substantial benefits for identifiable groups of road users without these users having to pay directly for them. Thus, when road users only pay road taxes, the beneficiaries of a certain investment will not have to pay anything at all. For example, increasing the maximum axle load on roads will be very beneficial to the shippers and the road haulage industry, whilst a new motorway in an urban area can result in a steep reduction in the costs to commuters, etc. Given the potentially strong distributional effects of such actions, the road sector has become an important tool from a political point of view.

In developing countries as well as at the local level of less-developed regions in developed countries, the distributional impact takes on a further dimension. Roads are often seen as a means to ensure that access is provided to everybody, at least so that the citizens may have access to basic social services such as health care and education. In addition, roads may be seen as necessary to promote economic growth in a particular region, or to ensure that the region sees itself as being an integral part of the country concerned.

2.3. An alternative to the centralised approach

2.3.1 The club model

There is no need to view the presence of a market failure as an argument for public ownership or control *per se*. There are many examples of how the market itself may deal with such problems and in a way that is compatible with economic efficiency. This also applies to infrastructure. For example, the classical structure of the railway may be seen as the market's response to the economic nature of the railway track. In other words, by vertically integrating the track with the railway operations, an industry is established which when subjected to competition could be functioning in way that is compatible with economic efficiency when operating on profit maximising principles, without there being a need for public intervention.

Another approach towards vertical integration is when various competitors band together to jointly own and operate an infrastructure on their own behalf. One example of such a solution is the computer reservation systems, a kind of infrastructure, which are owned by and operated for the airline industry. Similar examples could previously be found in air traffic control. A further example is when consumers decide to provide and operate infrastructure on their own. There are many examples of such arrangements in the Nordic environment for providing roads, water and sewerage in local areas, through so-called associations.

The last two approaches towards vertical integration referred to above can be seen as examples of the "club" model; there are many more examples of the application of this association framework for the development and provision of infrastructure. A club is characterised as a voluntary organisation that is operated by its users for their own benefit and paid for by them. A specific feature of the club model is that the club itself only provides for certain facilities, whilst the members then make use of these facilities in order to produce the final result, i.e. the service demanded by the members. These conditions are very similar to those that apply to the road sector.

Why then not use a club approach to the operations of the entire road sector? There is a need to explore this idea further, not least as the beauty of the club approach is that if an infrastructure can be operated by a club, it obviates the need to be concerned with the formulations of the objectives for the operations of the infrastructure. In a club, the members decide directly through the decision-making mechanism what they want to achieve and how.

It is argued here that the concept of a club is relevant and useful in order to understand the issues to be addressed and the possible organisational structures in the road sector. In this section the theory of clubs will therefore briefly be reviewed to begin with. The next step is then to make some concrete suggestions, based on some of the implications of club theory.

2.3.2 Clubs and economic theory

Clubs can be analysed by using economic theory[17]. Under certain conditions it can be shown that clubs are compatible with an efficient state of the economy. This implies that clubs can be an effective way of dealing with a number of problems that occur in a completely private economy, including indivisibilities, public goods and economies of scale. It can also be shown that clubs can be an effective way of dealing with congestion problems arising out of the joint and simultaneous use of facilities.

Some of the conditions that must be met are:

- There must be a competitive or a contestable market for the output of the club;
- It must be possible to separate members from non-members to be able to impose membership user fees; and
- The members of a club must be similar (as close to identical as the overall population permits). That is, narrow economic efficiency indicates that populations should be segregated by demand for quality or quantity of the club's goods.

It is clear that for the public road network in general, all three assumptions are violated, in principle. The main problem is that public roads, as mentioned above, are natural monopolies. In addition, the problem of imposing effective user charging mechanisms makes it difficult to discriminate between different types of users, although this is more of a technical problem.

Moreover, the third assumption is violated in that the road club would not be homogeneous. There are basically two problems. The first is that there are several types of users, e.g. the truckers and those driving cars, and the second is that some users are only interested in one part of the network, whilst other users may only be interested in another part.

The road system can therefore be said to be characterised by "club market failure". The implication is that delegating responsibilities for the road network to road users cannot normally be expected to result in an outcome that is as compatible with economic efficiency. However, this does not necessarily mean that the public sector must take over. There is an alternative, and it is actually based on the same approach as used by the owners of the majority of private companies, i.e. appointing an agent. The agent would manage the road network on behalf of the road users and in their interest, as if it were a club. It may be argued that the *raison d'être* of the agent is to ensure that there is effective, operational representation of the interests of the road users. The corollary is that the role of the public sector is to establish a regulatory framework to ensure that the agency arrangement actually functions, i.e. that the agent operates the road network in the interest of the road users[18].

By observing recent reforms in the road sector, not least in New Zealand and Namibia, where developments towards a kind of club structure based on an agency arrangement have materialised, the following regulatory and governance framework may be identified:

- The agent must operate in terms of an explicit objective function, and this objective should be economic efficiency. The efficiency criterion is based on the Pareto-principle, which must be seen as fundamental to all club arrangements, i.e. everyone must benefit from being a member;
- The agent should not be given any tasks other than to strive for economic efficiency. Concerns such as road safety and environmental issues should thus not be the direct concern of the agent, but should be superimposed on him by the concerned regulators responsible for these matters;
- The agent must be a legal person and have a governing board that is ultimately accountable and has to act in accordance with its fiduciary duties[19]. However, it is unlikely that persons who represent specific road users should have representation on the board, as this may give rise to conflict of interests[20]. Road users should instead be engaged as a watchdog, in that they must be consulted as part of the work to be done by the agent, and should be empowered to take action through a complaints procedure;
- There is a need for a regulator to ensure that the agent follows the rules of the game. To promote effective regulation, the regulator may be bestowed with the power to control the monies required by the agent; the regulator would thus only release monies to the agent for the operation of the road sector provided that he is convinced that the agent follows procedures compatible with efficiency (see below); and
- Full transparency of the work of the agent and the regulator to ensure overall supervision by the road users.

The above arrangements largely correspond to the institutional arrangements found in New Zealand and being put in place in Namibia. In both these countries, specific legislation has been enacted to establish both the agent and the regulator as agencies of the state.

2.4. The funding of roads

The governance framework is not complete, however, without considering the financing of the road network. At present, self-financing of the road sector is uncommon, as road users pay various types of taxes when making use of roads and not road user charges.

It is argued here that there are a number of strong motives for self-financing - to be achieved through the imposition of road user charges - which are basically economic in nature. The most important of these is that self-financing is intrinsic to the club approach, including in the variant of the club model advocated here, i.e. by using an agent to act on behalf of the road users. The club is to be operated in the interests of the road users, and the only way to find out if this is actually achieved is by testing their willingness to pay. Also, unless road users pay directly for the services they receive they will not have the incentive to monitor the agent (as well as the regulator). Self-financing is the glue that makes the different parts of the system stick together.

Self-financing is, in addition, required in order to overcome the problems associated with operations in terms of appropriations, as noted in the introduction. The public expenditure system is on the whole not appropriate for the financing of infrastructure, which requires long-term commitments, whilst public expenditures are made in terms of annual parliamentary appropriations.

The following additional types of arguments are often used to justify a requirement for self-financing and may also be seen as relevant[21]:

- Allocative efficiency;[22]
- It may be seen as a necessary condition for competition on equal terms;
- To limit directly unproductive profit-seeking activities, including rent-seeking[23]; and
- To prevent undue income-distributional effects.

Self-financing, of course, does not rule out that roads may be built and maintained to consider distributional effects. As for other sectors in the economy, it is possible to combine a self-financing system with specific subsidies for certain activities that are viewed as justified on social grounds. This approach has the added advantage of ensuring transparency, i.e. to provide information to the public about the costs of (the subsidies for) public service obligations

Self-financing is, however, not sufficient; there is a need to be quite clear about the approach to be used to the design and setting of road user charges, and the point being made here is that the club approach may be employed also to solve this problem. The debate on road user charges typically starts with the concept of marginal cost. Sometimes this results in an identification of certain cost elements which cannot be allocated, and it is then suggested that these fixed costs be recovered e.g. by way of annual fixed fees (in the form of licence fees), and that these fees should be seen as "access charges"[24].

The approach advocated here puts the road users' demands in focus; any road user charging system should therefore be designed so that it is seen as acceptable to the road users, or - more formally - in accordance with the Pareto criterion. In the absence of a real possibility to establish what road users would be willing to pay - as they, given the circumstances, have no incentive to reveal their preferences in this regard - economic game theory may be used in order to establish certain principles. Assume for simplicity that there are only two types of users of each road, e.g. truck owners and car owners. Game theory then suggests that these two groups would, in principle, be able to develop a pricing structure on their own through negotiations, fulfilling a number of conditions including that (i) each category of vehicle would pay at least the incremental cost associated with that type of vehicle; (ii) no vehicle category would have to pay more than the stand-alone cost associated with the provision of road services for each vehicle category; and (iii) total revenues would cover total costs[25].

The two first conditions can be seen as the conditions of fairness. It may be argued that both of these conditions must be fulfilled in order for the two categories to accept the pricing structure at all. A pricing structure that satisfies all three conditions is called efficient - or Pareto optimal - in that any movement in prices would be considered by one party to be an improved situation, whilst the other party would see it as a worsened situation. It can be shown that (given certain other conditions) it is possible to identify a set of price combinations which meet all three conditions and which therefore are efficient[26].

It may further be argued that one approach to satisfying the three conditions would be to set road user charges so that each user pays his marginal cost, and that all fixed costs not recovered through such a marginal-cost based approach are to be allocated to road users in terms of the benefit principle. Assuming that benefits are proportional to road use - which seems reasonable - implies that road costs should normally be recovered through instruments that are a function of distance, including weight/axle-distance charges and surcharges on fuel, but not through a vehicle-licensing scheme.

Of course, this discussion is not conclusive, as it still remains to be determined exactly how to reflect the benefits in the user charges. It is believed that this can be achieved by using rather simple approaches, e.g. by adjusting the various marginal costs for different vehicles proportionally. There are two aspects to be noted in this regard. First, ultimately the road users in the club approach are the champions and it is therefore important to hear them out. Second, once a road-user charging regime that is believed to be acceptable to road users has been formulated, a regulatory regime must be established, involving some kind of codification of the principles for setting the charges. It could then be left to the regulator (see above) to adjust the charges, on account of inflation or new expenditure requirements, in accordance with these principles.

2.5. Concluding words

The role of the public sector in the road sector will continue to change in the 21st century, as has been the case during the last few decades of the 20th century. However, the most important feature of the envisaged new institutional arrangements is that it recognises a third party, the road users. Ultimately, the road sector is for their benefit so why not involve them to a much greater extent than hitherto?

How to do this is not straightforward, but the argument made here is that it can be done through an agency arrangement subject to a clear accountability regime, in which a central feature is the explicit requirement that the sector be run in terms of the economic efficiency principle. The implication is that the public sector will have to play the role of the regulator, but also act as the facilitator of the agent to ensure that the agency is established and becomes operational. The role of the public sector is hence reduced to pure public interest functions (including the regulation of safety and environmental externalities.

The new party - the road users - enter the scene primarily in the capacity of overall monitor of the arrangements. The road users must be consulted and they must be able to protest; and to ensure that they do so effectively, they will have to pay the costs of running the road sector through road user charges. But the introduction of road-user charges will not only serve to establish a new governance arrangement in the sector; it will also relieve the sector of being held hostage to the public budgeting and appropriation system, which is totally inappropriate to the operations of any service, not least the operations of roads, which have an economic life of perhaps 30-50 years.

The new approach to governance also allows for the formulation of certain principles for the setting of the road user charges. These must be acceptable to the road users, and as a consequence they must be set so as to recover marginal costs, but also adjusted to take into account the benefits that different road users derive from the road system. Once a credible road user charging system has been designed, it must be operated as part of the regulatory regime. In the new approach there will be no need for politically determined charges.

It is now time to turn to the new role of the private sector.

3. PROCUREMENT[27]

3.1. Introduction

The last two building blocks entail the introduction of new forms of contracting by the road agent -- the representative of the road users -- with the private sector. This issue will be analysed by using the new method for procurement of road investments developed in the UK, referred to as DBFO. The intention is to explore the arguments behind DBFO-contracting but also to consider the appropriate structure of the contract as well as the payment arrangements under the contract. It is contended that as it has evolved at present in the UK as a procurement method, DBFO is not always appropriate.

Procuring by way of DBFO has been advocated on the following grounds:

1. The *financing* argument: Since the demand for public resources is diminished during the first years of the project, it is possible to undertake it earlier. In addition, the likelihood of being able to implement the project according to the right size is increased[28].

2. The *allocation* argument: Concessions and BOTprojects typically require that separate tolls be imposed on the users of the road. Since existing roads are not tolled and are financed by way of appropriations, these latter roads will be used too much, whilst the toll-financed roads are used inadequately. As long as alternatives exist, tolls result in the toll road being underutilised from an economic point of view. If roads are built by way of DBFO, on the other hand, this problem does not arise[29].

3. The *expenditure* argument: By using DBFO it will be possible to undertake road works, both construction and maintenance works, at a lower cost because of better incentives to economise[30].

4. The *risk cost* argument: By using DBFO it will be possible to reduce the cost of risk associated with implementing a road investment project, as well as the economic costs explained by the fact that future traffic levels are uncertain, which affects the economic benefits to be derived from the road investment[31].

All of these arguments have implications for economic efficiency. The first argument is not relevant in this context as it is argued here that the road sector should be self-financing by way of road user charges. The second argument is of interest here, because with the approach to governance in the road sector advocated in the previous chapter, it may be argued that toll roads operated in terms of a concession may not be appropriate or at least not necessary, in view of the fact that they may result in investments which are not guided by efficiency considerations. Under any circumstances, it may be argued that if proper road financing is introduced, there is in principle no need for concessions involving the collection of tolls in order to finance roads. The road user charges would provide the required long-term financing, whilst the shorter term financing requirements - the increase in demand for capital caused by a large investment project - could be provided under a DBFO contract, which presupposes that the contractor mobilises the working capital. The conclusion is therefore that it is primarily the latter two arguments that may be used in order to justify the new approach to procurement, given the new governance regime outlined in Chapter 2.

The continued presentation is based on the assumption that the road manager wishes to undertake a road investment, after having verified its viability by way of a cost-benefit analysis. The question to be addressed is if DBFO contracting can contribute to reducing the economic costs of the project when seen in a life-cycle perspective and/or may result in increased economic benefits.

When applying DBFO, a new role player appears, i.e. the financier or the capital market. The role of the capital market is, *inter alia*, to raise the capital required subject to competition and risk taking. Both in the UK and in Germany (when applying *Vorfinanzierung*), the contractor carries the risk that the project may take longer to implement and/or will cost more than anticipated. In the UK version of DBFO, repayment is not commenced until the road has been opened to traffic, whilst delays in *Vorfinanzierung* projects result in penalties, although the repayment period is always 15 years. If DBFO is combined with payments in the form of shadow tolls, the contractor additionally carries the risk in that the total payments will be determined by the total future volume of traffic.

In comparison with traditional contracting, these new arrangements force the contractor to take on substantially higher risks. The key questions to be asked are, on the one hand, *which types of risks* should be transferred and, on the other, *how* the risk transfer should be made. To consider these questions further, the next section, 3.2, will review the importance of risk from an economic point of view, including how the *cost of risk* may be analysed and considered when implementing a road project. In the subsequent section, the question *how* is considered further, with an emphasis on the relationship between the financing of and risks in conjunction with the implementation of a project, i.e. what is referred to as the risk management problem. This question must be studied against the background of the contracting format used in the road building industry, and for that reason different types of contracts will also be discussed in this section.

Section 3.4. then examines the types of risks that should be transferred. The issue is approached initially by posing another related question, viz. if it is possible to reduce the risk costs associated with uncertain future traffic by way of the payment mechanism. In particular, the payment method based on shadow tolls, and diminishing marginal road tolls with increasing traffic as developed in the UK, is examined.

3.2. On risk

The risk concept plays a central role in analyses of new methods of financing of infrastructure. It is often maintained that private financing improves the possibility to allocate the risks to those who can best handle them. Another feature of these analyses is a review of different types of risks, the risks that should be carried by the private sector, and thosethat preferably should be borne by the public sector[32].

The future is always uncertain, and building a road always entails risks. Firstly, it is not possible to fully forecast the construction costs. They are determined e.g. by the severity of the winter period, or the ground conditions where the road is to be built. Future maintenance costs are partly determined by future traffic levels and their composition. And the future economic benefits are uncertain as they are largely determined by future volumes of traffic.

The presence of risk implies that future costs and benefits can not be estimated exactly. On the other hand, it is often possible to estimate probability density functions for the costs and benefits associated with a road project, which allow for the estimation of expected costs and benefits. It is assumed here that it is possible for the various actors in the market to determine such functions.

From an economic point of view, uncertainty must be taken into account. The reason is that people in general are risk averse, which means that risks give rise to an economic cost. It may be shown that the risk cost associated with a project comprises two components, the cost for the specific risk and the cost of the market risk[33]. For an investment in a road, the market risk primarily reflects that future traffic is uncertain, whilst the specific risk primarily may be seen as associated with the investment itself.

The implication of risk is the same from both a private and a societal perspective. Risk-spreading signifies in the context of both private and public project financing that the cost of the specific risk component can be reduced and even eliminated. But there are also important differences between risks in a private and a public perspective, and by identifying these differences it is possible to interpret and clarify the language typically used in analyses of the role of the capital market in connection with the financing of infrastructure. The interpretation made here is that the concept “risk allocation” does not refer to “specific” types of risks which can better be managed by the private sector, but to the condition that the cost to the private sector for carrying the market risk may be lower than for the public sector.

It is also not correct to claim that the private sector is better at managing certain types of risks that may be viewed as project specific. The contrary actually applies, i.e. that the public sector is better at risk-spreading than the private sector. One of the reasons behind the focus of the private sector on risks in connection with infrastructure projects is thus that the mechanisms available to spread risks are incomplete, and that the specific risk costs can not be fully eliminated, in the same way as public financing is assumed to be able to accomplish[34].

On the other hand, the private sector has under appropriate conditions much stronger incentives to select cost-effective methods for building and maintaining a road than the public sector. These incentives reveal themselves in a more active search process for information about probabilities of events and their cost implicationsts, with the purpose of trying to change these events and/or reduce their cost implications. It is in this way that the private sector is better at managing risks.But ultimately this effort is dictated primarily by a desire to reduce costs *per se*, and not by the condition that the private sector is better at actually reducing specific risk costs. The risk management concept as used here is thus primarily understood to be the process of reducing overall (expected) costs.

No distinction has been made above between risk and uncertainty, and the two concepts are here seen as synonymous. There is, on the other hand, a need to also use the concept “genuine uncertainty”, which refers to the situation in which different actors/individuals are able to estimate probability density functions for various costs and benefits, but the estimated density functions differ (significantly) between these actors/individuals. Genuine uncertainty may be found behind the market risks in connection with a road investment, as will be argued below. But also the specific risk component, which reflects the sum of a number of events, can contain elements of genuine uncertainty. As the private sector can not be expected to be able to fully eliminate the specific risk, the existence of genuine uncertainty gives rise to special problems to be considered in contracting.

3.3. How?

3.3.1 Types of contracting[35]

What has been referred to above as risk management must be seen in the light of different types of contracting in the road construction and maintenance industry. Four basic types of contracts may be identified in conjunction with constructions works, ordinary build contracts (B), design and build contracts (DB) and design, build and operate contracts (DBO)[36]. A build contract presupposes that the design has been prepared by the client (by himself or by a consultant). This is the normal contracting format in the world today. A DBO contract, as it has developed in Sweden, comprises a maintenance phase of about seven years. In a DBFO contract, the contractor is responsible for design, building and maintenance, and also for mobilisingthe finance in order to carry out the project. For DBFO, the contractor is not paid by the road manager until after the road has come into operation; under the other contract formats the contractor is paid when the works are executed.

Contracts may also be distinguished by whether they are based on input or output (or performance) specifications. An ordinary build contract is based on input specifications. A design and build contract is, in principle, based on output specifications, but to date many of these contracts have nevertheless had a clear input specification orientation (at least this has been the case in Sweden). A DBO or a DBFO contract is supposed to be fully output oriented. However, so far there are few examples in the world of construction contracts of this kind, and even the DBFO contracts which have been let in the UK are not genuine output specification contracts[37]. Genuine output-specified contracts are much more common in connection with road maintenance[38].

Input specifications imply that the contractor in effect cannot choose construction techniques or materials; how the road is to be built is stated in the design, which is part of the contract. This contract also contains the bill of quantities and the unit price to be paid by the client for the various quantities. The contract also specifies how the unit prices are to be adjusted on account of inflation.

Input specifications imply that the scope of responsibility of the contractor is very limited and also that the risks that he carries in connection with the execution of the contract are limited. The contractor is primarily responsible for being able to build according to the prescribed technique and to control costs per unit of type of quantity. The client - the road manager - is responsible for the technique and therefore for the performance of the road and also for ensuring that the bill of quantities is correct. Should the quantities be underestimated, the contractor has a right to claim extra payments as indeed very often occurs. It is therefore quite common that prices negotiated as part of a tender for a build contract must be adjusted later upwards on account of extra work not foreseen at the time of tendering.

For a contract based on input specifications, the road manager or his consultant undertakes supervision in order to ensure that the proper technique and the right materials are used. In addition, the quantities are measured and controlled carefully as they serve as a basis of payment.

Procurement in terms of an ordinary build contract thus leaves very little scope for competition as concerns risk management. This contract format is also the reason behind the low level of innovation in the building industry, as it does not leave much scope for the introduction of innovation in order to affect risks or to reduce costs. However, it is not only the use of input specifications that stifles development. Whilst normal procurement procedures allow tenderers to submit alternative tenders, based on other techniques, there is no incentive for contractors to do so. If a bidder were to submit a tender involving a new technique he runs the risk that the client gains access to this new technique and hence also his competitors. There is thus no scope for a contractor to invest in development work, which normally requires that he recoup his investments through a number of projects.

A further complicating factor is that a new technique might result in lower future maintenance costs but at the expense of a higher - initial - investment cost. When evaluating bids for build contracts, the total life cycle costs of a road are not taken into account.

The DBO contract format has been developed to remedy the shortcomings of the traditional contracts. The basis for this type of contract is that the road should meet certain output specifications - road space characterised by measurable functions - which are demanded by road users. Road space implies the width and geometry of the road, road conditions, for example, the roughness of the road surface, the road's friction and its load carrying capacity. In other words, the outputs of the road are to be specified in such a way that over its life cycle total economic benefits should be maximised, subject to assumptions about future traffic and its composition[39].

There are three reasons why a DBO contract should include a period of maintenance. The first is to allow for technical development. The DBO contractor should therefore only be required to hand over information about the techniques used after a period of maintenance has been concluded; the maintenance period provides for a kind of patent period. Secondly, the contractor is responsible for ensuring the performance of the road, and it normally takes quite some time after the completion of a road until its performance can be established. And thirdly, to enable, as mentioned, a proper trade-off to be made between investment and maintenance costs in order to minimise the road's life-cycle costs.

The central components of a DBO contract are the performance requirements and how they are to be measured and verified, and the identification of bonus and penalty payments to be made when performance requirements are exceeded or not met respectively. The inspection requirements are much less voluminous than for a normal build contract, and more emphasis is put on the quality control system to be employed by the contractor than on actual inspection efforts.

Moreover, as the contract typically presumes a fixed (discounted) price (to be adjusted with bonuses and penalties), a contract in terms of outputs is a necessary condition to allow for competition as concerns the management of risks in road building. There is, however, yet another motive for DBO contracts, in that they allow projects to be implemented much faster than a normal contract. In a traditional contract, the design is prepared first, tendering is then undertaken before building can be initiated. In a DBO contract it is possible to undertake design and actual construction works at the same time, which allows for significant time savings[40].

Opponents of DBO contracting often point to the difficulty of establishing, measuring and verifying outputs. Whilst it is to be acknowledged that more development work is required in this area, it is contended that there is already today sufficient knowledge available to allow for performance oriented contracting. The method has already been tested. The reason for the slow progress at present is probably explained by the institutional arrangements characterising the road sector. If the governance structure were to change, for example in line with the proposals of the previous chapter, DBO contracting would be introduced at a much higher speed than at present, and the road sector would then start to deliver products in the same way as other sectors in the economy, i.e. products meeting the requirements of the consumers not of the technocrats and producers.

3.3.2 DBO or DBFO?

As argued, to promote innovation eventually resulting in lower costs for road building, risks must be unmasked and the market must be allowed to manage these risks. The next question is then if DBO is sufficient or whether the F should be added to yield DBFO? And if so, in what way should the contractor mobilise the capital required?

Initially, it should be noted that DBO under any circumstances requires that the contractor mobilise a larger working capital than required for an ordinary build contract, as the flow of payments is altered. In a build contract, the contractor is mainly paid during the construction phase. In addition, a DBO contract entails as mentioned a maintenance phase, and the need to verify outputs during this maintenance period. There will be a need for payments in respect of maintenance activities, as well as bonus or penalty payments on account of the road surpassing or not meeting the set performance requirements. Moreover, additional payments may have to be made at the termination of the contract, say after 10 years, depending on the road condition at that time in relation to the performance requirements.

When bidding for a DBO contract, the tenderer will thus not only carry the specific project risk associated with the project; he will also have to mobilise a substantial amount of working capital for a considerable amount of time, which may become expensive depending on what kind of guarantees he can offer. Different contractors are likely to differ in this regard, and their costs for borrowing money in the capital market will likely therefore also differ.

The implication is that an individual contractor when bidding for on a DBO contract will have to take steps to spread the specific risk of the project. Also the road manager should be interested in promoting risk spreading, primarily to ensure effective competition in the tender process. If contractors have to borrow, their differing borrowing costs may well hamper competition.

The solution to this problem is to use an intermediary as the contractor, rather than the contractor *per se*, i.e. to enter into a contract with a separate project company, as now done in the UK when implementing DBFO contracts. The official role of the project company is to both mobilise the contractor and the finance required, but the actual purpose of such a company is to provide for risk spreading so that the costs of the specific risk may be minimised. When a traditional contract based on input specifications is employed, and public monies finance the project, the tax-paying public is used in order to eliminate the costs of the specific risks of a project. When an output specification approach is used, the special project company essentially fulfils the same purpose.

However, for the road manager there is an additional motive for the execution of the contract by way of a project company, viz. the need to assess the quality of the contractor. There is always the risk of default in contracting, but when output specifications are a feature of a contract, the risk of default becomes much larger. For the road manager, it is difficult to assess this risk. For the capital market, on the other hand, risk assessment is its trade, so by contracting by way of a special project vehicle, the road manager can assume that the proper due diligence of the ultimate construction company as well as the other financial arrangements to be put on place will be carried out. The capital market will in addition contribute to the development of arrangements for ensuring a succession in the event of default on part of the construction or the special purpose company[41].

The main driving force behind this process is the condition that the income of the special purpose company is solely derived from the payments to be made by the road manager. The risks of a DBO contract therefore become very clear if a special purpose company is established and the excess is raised considerably in view of the limited guarantees available in such circumstances. As a consequence, the use of a special purpose company will lead to a careful assessment of risks *ex ante*, and eventually also to a careful process of risk management and monitoring. It provides the ultimate institutional framework for how to apply the output specification approach in road contracting.

It should, however, be acknowledged that using a special purpose company entails transaction costs. Such a solution is hence only warranted when the project being considered is of substantial size[42].

In conclusion, if DBO is to be introduced, it will normally be necessary to go one step further and introduce DBFO. Ultimately, the whole view of the road building process is to be changed. The road manager should not primarily procure roads; his task is to ensure that road services of acceptable quality are delivered to the road users. And when he has been assured that this is being done, then - and only then - should he pay for the services rendered.

3.4. Which types of risks?

Hitherto, attention has been paid to the question "how?". The answer is that efficient risk management requires output specification contracts, often in combination with a separate project company. This then raises the question of how the payments should be structured, and if it is possible to design them in such a way that the market risk may be transferred to the private sector. The purpose of the shadow tolls thathave been used in DBFO contracts in the UK is to transfer the market risk to the private sector. The answer to this question is important in order to be able to indicate what kind of risk that should be borne by the private sector in the road sector.

This paper will not analyse this aspect; the reader is referred to other literature summarised here[43]. It may be shown, however, that it is impossible for the capital market to reduce the cost of risk given that future traffic is uncertain. The reason is that the capital market cannot compete concerning the market risk as bidders will view this risk differently, ultimately because the volume of future traffic is genuinely uncertain. The pricing mechanism does not function as the item subject to tender cannot be specified in objective terms.

It may be argued that this condition is also reflected in the actual structure of the shadow toll payment mechanism as it has developed in the UK. The revenues of the UK project companies established in terms of DBFO-contracts are not directly proportional to traffic volume; the marginal revenue is a decreasing function of volume, and rather sharply so. The implication of this structure is that the relationship between total annual revenues and traffic volume is weakened considerably. This may be interpreted to be the answer of the capital market to something that it has been asked to do but cannot. The response of the market has, in other words, been to twist the shadow tolls in such a way that they do not really vary with traffic, and therefore do not transfer risks in any significant way. Our interpretation is that shadow tolls cannot be used to solve an efficiency problem; they only make the procurement process more difficult and complicated.

Are bidders not confronted with the same problem as the risks associated with the investment proper? It is argued here that there are important differences, in particular, that most of these risks may be managed. In addition, it is possible to obtain much more information about these risks by studying other similar projects that have already been implemented. Most project-specific risks are therefore not genuinely uncertain as in the case of future traffic volumes. Also, the total cost of a project is the sum of a large number of events, which means that individual events do not matter that much. A project has its own internal pooling capacity, so to say.

On the other hand, it should also be stated that it serves little purpose to ask the private sector to take on project-specific risks that are genuinely uncertain and also cannot be managed. Examples of such risks include risks related to future political decisions on new regulations (e.g. to improve road safety), which subsequent to road completion may result in increased costs for the contractor. Risks of this nature do not create proper driving forces, and will only raise costs, as it is unclear to what extent the private sector may in fact protect itself against project-specific risks through risk spreading.

Whilst shadow tools are questionable from an economic point of view, actual payments during different years should not necessarily be fixed, as they are at present in terms of the German *Vorfinanzierung* model. As indicated already, payments should vary by taking into account how well performance requirements are being met. A particularly important performance requirement is that the road lanes remain open to traffic as much as possible. Thus, if the contractor is forced to close road lanes in order to repair them there is scope for a penalty through reduced annual payments. And payments may also be reduced if, for example, the road is more rough than stipulated in the contract.

It is important to note however, that the penalties (prices) to be paid by the contractor for lane closures or for unsatisfactory performance cannot be revealed through tendering procedures[44]. Such prices must be determined *ex ante* and in terms of the principle of economic efficiency, i.e. by using the same prices that go into the cost-benefit analysis used to establish the viability of the road project in the first instance. These prices must in addition be stated in the bid documents when going out to tender.

3.5. Maintenance

This presentation has focused so far on investment, including major reconstruction projects. Turning to maintenance activities the same basic reasoning applies. The proposed governance structure (Chapter 2) puts the road user - so to speak - in the driving seat; road activities are there to satisfy his needs according to his willingness to pay. By applying DBFO, this philosophy will be reflected in the approach to procurement of road investments, which places emphasis on output specifications meeting the road users' demands.

The same approach should, of course, also be applied to road maintenance activities in general. Indeed, if the new governance regime implies that road users will pay for the roads, it will be necessary to inform the road users about the performance specifications being employed, as well as to gain their acceptance of this choice. This implies that it will not be possible to divide maintenance into a number of separate activities such as routine and periodic maintenance, as both types of activities are required jointly in order to ensure adequate performance. If road users demand a specified performance and contractors are to be responsible for delivering such performance then one contractor must be made responsible for all road maintenance activities with respect to an identified set of roads. In addition, in order to foster innovation in road maintenance activities, maintenance must be contracted out for longer periods of time. Long-term contracts also facilitate competition as the facilities and equipment required by the maintenance contractor may then be fully written off.

The history of private contracting for road maintenance is shorter than contracting for larger road works. Road maintenance contracts have typically been based on input specifications, unit prices and bills of quantities. The introduction of the performance approach appears, however, to have been quicker for road maintenance, so far, and it is today quite common in a number of countries to operate at least part of the road maintenance efforts in terms of performance contracts. Also, some countries have recently introduced long-term output-oriented contracts, which are also characterised by the contractor taking responsibility for more or less the entire operation during the contract period[45].

Also long-term maintenance contracts may give rise to substantial risks for the contractor as the performance requirements may result in a need to reconstruct roads during the contract period. It is therefore argued here that efficient contracting will require firstly that larger areas or roads are bundled together to form one contract for a period of perhaps 10 to 15 years, and secondly, that contracting be done by way of a special purpose company. By mobilising the working capital from the private sector, proper risk assessment and monitoring of performance would be assured. But such special-purpose vehicles for road maintenance[46] would also have the benefit of facilitating innovation and improving competition. Innovation and competition is promoted in that the special purpose company would be in a position to replace a contractor engaged to do specific works during the contract period, thereby allowing new and more innovative contractors to be introduced.

As for a DBFO contract, payments under a performance-based maintenance contract would entail a fixed fee, say on a monthly basis with bonus payments for performance above minimum requirements and penalties for inadequate performance. And closure of lanes in order to effect maintenance works would, of course, result in penalty payments.

3.6. Concluding words

Road works are associated with substantial risks. Considerable efforts are required to penetrate these risks, and to analyse how they may be managed, but proper risk management also allows for costs to be reduced considerably. The contracting formats typically used today imply that these risks are largely ignored, which does not mean that they do not exist. They are there and are borne by taxpayers, but are not being exploited to the advantage of road users and society.

To allow the market to compete for risk management in order to reduce road costs, it is necessary to replace the present input-oriented contracts, with contracts based on outputs, or performance requirements. The advantage of DBFO-contracts is not only explained by better optimisation in the short run, but also by (i) their ability to promote innovations; (ii) that they enable construction works to be undertaken much more quickly than is typically the case today; and (iii) that they allow for a proper consideration of the life-cycle costs of the roads.

For the road manager, output specifications will give rise to new problems, viz. how to assess not only that the contractor is technically competent but also can execute the works without defaulting. In addition, there is a need to promote the aspect that specific project risk costs are reduced in order to ensure strong competition when tendering. An effective way for dealing with these problems is to create separate project-specific companies to be the road manager’s contracting party. The official role of the project company is to mobilise the resources, but from an economic point of view its purpose is to reduce and equalise the bidders’ project-specific risk costs and to ensure a strong governance structure for risk management.

The conclusion is that contracting is not just about works but should normally also entail the mobilisation of the working capital for the performance of the works. Furthermore the road manager should only pay for services rendered, and according to set performance requirements. However, payments should not be based on shadow tolls; contractors have neither a real influence on traffic volumes, nor can they be expected to be able to predict the anticipated future volumes with a high degree of consistency.

NOTES

1. See Bousquet & Queiroz (1996).

2. World Bank (1994).

3. Vägverket (1995).

4. Dunlop (1995).

5. The term "road manager" refers in this paper to the entity legally responsible for the management of the road network, irrespective of whether it is part of a ministry or a public agency of sorts.

6. Gomez-Ibanez & Meyer (1993) and World Bank (1994).

7. It should be noted that this kind of financing only involves a delay in the actual expenditures to be made by the road manager of public monies, and that the public sector therefore retains final responsibility for mobilising the required financial resources. Compared to BOT projects and other similar projects involving tolls, it is therefore much easier to mobilise private sector involvement in DBFO or *Vorfinanzierung*; see European Commission (1997).

8. DBFO should not be seen as synonymous with shadow tolls, although the two concepts are frequently used in this way. Shadow tolling does not follow from an application of DBFO contracting, as will be argued below in Chapter 3 of this paper. It should also be mentioned that payments in England, where DBFO has been pioneered for road building projects, are not exclusively in the form of shadow tolls; also other factors such as road capacity availability and road safety are considered when determining the size of annual payments to be made by the road manager to the contractor.

9. Federal Ministry of Transport (1997), Highways Agency (1997), Ministry of Transport and Communications (1997a) and Stevenson (1993).

10. Ministry of Transport and Communications (1997b).

11. Road Fund Administration Act (1999).

12. This paper does not expand on the concept Public-Private Partnerships (PPPs); see, e.g., Fayard (1999).

13. It is recognised that roads may sometimes be devolved to the local government level but, even in this case, a centralised approach is taken.

14. See, e.g., Heggie (1995).

15. See, e.g., Jansson (1992).

16. In addition, it should be mentioned that the road sector gives rise to a number of external effects including noise, exhaust emissions and accidents. Arrangements for how to consider these effects may have important implications for the organisation and financing of the road sector, although this is not considered in this paper.

17. See, e.g., McGuire (1987), Sandler and Tschirhart (1980) and Cornes and Sandler (1986).

18. Arguments may be made for having separate "clubs" for the main road network and local road networks, *inter alia*, to address equity issues. This idea is not pursued further here, however.

19. It is expected that the board would be appointed by the Government, however, subject to procedures to ensure that directors have skills of relevance to and fully appreciate the object of the agent.

20. It is sometimes maintained that accountabilities would be strengthened by involving stakeholders; see, e.g., Heggie (1995).

21. See, e.g., Roth (1996).

22. To achieve allocative efficiency, it is necessary to impose charges for the use of roads that are equal to the marginal cost of road use. Such charges will essentially cover three elements (disregarding environmental effects and road safety): (i) maintenance costs which are variable with road use; (ii) road damage costs; and (iii) congestion costs. Some economists argue that such charges will also lead to full cost-recovery; see e.g. Mohring and Harwitz (1962), Newbery (1989, 1990) and Small *et al.* (1989). Their arguments are based on the assumption that there is a constant relationship between road capacity and construction costs (i.e. there are constant returns to scale in road construction), and their works also provide data and arguments to justify such an assumption. These assumptions have, however, been criticised by others, who argue that more realistic assumptions would show that marginal-cost based prices will not result in cost recovery; see, e.g., Heggie & Fon (1991). This debate is likely to be of limited real interest as cost-recovery under any circumstances will not result in any large static efficiency losses. Firstly, the price elasticity of road use is low. Secondly, financing roads from ordinary taxes is normally associated with higher losses on account of the significant economic costs (dead-weight burden) associated with the tax instruments that have to be relied on.

23. See endnote 18.

24. See, e.g., Heggie (1995).

25. See, e.g., Littlechild and Thompson (1977) and Brown (1985).

26. See, e.g., Littlechild and Thompson (1977) and Brown (1985). These analyses are based on the assumption that there are joint/residual costs that must be allocated, after payment of the marginal costs by each party. However, it may be shown that in the case of congestion only one price structure may exist, i.e. when marginal cost based prices directly result in full cost-recovery so that there are no residual costs to be allocated; see footnote 20.

27. See also Bruzelius (1998).

28. This argument appears to have been important in Finland when introducing DBFO; seeMinistry of Transport and Communications (1996) and (1997a).

29. Bousquet & Fayard (1997).

30. See, e.g., Highways Agency (1997).

31. See, e.g., Nicholson (1996).

32. Cf. Highways Agency (1997).

33. Cf. Brealey & Myers (1991).

34. See Arrow & Lind (1970).

35. See, e.g., Grennberg & Olsson (1996), Olsson (1993) and Vägverket (1995).

36. The following is viewed as essentially identical: “functional specifications”, “output specifications”, “performance specifications” or “end-user specifications”.

37. See, e.g., National Audit Office (1998).

38. See, e.g., Zietlow (1996).

39. This is the philosophy underlying some road planning models, including HDM developed by the World Bank.

40. See, e.g., Vägverket (1995).

41. Cf. Highways Agency (1997).

42. It is envisaged that if DBFO is fully introduced, a new type of road management company will emerge which will not necessarily be owned by contractors but by investors in general, and that these companies will in due course take on several projects, thus making transaction costs less of a concern.

43. See Bruzelius (1998).

44. This has been attempted in the UK in connection with tendering for DBFO contracts.

45. See, e.g., Frost & Lithgow (1996), Schliessler & Bull (1993) and Zietlow (1998).

46. See endnote 40.

BIBLIOGRAPHY

Arrow, K.J. & Lind, R.C. (1970), "Risk and Uncertainty; Uncertainty and the evaluation of public investment decision", *American Economic Review*, 60, 364-78.

Bousquet, F. & Queiroz, C. (1996), "Road Financing Systems: A Cross-Country Comparison of Typical Issues and Good Practices", *Proceedings of Seminar G*, Volume P406, PTRC, London.

Bousquet, F. & Fayard, A. (1997), "Analysis of the Interface between Road Financing and Road Management - Observation of Current Trends in Europe", *Proceedings of Seminar J*, Volume P418, PTRC, London.

Brealey, R.A. & Myers, S.C. (1991), *Principles of Corporate Finance,* Fourth Edition, McGraw-Hill, Inc., New York.

Brown, Stephen M. (1985), Cost-sharing clubs and the Private Provision of Transportation Infrastructure, Ph.D.-thesis, Washington University, St. Louis, Mo.

Bruzelius, Nils (1998), "Köpa väg eller köpa vägtjänster? En analys av nya metoder för finansiering av vägar", Ekonomiska Forskningsinstitutet, Handelshögskolan vid Lunds Universitet, Lund.

Cornes, Richard & Sandler, Todd (1986), *The Theory of Externalities, Public Goods, and Club Goods,* Cambridge University Press, Cambridge, UK.

Dunlop, R.J. (1995), "A Comprehensive Reorganization of a Road Agency. The New Zealand Experience", Presentation at the World Bank, September 13, 1995, Washington, D.C.

European Commission (1997), "Trans-European Networks: European Commission Communication on Public/Private Partnerships", COM(97)453.

Fayard, Alain (1999), "Overview of the Scope and Limitations of Public-Private Partnerships", Seminar on Public-Private Partnerships (PPPs) in Transport Infrastructure Financing, 12 January 1999, ECMT, Paris.

Federal Ministry of Transport (1997), "Private-Sector Funding/Privatization of Federal Trunk Roads - Status and Prospects", Bonn.

Frost, M. & Lithgow, C. (1996), "Improving Quality and Cutting Costs through Performance Contracts. Australian Experience", Road Management Training Seminar, 17-18 December 1996, World Bank, Washington, D.C.

Gomez-Ibanez, J.A. & Meyer, J.R. (1993), *Going Private; the International Experience with Transport Privatization,* The Brookings Institution, Washington DC.

Grennberg, T. & Olsson, U. (1996), “Funktionsentreprenad på väg; Restvärdesbedömning vid avlämnandebesiktningen”, Teknisk Rapport 1996:04 T, Avd. för Anläggningsproduktions-teknik, Tekniska Högskolan i Luleå.

Heggie, Ian G. (1995), "Commercializing Africa’s Roads: Transforming the Role of the Public Sector", *Transport Reviews*, 15 (2), 167-84.

Heggie, Ian G. & Fon, V. (1991), "Optimal User Charges and Cost Recovery for Roads in Developing Countries", Infrastructure and Urban Development Department, WPS 780, Washington, D.C.

Highways Agency (1997), *DBFO - Value in roads; A case study on the first eight DBFO road contracts and their development*, London.

Jansson, J.O. (1992), "Vägväsendet i samhällsekonomisk belysning", *VTI meddelande*, Nr 701, Väg- och Trafikinstitutet, Linköping.

Littlechild, S.C. & Thompson, G.F. (1977), "Aircraft Landing Fees: A Game Theory Approach", *Bell Journal of Economics*, 8 (1), 186-204.

McGuire, Martin C. (1987), "Clubs", in *Palgrave*, Macmillan Press, London.

Ministry of Transport and Communications (1996), “Introduction of Private Finance for Roads in Finland; Application of the Shadow Toll Option on Main Road 4”, L 23/96, Helsinki.

Ministry of Transport and Communications (1997a), “Private Finance for Main Road 4; Finland”, B 16/97, Helsinki.

Ministry of Transport and Communications (1997b), “Public-Private Partnership in Rail Projects”, 31/97, Helsinki.

Mohring, Herbert & Harwitz, Mitchell (1962), *Highway benefits: An analytical framework*, Northwestern University Press, Evanston, Ill.

National Audit Office (1998), *The Private Finance Initiative: The First Four Design, Build, Finance and Operate Roads Contracts*, *Report by the Comptroller and Auditor General*, HMSO, London.

Newbery, D.M. (1989), "Cost Recovery from Optimally Designed Roads", *Economica*, 56, 165-85.

Newbery, D.M. (1990), "Pricing and Congestion: Economic Principles Relevant to Pricing Roads", *Oxford Review of Economic Policy*, 6 (2), 22-38.

Nicholson, S. (1996), “Working in Partnership: DBFO in the UK”, *Proceedings of Seminar G*, Volume P406, PTRC, London.

Olsson, U. (1993), “Funktionsentreprenad för drift och underhåll av vägar och gator”, Doktorsavhandling 1993:135 D, Avd. för Anläggningsproduktionsteknik, Tekniska Högskolan i Luleå.

Road Fund Administration Act (1999), *Government Gazette*, Windhoek.

Roth, Gabriel (1996), *Roads in a Market Economy,* Avebury Technical, Alderhot.

Sandler, Todd & Tschirhart, John T. (1980), "The Economic Theory of Clubs: An Evaluative Survey", *Journal of Economic Literature*, 18, 1481-1521.

Schliessler, A. & Bull, A. (1993), *Roads; A New Approach for Road Network Management and Conservation*, United Nations Economic Commission for Latin America (ECLAC), Santiago.

Small, Kenneth A, Winston, Clifford & Evans, Carol A. (1989), *Road Work; A New Highway Pricing and Investment Policy*, The Brookings Institution, Washington, D.C..

Stevenson, P. (1993), "Tunnel Financing in the Netherlands", in: *World Infrastructure 1994*, Sterling Publications Limited, London.

World Bank (1994), *World Development Report 1994: Infrastructure for Development*, Oxford University Press, Oxford.

Vägverket (1995), *Byggande och skötsel på funktionsentreprenad*; *Handbok för upphandling av väg- och trafikutrymmen med funktionella krav*, Publ. 1995:49, Borlänge.

Zietlow, G, (1998), "Cutting Cost and Improving Quality through Performance Specified Road Maintenance Contracts; Latin American Experience and its Relevance for Africa", SEAT Note No. 14, World Bank, Washington, D.C.

Topic 2

TRANSFORMING ECONOMIC AND INSTITUTIONAL STRUCTURES AND TRENDS IN TECHNOLOGY: EXPERIENCE AND PROSPECTS

d) Technology

TECHNOLOGY POLICIES FOR A BETTER TRANSPORT SYSTEM IN EUROPE

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SUMMARY

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RESUME

The transport system in Europe is a mixture of well-integrated components, national systems with more or less interconnectivity and local and regional components. There are well-known bottlenecks and challenges for improvement. Technological innovations are generally considered as an important and promising path towards an improved European transport system.

The innovation process is in large measure determined by technology push and market pull. In this process the direct and indirect influence of governments is very large, both in a positive way, e.g. by subsidies, taxation and the promotion of R&D aimed at technologies which are considered to be helpful to reach policy goals, and in a negative way by preventing technological innovation, e.g. through legislation and regulation.

All national governments have some way to address technological innovations in transport, but rather few have a well-defined technology policy in this domain. Technology policy exists in other domains such as economic affairs, defence and environment. For the domain of transport an effective technology policy has to deal with specific issues such as the fact that many actors and stakeholders are involved, the consumers are a very diffuse group, the requirements are often mutually inconsistent, values and constraints exist that are counterproductive and transport activity is diffused in all domains of daily life and the economy.

This report gives an overview of some promising technological developments, which may change transport in the next 10 to 30 years. It gives a qualitative estimation of their possible impact on policy goals. Possible policy options to improve the innovation process will be given.

Most of the research on which this report is based was carried out in a European context.

The report tries to bring some structure and show some important general trends in the very diverse and changing field of technological innovations. All modes and intermodality are considered, with an emphasis on road passenger transport.

1. INTRODUCTION

This report has been written to give an overview of possibilities for policy makers to influence technological innovation in transport. Reasons why policy makers may have interest in transport technology are:

1. Technological innovations can help to achieve certain goals such as an increase of safety, less air pollution, less delay due to congestion;
2. Technological innovations penetrate every sector of society and have often large impacts. Governments have to be aware of these impacts and if necessary take measures to prevent unwanted effects.

Scenario studies have shown that technological innovations alone or combined with changes in transport demand can achieve reductions in air emissions as targeted in national and international policy goals. Chapter 3 gives a summary of four of such studies. Section 3.2 looks at the question whether policy measures can influence the process of technological innovation in such a way that the desired improvements are achieved. The influence of governments on technological innovations is large, but their power to control the innovation process and steer it in a desired direction is limited. The development of technologies has mainly to be done by researchers and industrial actors, although governmental institutes may also have a role in the innovation process. Centralised decision making often appears to be less effective than a more diffuse decision making which is left to the market. A distinction can be made between technological innovation which is feasible under all circumstances and innovation that needs special conditions or care of the authorities.

Intervention in the process of technological innovation requires insight in the characteristics of that process. Chapter 4 describes the different phases and the possibilities to steer the process. Government steering is the subject of Chapter 5, where technology and transport policy in various countries is described. Large differences exist between various countries, which makes it unrealistic to give a standard prescription for policy making for transport technology.

Chapter 6 summarises technological innovations that can be expected in the next 20 years. In Chapter 7 the implications are given for policy making.

2. THE RELEVANCE OF TECHNOLOGY FOR TRANSPORT

Technology is an important aspect of the traffic and transport system. Many problems are caused directly or indirectly by the technology that is used. E.g. the current internal combustion engine is the source of emissions of air pollution and greenhouse gasses to the atmosphere.

On the other hand, changes in technology have already had a positive impact on several effects. Environmental pollution from lead in exhaust gasses has disappeared nearly completely in Western European countries since lead has been replaced by other additives to petrol. Noise from engines has been reduced and NO_x and CO emissions have been removed to a large extent by catalytic converters. Traffic safety has been improved by airbags, a stronger construction of cars and improved design. Dynamic traffic management has increased the utilisation of existing infrastructure. Good technical equipment for the removal of broken down vehicles, coupled with a monitoring and alarm system for highways has reduced the impact of incidents on traffic throughput. The introduction of high-speed trains has reduced travel times by rail and has given a new dimension to the European transport system.

Travel information makes it possible to plan trips in a more rational way, which reduces the nuisance caused by the temporarily over saturation of infrastructure. Route and traffic information supports travellers to take optimum decisions during trips and reduce searching and delays. Existing travel information is becoming more easily accessible thanks to distribution through communication channels like Internet.

Technology has, first of all, a role in vehicles and infrastructure, but also in the optimum utilisation of infrastructure and the rational planning of trips, including route and modal choice and the utilisation of more than one mode. New transport systems can be developed using existing and new technologies, e.g. automated underground freight transport and automated guided vehicles.

Smart cards are deployed now in several places to make travelling with different modes easier and quicker. One card pays for parking charges, motorway tolls, public transport etc.

Technology has the potential to influence the demand for transport in a qualitative and quantitative way. Teleworking may not reduce total travel demand (AVV, 1998) but it gives the possibility to travel at other times outside the peak period. Remote diagnostics and maintenance, remote learning and remote operation have certainly possibilities to reduce the number of certain specific trips.

Technology offers other possibilities, because it can facilitate policy implementation. New ways have emerged to charge travellers for the use of infrastructure and for external effects. It is technologically possible to make drivers pay more if their car emits more NO_x or CO_2 by the application of sensors in the exhaust. The location of a vehicle may be determined by a satellite navigation system or roadside radio beacons. Charges may be levied depending on the area where cars are driving. Also the enforcement of regulations can be simplified considerably by the application of new technologies, e.g. equipment for Automated Speed Adaptation installed in a car makes it possible to reduce the maximum speed automatically as soon as the car enters and area with speed limits.

Finally, several technological innovations are coming into use in the transport sector, many of them unplanned and unforeseen by governments. For instance, mobile telephones are used frequently by drivers, especially when they are waiting in congestion. This innovation relieves the nuisance caused by traffic jams, but it may endanger traffic safety if its use interferes with the driver’s task. The operation of electronic equipment such as telephones and audio equipment distracts the attention of the driver and is a rather frequent cause of accidents. In such cases governments have a responsibility with respect to such technologies. With regulations they can reduce the risks.

New technologies may also have side effects that have an indirect negative impact for certain policy objectives. The improvement of fuel efficiency of engines made it possible to build larger, heavier cars with the same fuel consumption as older smaller cars. The popularity of these larger, heavier cars made the effect of more efficient engines disappear. Another example is the computerisation of the standard passenger car. These cars may grow into mobile offices. The difference between travel time and working time in the office may disappear to a great extent, which may further increase traffic demand.

To summarise, governments have to deal in a pro-active way with technological innovations in traffic and transport because these innovations can be used to improve the transport system by:

- modifications of vehicles that make them safer, less polluting, more economical;
- better utilisation of the existing infrastructure;
- better integration of transport modes;
- changing the demand for transport;
- supporting enforcement of regulation;
- improving possibilities for charging for the use of the transport system.

Furthermore, governments have to react in a timely fashion on technological innovations because they may affect safety, transport demand and performance of vehicles and infrastructure.

3. SCENARIO STUDIES ON TECHNOLOGICAL INNOVATIONS

Technological innovations will have a large impact on transport in the future. The current problems with respect to fuel consumption and possible finite supply of oil, air pollution, greenhouse gasses and congestion might be solved to a certain extent by the deployment of new technologies. Several scenario studies have been done in which the possible impact of technological innovations has been studied under different assumptions about future economic development and political conditions. Van Wee and Annema (1999) have reviewed some of these studies. Their conclusions will be summarised in the next Chapter.

It is uncertain how new technologies can be promoted in such a way, that they will replace the older technology and that the innovation will have the desired impact. The uncertainty about the impact of policy measures is even larger than the uncertainty about the impact of technological innovations. The second Chapter of this chapter describes the result of a scenario study done in the FANTASIE project for the European Commission. It gives an overview of those innovations that will come on the market more or less independent from additional government intervention and the innovations that will be realised only with specific support from the government.

3.1. The possible impact of technological innovation on the environment

The "classical" pollutant emissions, HC, particulates, SO_2 and CO can be tackled by technical measures. NO_x is a persistent problem, especially for diesel engines, but strong technological efforts are assumed to make it possible to bring this emission down to acceptable levels (Bleijenberg and Dings, 1998). CO_2 emissions are the most difficult to reduce. Exhaust pipe treatment is not a feasible option and the technological possibilities are the reduction of fuel consumption or the use of alternative fuels. Furthermore, the reduction of kilometres travelled would be a good way to reduce CO_2 emissions, but most instruments to realise that are not very effective and are politically not popular. Policy options to suppress transport demand are not very effective or get much resistance.

Van Wee *et al.* (1996) report a scenario study which investigated the feasibility to achieve the following emission reductions between 1990 and 2030:

- CO_2: -80 per cent
- NO_x: -90 per cent
- VOC (volatile organic compounds) - 90 per cent
- small particles: - 90 per cent.

They studied the following four scenarios:

1. Business as usual, where no particular measures were taken to reduce traffic demand or to stimulate technological improvements. This scenario does not lead to a situation that satisfies the requirements.
2. Maximum technological innovations, such as the introduction of the fuel cell, hybrid propulsion, electric vehicles. With these innovations used as much as possible, the emission reductions could be achieved.
3. A capacity restraint scenario, where the demand for transport has been significantly reduced. Large changes to society are needed, transport has to be organised much more efficiently, distances between production and consumption have to be reduced and commuting and travel by car is brought back to the most necessary minimum. The economic growth changes in qualitative and quantitative terms. Under the assumption of this scenario the desired emission reduction could be realised.
4. In the fourth scenario a mix of technological innovations and reduction of transport has been studied. The objectives could be realised here for much less extreme assumptions.

The second and fourth scenarios show that economic growth and high standards for air quality are not necessarily incompatible. Technology can help to decouple economic growth and the increase of environmental damage by the growing transport.

Van Wee and Annema (1999) recently reviewed three other scenario studies:

1. The Netherlands: RIVM (1997) *National Economic Outlook 1997 - 2020*. Alphen a.d. Rijn, the Netherlands, Samson H.D., Tjeenk Willink.
2. Grossraum Hannover: ifeu-Institut für Energie- und Umweltforschung, Prognos AG, Basel (1997) *CO_2 Minderungsstudie Verkehr GrossraumHannover*. Heidelberg/Basel.
3. European Union: Tanja, P.T., W.C.G.Clerx, J. van Ham, T.J.Liogt, A.A.W.G. Mulders, R.C. Rijkeboer, P. van Sloten (1992) *EC Policy measures aiming at reducing CO_2 emissions in the transport sector. report 92/NL037, Delft: TNO.*

These studies concentrated on the reduction of CO_2. Most studies consider only the effects of the use of vehicles and neglect the costs of manufacturing, distribution and recycling. The technology options chosen in these studies to reduce CO_2 emissions are:

- Fuel efficient technologies;
- Electric and hybrid vehicles (Dutch and Hannover scenario);
- Buses on natural gas;
- Light rail;
- High speed bus lines;
- Extra duty on fuel;
- CO_2 emission standards;
- More telematics in goods transport (Hanover);
- Regulations and agreements with industry;

- Price measures;
- Reduction maximum speed (EU).

The Hanover study took two scenarios: local and regional measures and local, regional and national measures. In the EC study two scenarios have been studied: *Reasonable Restrictive* and *Target* scenario. The Dutch study used three scenarios, for *low, medium and high economic growth.*

All studies assume that in the base case the fuel efficiency of the car fleet will improve. This effect has been noted in the period between 1980 and 1990, but presently the average fuel efficiency is stable. Cars have become heavier and buyers prefer heavier and upgraded cars (and mini-vans and mini-buses), with the result that more fuel is needed for propulsion.

The result of the three scenario studies is that in the EU study annually a 0.3 to 2.8 per cent reduction of CO_2 emissions is possible. In the Dutch study 0.3 to 1.1 per cent per year is found to be possible. This depends on European co-operation and the autonomous improvement of fuel efficiency. If city centres are closed for vehicles with internal combustion engines, the reduction will become an additional 1.1 per cent. In the Hanover study 0.5 to 1 per cent improvement per year is possible.

All studies agree that CO_2 reduction policy is most effective if coherent packages of measures are applied, including new technologies, a change in forms of vehicle ownership (a variety of cars available for travelling without the need to own the cars), operations, regulations, infrastructure. The studies recommend:

- Pricing instruments (differentiated taxation of fuels);
- CO_2 limits for manufacturers;
- Subsidies for R&D for new vehicle concepts and fuels; and
- Spatial and organisational measures to influence demand, occupancy, load rates, etc.

Two studies conclude that there exists a rebound effect. If a certain kind of fuel is made cheaper or the fuel efficiency is improved, the effect will be that drivers using that fuel increase their car kilometres. There seems to be an asymmetry, because an increase in prices seems to have a larger impact than a decrease. Furthermore, the long-term effects of changing prices are much higher than the short term effects (Goodwin, 1992).

Synergy effects are considered to be necessary, but on the other hand, the combined effect of individual measures is often lower than the sum of the individual measures. Fuel pricing as an instrument for decreasing CO_2 emission seems to be effective only if the price increases are very high. Tradable permits are believed to be potentially more effective.

The effect of non-road traffic (air, ship) is very large and often neglected: CO_2 emissions from aircraft fuelled in the Netherlands is 7.7 megatons and for ships it is even more: 34.6 megatons. This can be compared to the emissions of all cars in the Netherlands: 17 megatons.

The conclusions of these scenario studies are that emission reductions are feasible and that a mixture of technological innovations and measures to reduce transport demand are most appropriate. The increase of fuel price alone will have an insufficient impact unless unrealistically high prices are introduced. Rebound effects have to be prevented. The possibilities to improve air quality are not only present for road traffic: air and waterborne transport also contribute considerably to emissions, and there is scope for reduction.

The scenarios discussed in this Chapter dealt with the question whether it would be possible to achieve new emission standards. Other policy objectives like improvements of safety and reductions of congestion are more difficult to study in scenarios. The rebound effect that is already the cause of uncertainty in emission studies, is much larger if we consider the impact of all kinds of measures on congestion or safety. For instance, if congestion during peak hours is reduced, people will "return to the peak", i.e. people who travel now before or after the peak hours will change their departure time to the more desired peak hour. The reduction of travel times by high-speed trains has had the impact that people increase their commuting distance considerably. It seems that technologies like ABS which improve the safety of cars do not have the impact that less accidents happen, but that people drive with higher speeds in risky conditions because they expect that with ABS it will be possible to stop more abruptly. The technology offers the possibility to shift the boundaries of what is perceived as safe driving.

Since rebound effects often mask the primary effect and no good models exist yet to predict these effects, scenario studies with respect to safety and congestion are very uncertain in their outcomes and have been executed rather infrequently.

3.2. The sensitivity of technological innovations in policy scenarios

We can estimate the speed of deployment of technologies in transport for different future scenarios. Some technological innovations will come relatively autonomously, thanks to technology push and market pull. For governments several technological innovations could be desired to realise the achievement of policy goals. The preceding paragraph describes how technological innovations, especially if coupled with changed travel behaviour and reduced transport demand, can be effective in reducing emissions. The question to be solved is, whether a *policy push* can be given to the innovation process such that the desired innovations are realised.

Impacts of policy measures on the innovation process are uncertain and depend on many (minor) details of the technology, the network of actors, the context of the innovation and the preference of the users. Especially in the critical phase of the innovation process, where a new, maturing technology has to be introduced in the market, the uncertainty about the chances of success is large but also the possibilities to influence success are large. An estimation of the success of innovations and their potential market share can be undertaken at present only by using an *expert guess*. Nobody knows for certain what will happen, but one may ask experts in certain domains about their opinion about the market potential of certain technological innovations. This has been done in several studies, e.g. the Japanese and German Delphi studies, the British Foresight project, the Dutch INIT project (INIT 1997) and recently also in the European FANTASIE (*Forecasting and Assessment of New Technologies And Transport Systems and their Impacts on the Environment*) project. The results of scenario studies done in FANTASIE, based on trend extrapolations and expert opinions are discussed in the rest of this Chapter.

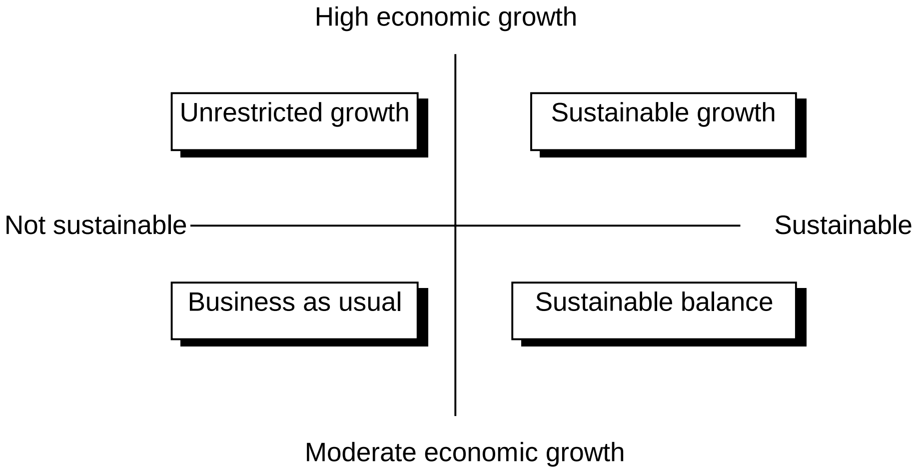
The FANTASIE research project, in the Fourth Framework Programme of the European Commission, has the objective of surveying new technologies with a potential impact on policy objectives for transport and to determine suitable policy options to cope with the technological innovations. In FANTASIE, Korver and Harrell (1999) studied in four scenarios possible innovations in transport and the market share for different transport concepts under different future conditions. The scenarios considered have two main dimensions:

1. Not sustainable;
2. High growth/moderate economic growth.

The two unsustainable scenarios have the following characteristics:
- Business as usual (moderate growth);
- Unrestricted growth (high economic growth).

The two sustainable scenarios are characterised as:
- Sustainable balance (moderate growth);
- Sustainable growth (high growth).

Figure 1. **The four prototype scenarios**



In *sustainable growth* economic growth and transport demand have been decoupled. In *sustainable balance* transport demand has been changed considerably. The transport demand for freight is determined first of all by economic growth and secondly by sustainability. For passenger transport sustainability is the first determinant and economic growth gives a second level influence.

The possibilities for governments to have influence in the innovation process depend on economic conditions, the government's role and the character of the autonomous forces in the innovation process. In a growing economy the possibilities to steer the innovation process are better than in a declining market. Furthermore, it appears that in the different scenarios the change in fleet composition is larger for passenger cars than for trucks. This means that governments can have a larger influence on the development of passenger transport than of freight. Especially certain niche markets, e.g. urban transport, are sensitive to government influence.

The conclusion from the scenario analysis is that governments will have more influence on certain innovations such as:

- Urban cars (for these small cars with limited range and speeds an average market share is possible);

- Air ship (small market share is possible);
- Supersonic aeroplanes (this transport concept will get small market share);
- Maglev (very small market share);
- Light rail and people movers (small to average market share).

For freight transport the transport concepts for which governments can have a significant influence are:

- Road train: several trailers coupled together mechanically or electronically to a long vehicle or platoon of vehicles with one driver (small market share);
- High speed rail (small niche);
- Automated Guided Vehicles (average market share possible);
- Underground transport systems (small niche).

The conventional transport concepts will hold their main share of the market for the next 30 years. This means that policies of government and other authorities will not have much influence on the market shares of the following transport concepts:

- The all-purpose car will keep 50-70 per cent of the passenger kilometres in Europe;
- Sub-sonic aircraft will be responsible for *ca*. 10 per cent of the transport market in 2020;
- Conventional trains for passengers will keep about 5 per cent;
- Heavy trucks will carry about 45 per cent of the freight;
- Vans and light trucks will take 15-20 per cent of the freight market;
- Conventional rail for goods 4-11 per cent;
- Ships *ca.* 7 per cent.

This means for policy making that one should first of all take care of the dominant present transport concepts and try to steer the future development of these transport means. The emphasis should be on evolutionary improvements, better utilisation and the prevention of unwanted developments. For the niches there are possibilities to influence the technological and social developments and possibly for systems innovations. The implementation of Automated Guided Vehicles for freight transport and the introduction of the small urban car for passengers seem to be good subjects for cost-effective government steering.

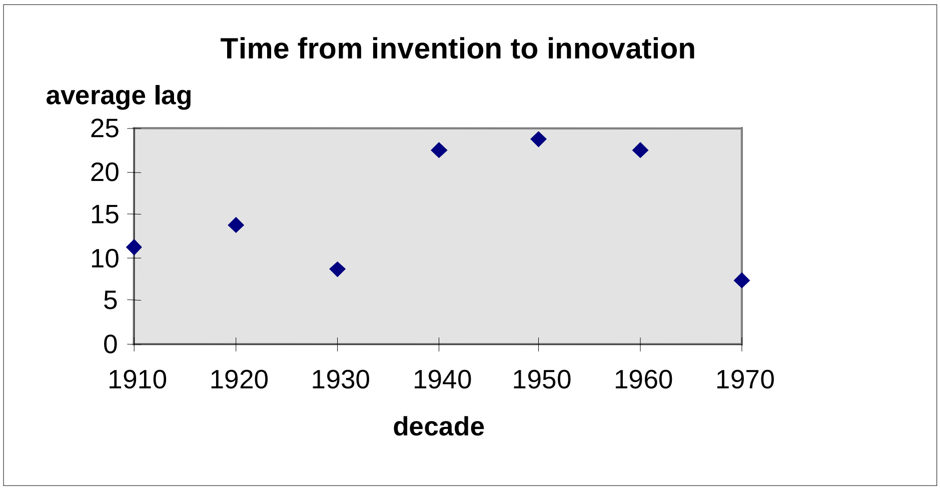
4. THE PROCESS OF TECHNOLOGICAL INNOVATION

Technological innovation follows a certain development process that may take several decades. New technologies start as inventions that are developed into practical applications and brought into a form that can be introduced on the market. The time between an invention and market penetration is rather long, between 1 and 60 years. The average time was 15 years at the beginning of the 20th Century and was about 25 years in the sixties (Rosegger, 1996).

The life cycle of technological innovations normally goes along the following phases:

1. Birth of the invention;
2. Test;
3. First practical application;
4. Market introduction;
5. Maturity and use;
6. Decline or takeover by a new innovation.

Figure 2. **Time lag between invention and innovation for some major innovations** (adapted from Rosegger, 1996)



Between the phases 1 and 3 the average time lag is about 20 years. The period until the decline depends on the durability of the product, the speed at which other technologies are developed, the infrastructure that has been built up for the technology and other external conditions. Of course, these figures are an average. Several products, such as computers and software have a much shorter lifecycle.

In the different phases many decisions, made by several actors, determine the process. The technology is integrated with other technologies and development has to be adapted frequently. In general it is not wise to take decisions about the innovation process in a centralised way. It should be left to the actors in the market with little steering from governments. The quality of decisions that are made in a co-ordinated, centralised way is nearly always worse than decisions taken in a decentralised way by actors in the market (Grübler, 1998).

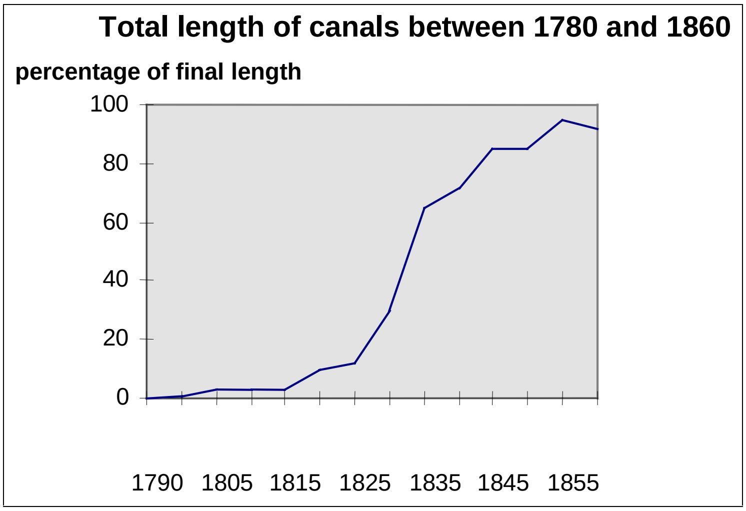
Industry calculates a duration of about 20 years between phase 3 and 5 (with an exception for the IT industry which has much faster innovation processes). For cars, engines, aeroplanes etc. this period may be even longer. The idea to speed up innovations and market uptake is attractive, but on the other hand, skipping steps in the development path is generally not recommended (Grübler, 1998).

The market penetration of an innovation is often represented as a smooth S-shaped function. If we look more closely to these functions, we often see significant fluctuations around the S-shape especially in the beginning and at the end of the growth. Figure 3 shows an example of such an

S-curve with variations. Modis and Debecker (1992) explain these variations around the S-curve as the result of the chaotic, unpredictable and uncontrollable character of the innovation process. Others see it as the consequence of more or less predictable phenomena:

- In the beginning the initial start-up problems, a premature start, “growing pains”, delays in the development of the necessary infrastructure and failures in the initial applications;
- At the end an overshoot, where the production still goes on, possibly owing to over-extended support by the government, while the market demand is already decreasing.

Figure 3. **Growth of the total length of canals as an example of initial breakdown and final overshoot** (adapted from Grübler, 1998)



The character of the growth curve makes it rather risky to draw conclusions from a time series. If there is a temporary breakdown at the beginning of an innovation process, it might mean nothing more than a start-up problem that will disappear or, alternatively, the product might be already at the end of the innovation process. At the end, the observed decrease of the innovation growth may be the delayed end of the product or just a transition to a new phase where the innovation is taken over by a new generation.

The moments in the innovation process that are especially suited for influence from the government are at the beginning, after the invention phase. Since at the invention phase and the first applications the risk of failure is very high and the uncertainty about the possibilities is large, it is not very effective to try to influence the innovation process there. If market penetration has started already, a government can influence the speed of introduction and the market share that can be achieved, but it is no longer possible at that stage to make fundamental choices. So the best phase of intervention in the innovation process is just between the uncertainty of the initial invention phase and the certainty of the market introduction.

Another phase in which governments can take decisions that have a large and rather certain impact on the innovation process is at the end, at the phase of replacement. During this phase the uncertainty is also large, but a great deal of the uncertainty can be removed by choosing to support the technology further, to replace it by another technology or to abandon it.

The model given in Figure 5, originally developed by Rothwell and Zegveld (INIT, 1997) gives a comprehensive view of the innovation process. In this model three driving forces for the innovation process are present:

1. Technology push;
2. Market pull; and
3. Policy push.

Figure 4. **Phases of the innovation process where choices of governments can have much impact**

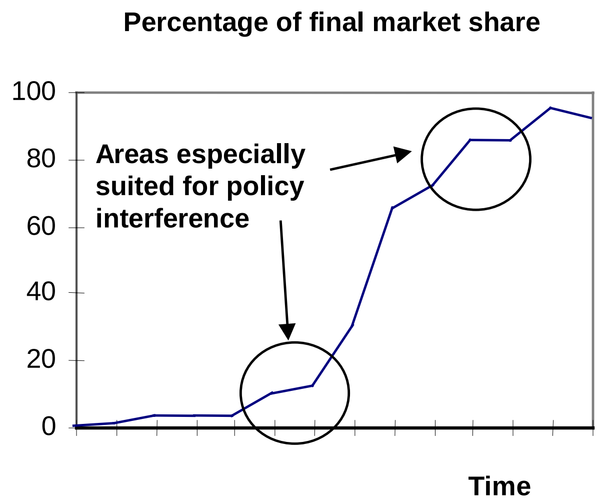
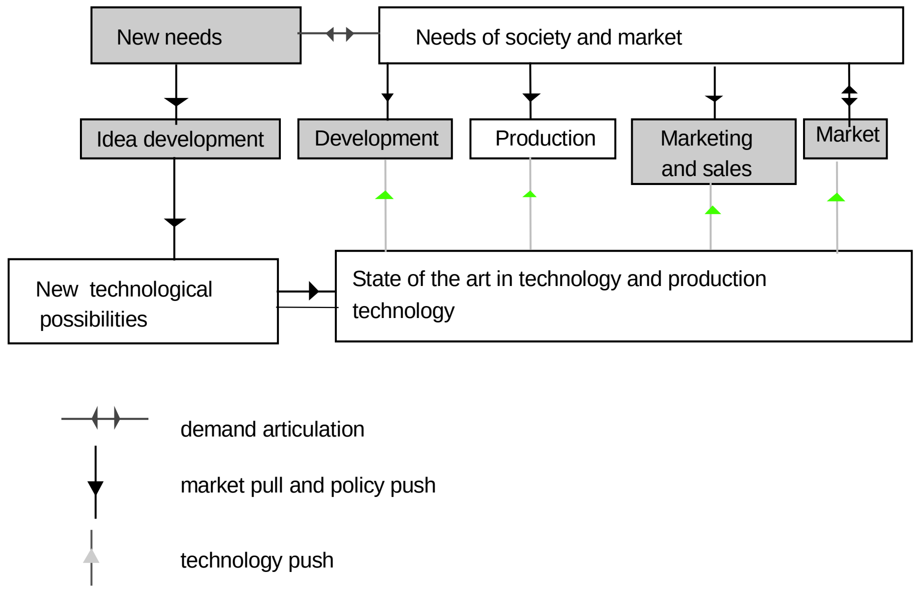


Figure 5. **The innovation process with the three distinctive forces acting in the process** (INIT, 1997)



The actors who exercise influence on the process of technological innovation are:

- Research institutes at universities and in industry, and independent research institutes (technology push);
- Industry and service providers with their available portfolio of knowledge and technology (technology push);
- Consumers with their needs, demands and purchasing power;
- Authorities with financial incentives, regulations and legislation.

A government can use its influence in the following ways, among others:

1. By expressing the needs of society, by taking the leadership with respect to problems that are relevant for everybody but owned by nobody. Governments can also transfer this task by making certain private actors responsible for certain demands from society.
2. By stimulating R&D; this can be done by financial incentives, by ordering certain research, by stimulating research institutes to choose their subjects from the agenda set by society.
3. By facilitating the innovation process; this is done by removing institutional and legal barriers, stimulating network formation and the development of supporting infrastructure. *Strategic niche management* is one example of a strategy to facilitate the innovation process (Weber *et al.*, 1998).
4. By changing the market conditions and making them more favourable for the preferred innovation. Existing, older technologies can be charged, premiums can be given to scrap older tools and vehicles, tax reductions can be given to preferred technologies. Internalising external costs can be the rationale behind such financial incentives.
5. Legislation and regulation are used first of all to make innovations legally allowed, to forbid older technologies, to limit the use of certain technologies.

As will be described in Chapter 5, the preference and possibilities of governments in different countries varies due to economic, institutional, cultural and geographical conditions. The choice an innovation strategy does not depend on functional arguments alone.

4.1. Market imperfections due to social dilemmas

Although most governments at present seem to prefer a free market approach both for innovative products and transport means, interference cannot be avoided to some extent with the “free” market. One of the general arguments behind this interference is the need to avoid *social dilemmas*. Co-operation between different actors can only be productive if all participants gain some benefits. Since these benefits are often achievable only after a certain time, the existence of a win-win situation is not always sufficient to make co-operation attractive. The benefits should be gained preferably within the time horizon relevant to each participant.

A social dilemma can arise if some participants do not gain a benefit within their time horizon. Financial incentives can be given to change this situation. This has to be seen as a modification of the market structure and not as an overruling of the market mechanism. Covenants between different actors can serve the same function as *hedging* in the financial world: bringing profits into another time horizon, reducing long-term risks and anticipating future benefits (Ybema and Bos, 1998).

Table 1. **Time horizons for different participants in the innovation process**

Participant	Time horizon for profit assessment
Consumer/end user	Days or weeks
Salesmen	Months
Production managers	Years
Politicians	4 years
Banks	5 years
Industrial researchers and developers	More than 20 years
Infrastructure builders	At least 30 years

Another social dilemma exists if short-term costs have to be paid for long-term profit. Participants who do not have the possibility to pay the initial costs can be motivated to co-operate if start-up subsidies are given.

A third social dilemma occurs if benefits for one participant are at the expense of losses for others. If these conditions are the same for all participants, a prisoner's dilemma exists where suboptimal decisions are taken that in sum mean benefits disappear for everybody. In such conditions the profit structure of the market is not favourable for positive development. Giving new profit structures and changing the ownership of and responsibility for certain public goods can improve the conditions (Van Zuylen, 1995).

For the technological innovation process with its many uncertainties, risks, different time horizons, mutual dependencies and, often, the large number of stakeholders, a critical analysis and reshaping of the network of actors and a restyling of financial conditions can be a part of a policy to create favourable market conditions.

Some other practical actions in addition to the ones described above are:

- *Network development*. In the present market co-operation between parties often has to be developed in order to realise certain innovations. E.g., the owner of the infrastructure has to co-operate with information service providers in order to make real-time data available. Another example is that different carriers should co-operate to make multi-modal transport possible.
- *Covenants between government and actors in the private sector*. Innovations can be stimulated without enforcement if government and private parties agree to help each other. The private parties promise to introduce new, environment-friendly technologies and the government promises not to develop new legislation that enforces the introduction of the innovation or to give the companies involved a tax reduction. This leaves more freedom for all parties.
- *Subsidies*. Payment by the government or by local authorities to private parties to cover the costs of R&D, investments etc. The purpose of the subsidies should be well defined and agreed, although subsidies cannot have the character of a well-defined assignment given and paid by the authorities.
- *Organisation development.* Often a new organisation has to be set up for the development or implementation of the innovation. Existing organisations might change their focus or their domain in order to take care of certain innovations.

The choice of the most appropriate options depends on the character of the concept, the maturity of the necessary techniques and the stakeholders to be involved.

5. ROLES AND ROLE-BEHAVIOUR OF GOVERNMENTS

In the innovation process governments can choose to take different roles, depending on their preferences, national government culture and possibilities in an international context. The role that is chosen has to fit the role that the government has in a certain domain of transport. For example, for the domain of infrastructure the government has the role of owner, planner, manager and maintainer. For public transport the role of the government is often the regulator role, subsidiser. For goods transport the government has the role as facilitator, co-ordinator and legislator etc. The role that is chosen for the technology policy should be consistent with the primary role of the government.

A list of relevant roles is given below:

Role	Content
Neutrality	The government does not interfere in any way in the technological development and does not undertake any action which may have a relation with it.
Monitor	The government is informed about new technological developments that might be important for certain policy domains. In that way the government can act in a proactive way and is able to react properly on proposals from actors in industry for support. Existing policy can be adapted if new opportunities become visible.
R&D agent	The government fosters knowledge development. It takes initiatives to start new research on a national scale and stimulates participation in international research programmes. The knowledge is made accessible to all parties that show interest and knowledge transfer is organised.
Regulator	Creating a legal and regulatory framework for innovations, setting standards for safety, environment and performance.
Innovation agent	The government creates the conditions for the successful implementation of innovations. Pilots and demonstration projects are set up, a niche market is organised where an innovation can grow out of the embryonic phase, become mature and competitive. The government can make covenants with trade and industry, i.e. agreements for realising certain improvements. Regulations can be made to enforce innovation. In some cases the government also has to further favourable technological conditions for technological innovation e.g. by promoting standards, the development of a common architecture and interoperability.
Implementer	The government uses the innovation for the execution of its own tasks. E.g. government departments use certain technologies to manage infrastructure, to enforce regulations etc. The government may be the “early buyer” of innovative products.
Developer	Government agencies execute research and development for technological innovations. A research institute owned by the government may invent and develop new technologies.

Within each role different behaviour and instruments are possible. The behaviour depends on goals, resources, available political power, etc.

- Giving *financial support* in the form of subsidies fits in many roles, especially in the roles of R&D agent and Implementer;
- *Procurement* of innovative products or services by the government is a very effective way to create an incentive for innovation. It is especially suited in the role of Implementer;
- *Co-ordination* between different actors is an activity that often has to be done to create better conditions for innovation. In the role of innovation agent it is an essential ingredient, but also for the R&D agent and Implementer role this activity is needed;
- *Facilitation* of innovation processes by offering an environment of pilots or research facilities or by creating an efficient mechanism for knowledge transfer. This may fit in the role of R&D agent, Implementer and innovation agent;
- In certain cases a government may *commission* companies to develop a technological solution to a problem, e.g. to develop instruments for traffic control. This activity could be a part of the role of Implementer;
- Certain countries have government owned research establishments where technologies are developed. With such institutes the government is able to be a developer of innovations;
- Governments can use their networks and international co-operation programmes for the promotion of the interests of research institutes and industry. This activity may be useful in nearly all roles, except for the neutral one;
- Governments can create a sense of urgency by expressing the problems and needs of society. This may have an impact on research and industry. The result could be that research programmes are started and new products and services are offered to solve these problems.

The behaviour of governments often changes when they choose another role. Governments that offer financial support for pre-competitive research, often stop direct financial support as an innovation comes in the implementation phase, even if they continue to support the innovation. This gives sometimes rise to confusion when the costs of implementation are much higher than those for the research phase. The wisdom of such a strategy is debated by industry. Developers in industry complain about inconsistent government policy. In fact, the apparent inconsistency is often just a deliberate change of role coupled with a new preferred behaviour.

5.1. The match between development phase and role preference

For different phases of the innovation process, different roles might be preferred. The combinations of roles and phases of innovation are given in the following table:

Table 2. **Relation between innovation phase and government role**

	Neutral	Monitoring	R&D agent	Regulator	Innovation agent	Implementer	Developer
Invention	+	+	++	-	--	--	+
Test		+	+		+	+	+
First application		+	-	+	++	++	+
Market introduction			-	++	++	++	-
Maturity	+	+	--		-	-	--
Decline		+	--		--	--	--
Replacement	+	+	+	+		+	+

-- role has conflict with innovation phase
- role does not match innovation phase
   combination role and innovation phase is possible
+ role fits phase
++ role is required in this phase

5.2. Some experiences with technology policy

Technology policy was originally linked with industrial policy and economic affairs. In that policy domain the experience of the last decades has been documented, e.g. by Rothwell and Zegveld (1981).

The rationale behind the choice of a strategy for technology policy depends on several issues such as the national traditional roles of the government. Innovation policy has a short existence. It was created in the 1980s. There is a friction between the trend towards the movement to less government involvement in industrial affairs and the apparent need for active government involvement in all important innovations.

5.2.1 Consensus and long-term commitment

Innovation processes take a long time and several innovation processes often are entangled with each other. Governments choosing to have an innovation policy should be prepared to have a consistent, long term policy, where long term means at least a period of 20 years. Furthermore, the policy should be based on consensus between government, industry and society. Both requirements are not easily fulfilled, because governments have to put also a certain emphasis on successes for the medium long term in order to remain attractive for the citizens in the next elections. The industry consists of many competing actors. The society is no more than a "social construct": in reality society is a collection of persons, organisations, processes etc. with a limited coherence, susceptible to sudden changes of collective mood. The consequence is that a certain level of *consensus* is necessary, but this has always to be seen in the context of the different actors and their perspective (Jamison, 1998).

The solution which satisfies both the requirement for consensus and for long-term commitment is to *create* a vision on innovation which has sufficient power to generate the support of industry, political actors and important parties in the society. Without this vision no effective innovation policy is feasible.

For technological innovations in transport in the European Union this vision comes partly from the Common Transport Policy (CTP) and from national transport policies. This is not at all sufficient to implement an innovation policy for transport. For instance, one should also have a vision on the role of the EC and national governments in innovation processes, on the question of regulation on European and national level which limit the possibilities for innovation, etc.

Another drawback in reaching a shared vision is the fact that social processes – and transport has to be seen as a social process – more or less chaotic character and are often difficult to steer. People responsible for steering chaotic processes do not agree with each other about the best strategy to follow, therefore, the chaos of the processes is often reflected in the chaos of managers and policy makers who disagree with each other and often are not able to take the "right" decision (Geenhuizen *et al.*, 1998).

5.2.2 Goals and tools for technology policy

The relation between investment in R&D and productivity growth is present in industry: in the past it appeared that for each percent increase of R&D the productivity want up with 0.1. For capital intensive R&D the productivity gain due to 1 percent increase of R&D is 0.7 per cent. The rate of growth of productivity seems to be related more strongly with basic research than with industrial investments in applied research (Rothwell and Zegveld, 1981).

Innovation policy has many direct and indirect goals that are often mutually dependent. The goals for industrial innovation policy these goals are among others (Rothwell and Zegveld, 1981):

1. International competitiveness;
2. Employment;
3. Economic growth;
4. Better quality goods;
5. Higher productivity;
6. More efficient use of energy/resources;
7. Protection of the environment;
8. Social and human development;
9. Improved quality of jobs;
10. Improved public services (health, housing, education, infrastructure);
11. Increased leisure;
12. Development of industrial infrastructure;
13. Security and safety;
14. Independent capability in advanced technologies;
15. National security.

Some of these policy goals, such as safety, environment and energy-efficiency are also specific for transport policy, the other may also be seen as relevant generic economic goals that can be added to the more specific transport goals as accessibility, cost-effectiveness, environmental protection and safety.

The policy tools that are used for the stimulation of industrial technological innovation are similar to the ones that are applied for transport innovation:

1. Direct involvement of governments in technological development:
   a) Scientific and technical, support for research organisations;
   b) Public enterprise, direct innovations by publicly owned industry, participation in private enterprises.

2. Knowledge management:
   a) Education, universities, general education;
   b) Information, information networks, knowledge centres.

3. Financial incentives:
   a) Grants, loans;
   b) Taxation, personal, industrial, payroll and indirect.

4. Indirect steering by constraints:
   a) Regulation and legislation, patents, health regulation, monopoly regulation;
   b) Political, planning, regional policies, public consultation.

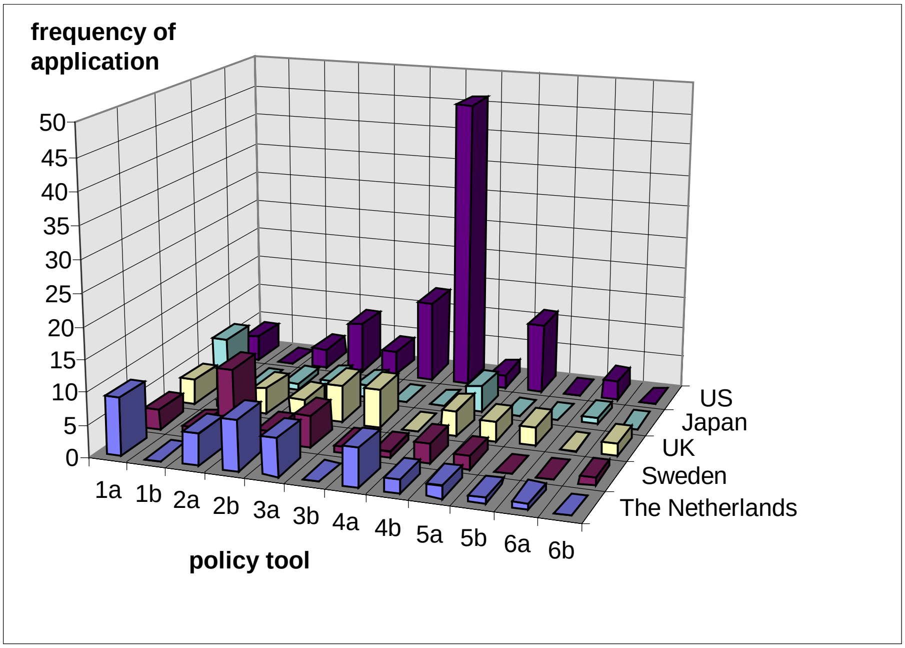
5. Application in the work of the government:
   a) Procurement, direct ordering or purchase of innovations;
   b) Public service, use of innovations in infrastructure and public services.

6. Trade stimulation:
   a) Commercial, trade agreements, tariffs, currency;
   b) Overseas agent, support of sales organisations in other countries.

The demand created directly by governments appeared to have the largest influence on innovations in the past, subsidies appear to be much less important.

Rothwell and Zegveld (1981) showed that, in the 1970s, countries had different preferences for these policy tools.

Figure 6. **Preference for instruments for technology policy for economic affairs**
The numbers refer to the list of technology policy measures
(adapted from Rothwell and Zegveld, 1981).



The effectiveness of a policy measure depends on the economic and political structure of a country. For instance, the tool of procurement which was mentioned at the beginning of Chapter 5 appeared to work best in a country like Japan with centralised decisionmaking.

5.2.3 Regulation

Rothwell and Zegveld found that regulation and legislation can be considered as a secondary tool working in the background of the innovation process in industry. It is not the main driver for innovation. It can be as well an advantage as a disadvantage for innovation, because regulations may require innovations or exclude any technical change. In terms of barriers, regulations and laws are the most important barrier (mentioned in 47 per cent) and also the most important facilitator (44 per cent). In order to make an innovation process possible, often regulations have to be adapted. Grübler (1998) warns against too quick changes in regulations with the objective to speed up the innovation process. He expects that decisions that are taken too early have a high risk of being wrong so that they have to be corrected afterwards. That may reduce the willingness to change regulations in the future, which will constitute a drawback for future innovations.

The problems caused by regulations are the following (Rothwell and Zegveld):

- Regulatory time pressure leading to non optimal solutions;
- High costs to comply with regulations;
- Unclear scope and implications of regulations;
- Unwillingness to change rules, disagreement over interpretation, inconsistencies between rules.

Regulations are probably the main reason why the time between first patents and introduction to the market has been increasing between 1960 and 1980, the period studied by Rothwell and Zegveld. It is not certain, however, whether this increasing lag is only due to regulations or to the fact that the number of innovations is increasing and that other kinds of organisations have to be involved.

Other important barriers mentioned by Rothwell and Zegveld are:

- Costs and technical reliability;
- Market considerations;
- To maintain integrity of products; and
- Lack of adequate testing procedures.

Knowledge management by direct R&D grants and the fact that the supplier of an innovation has sufficient technological capability appears to be an important facilitating condition.

5.2.4 The cost-effectiveness of financial support

A common belief is that small companies give a larger and more cost-effective contribution to industrial innovation than larger institutes. The statistics on this issue might be biased due to the fact that smaller firms have to register their innovations with patents while larger enterprises can afford to keep many inventions for themselves without patents and to work on innovations without publicity. The contribution of small and medium sized firms to innovation depends on the national structure and culture. In Japan the contribution of these firms to innovation is small, while in France, Germany and US their contribution is larger (23–35 per cent). In the UK, radical innovation was nearly exclusively the product of small firms.

The cost effectiveness of direct financial contributions from government for innovation is determined in large part by the procedure for application and control. Small firms have to do much administrative work to comply with the requirements to get subsidies. Generic measures seem to have more influence on innovation than specific R&D subsidies. Subsidies can even be worthless if there is a conflict between them and general tax measures or regulations.

In the US generic measures are seen as effective since there are many competing firms and market forces can select the best ones. In Europe the scale, i.e. the number of firms with comparable competence is smaller. As an alternative, an alliance between firms and government might be more effective than generic measures.

5.3. National preferences, national differences

After looking at innovation policy and the policy tools preferred in different countries, we could look at national political cultures with respect to transport policy. The objective is to compare national cultural preferences and to try to draw some conclusions with respect to possible European technology transport policy. We shall use the results from a recent study done by Roxanne Powell (1999) about differences in national transport policies in several European countries. She was able to identify several differences in approach in policy in these countries. Some of the differences can be extrapolated to differences in technology policy for transport.

Powell's objective was to look for the fundamental principles, underlying rationales and conceptual habits that shape transport policy in a given country. One of the determining issues is the degree of centralisation in decision-making, the hierarchical structure of the administration. This structure is changing at the national level: at the current time, France is decentralising decision making. Britain has centralised policy on the essential transport issues but is preparing new legislation to give more power to lower authorities for transport management. Constitutional reforms implemented in the UK (Scottish, Welsh and Irish Parliaments, bringing more power to the Regions in England) is set to change decision making structures, including for transport and infrastructure. Furthermore, the role of individual politicians at a local level on national political decisions through lobbying is known to be important in countries like France, Belgium and Italy. The formal and informal political power structures are often diverging and the level of democratic control for different forms of political decision-making also varies.

The *objectives* for transport policy are quite diverse. In France the mobility of goods and people has traditionally been viewed as a factor of economic growth, on local as well as regional level. This makes the strengthening of internationally significant transport corridors an important objective. Traditionally, there has been a link between transport and social development. The right to transport and access to transport facilities has been important in French policy, as well as in UK, Belgium and somewhat less in Germany. New issues in those various countries are:

- Providing transport users with greater choice;
- Reducing dependency on the car; and
- Opening up access to peripheral regions.

In France and Germany the car manufacturing industry employs a large workforce, as is also the case for the rail industry. This explains why there is substantial public funding for transport R&D with a view to export advanced products, e.g. high speed trains and innovative cars.

5.3.1 Objectives of national transport policy

In the Netherlands the setting of quantitative objectives has become commonplace in the Dutch Transport and Traffic Plan SVV II (van der Hoorn, 1993). Most other countries do not have these targets. Except for Germany and Switzerland the other European countries have only qualitative objectives. The exception is that many countries have quantitative objectives for CO_2.

There are differences in the *objectives* of certain policy measures taken in different European countries. The same measure might be taken with completely different objectives. In the Netherlands the objectives behind higher petrol prices are mobility management, while in other countries, like France, the objective is to get a constant flow of revenues for the national budget. Road pricing is seen in Belgium and UK as a means to provide income streams for local authorities and to reduce local congestion. In Germany road pricing is seen as an instrument to promote environmental objectives.

In France, Germany, Belgium and the Netherlands the awareness of European accessibility is strong. The connection of regions to the “Blue Banana”, the banana-shaped region which stretches from London to Munich and Milan is seen as important. Germany wants to strengthen its strategic position in that “banana” and in respect to transport flows east-west. Internal accessibility is an issue in France and Spain. “Equality in the distribution of goods” (and also transport infrastructure) is in France enshrined in legislation. The objective is to increase national cohesion.

Policy objectives can have a *different meaning* in different countries, even if the same words are used. In Britain the term *“accessibility”* is used for transport for disabled people and for the access to a town or the countryside. The meaning of accessibility in Germany, Belgium and the Netherlands is access to economically important city centres.

Transport-related taxes can be added to the general revenues in the national budget or can be *hypothecated*, i.e. directly re-invested in the transport sector. This is done in France systematically through a local tax on businesses which is used for public transport in the same area. A tax on motorway tolls is used for investments in rail and waterways infrastructure. In the British tradition road taxes constitute general revenue. Strong opposition against hypothecation was overturned in 1998 when it was announced that taxes on work-related parking spaces are to be used to fund local transport improvements.

In pricing policy a distinction can be made between fiscal (taxes) and non-fiscal instruments (charges). Under such a definition, fiscal measures are fuel taxes, vehicle taxation, individual tax relieve, VAT, Eurovignette etc.; non-fiscal instruments are tolls, public transport fares, parking charges etc. Often, fiscal pricing is adapted to individual circumstances: in France older cars pay less tax (which has a negative impact on air quality) while in Germany the vehicle tax depends on the vehicle’s emission level. Britain tries to create level market conditions between different modes, while Switzerland wants to tax road haulage more heavily. A system of pricing for goods vehicles which depends on weight, emissions and distance travelled is being prepared and will become operational in 2001. In the UK some tax concessions exist which favours company car users. Other tax incentives are not used. In France several fiscal instruments are used. New car purchase is stimulated through tax rebates.

Road pricing in urban areas has been removed from the political agenda in France, but is on the agenda in Flanders, the Netherlands and the UK. An experiment in Germany (Stuttgart) where price incentives were used to change the transport behaviour of motorists has been stopped under federal pressure.

Environment

NO_x, sulphur, organic compounds and small particles are subject of the EURO I and II standards and future revisions of these standards. CO_2 emissions get much attention in the environmental assessment of transport. There is still a gap between goals and reality. Only Germany and France have brought back total CO_2 emissions between 1990 and 1994, but transport related CO_2 emissions have gone up in all countries.

Different approaches exist in different countries for the choice of technologies for environment-friendly transport. In countries like France and Germany (with an own car industry) there is a strong belief that technological solutions will reduce energy and emission problems. Financial incentives are given in France and Germany for applying clean and energy-efficient technologies. Policy push is applied in these countries to achieve the goals of low emission. In Britain market pull is favoured, while in Belgium the technology push seems to be the dominant mechanism.

Another environmental issue is fragmentation. Underground transport infrastructure can contribute to avoidance of this problem. Underground infrastructure for passenger transport exists already for a long time in several European cities. Also for freight transport some underground infrastructure is in use, e.g. for the post office in London. New underground infrastructure can make more efficient use of space in cities and at locations where visual intrusion has to be avoided.

Underground transport is common in Switzerland, due to lack of space. Tunnelling is a normal technique for infrastructure. The project Swissmetro is an ambitious project of 675 km high speed Maglev trains running underground with a high frequency between 19 urban centres. This project will be very energy efficient and environmentally friendly. In France much underground infrastructure has been developed, especially in the Paris region. The high costs have reduced the ambitions. In the UK little interest exists for underground infrastructure.

5.3.2 Accessibility and mobility

The trends with respect to mobility in all European countries are as follows:

- Travel distances are increasing;
- Reduction of walking and cycling in town centres in either absolute or relative terms;
- The amount of time spent on travelling remains constant (in the UK it is increasing);
- The speed of travelling between cities is improving much more than the speed of travelling within a city;
- Congestion is concentrated in and around urban centres.

Improvement of multimodality is directed in France by two national master plans, one for passengers and one for freight. Up to now the integration of rail and air have been the focus. Also Germany is working on the integration of air and rail (DB and Lufthansa).

For urban areas all countries feel the obligation to promote urban modal shift. Existing road infrastructure is reallocated to public transport. Cycling is promoted in many countries. France requires that all urban road construction project has also a part for bicycle lanes. Denmark tries to realise a shift of 4 per cent from car to bicycle and walking.

Infrastructure building is allocated fewer resources and the emphasis is on more efficient utilisation of the existing infrastructure. In France the decades of new rail infrastructure are over. The TGV network is almost halted. UK slowed down the investments in road infrastructure. The investments on rail are still going on, with the objective to catch up with other countries. There is some interest to create an efficient transport corridor stretching from Scotland and the North to the Continent. In other countries the expansion of the rail network still continues. In West Germany the emphasis is on rail network expansion and better use of road networks, in East Germany on extension of the road infrastructure to promote economic prosperity. The Transrapid high-speed Maglev link between Berlin and Hamburg is going ahead. In Belgium the extension of the rail network is priority number one. In Spain 71 per cent of the investments are in roads, but investments are also done in public transport and rail. In urban areas the target is to maintain the public transport modal share.

Road telematics is being developed. France and the UK have drafted new legislation for driver information systems. Also in dynamic traffic management the Euroregions are beginning to come off the ground.

Congestion pricing is considered in all countries, but has been implemented nowhere. In France, on some motorways, tolls are made dependent on the time of the day and day of the week.. In the UK legislation is being prepared which will make it possible for local authorities to levy road charges. In Germany road pricing is politically only feasible for goods traffic. Private motorist still have an untouched position.

5.4. Conclusions for transport technology policy

National preferences diverge as regards general transport policy. The cause for this is partly the history of transport policy, the regional and economic structure, the role that a national government has traditionally and changes in this role, etc. The same applies to transport technology policy.

In the abatement of air pollution there is a certain convergence on the level of goals. In terms of policy measures there are differences in approach, where the presence of a car manufacturing industry makes countries more technology oriented while countries without that industry try to realise improvements more with changes in transport behaviour. All countries rely on international regulations with respect to clean vehicles.

With respect to the abatement of congestion and the promotion of accessibility larger differences exist. There is some commonality between several countries in the sense that they reduce the investments in new infrastructure and put more emphasis on better utilisation of the existing facilities. However, the certainty that congestion problems will be solved in the future cannot be given by any country.

The way in which countries approach the problem of accessibility and mobility is rather diverse. Even in the cases that different countries have the same objectives with respect to this subject, the meaning of these objectives in terms of the consequences for policy measures can be completely different. The economy of a country, the role of transport and of the transport industry, the need to give access to underdeveloped regions and political preferences are quite diverse. Since most problems of accessibility and mobility have a regional character, the differences in approach will only come out if generic measures are taken or if policy has to be made to promote interconnectivity and standardization.

Technology policy for transport and for industrial purpose share several objectives. Also the policy instruments for both domains are similar. There are significant differences, however. The roles of governments in the domain of transport is more diverse than in trade and industry. Furthermore the goals are more specific and benefits of technological innovations are not always received by the same party that has to invest. The ambiguity of goals in transport policy is more the rule than exception.

6. SOME PROMISING TECHNOLOGICAL INNOVATIONS

There is a large number of technologies which can be applied for the improvement of transport. Listing them all is impossible and not very useful. Too many of them will remain invisible, integrated in vehicles or infrastructure. Many promising innovations will not survive. Therefore a selection has been made, based on an inventory of innovations from the FANTASIE-project (Brand, Davidson and Moon, 1998).

Innovations are possible on different levels of the transport system. A common distinction is made in:

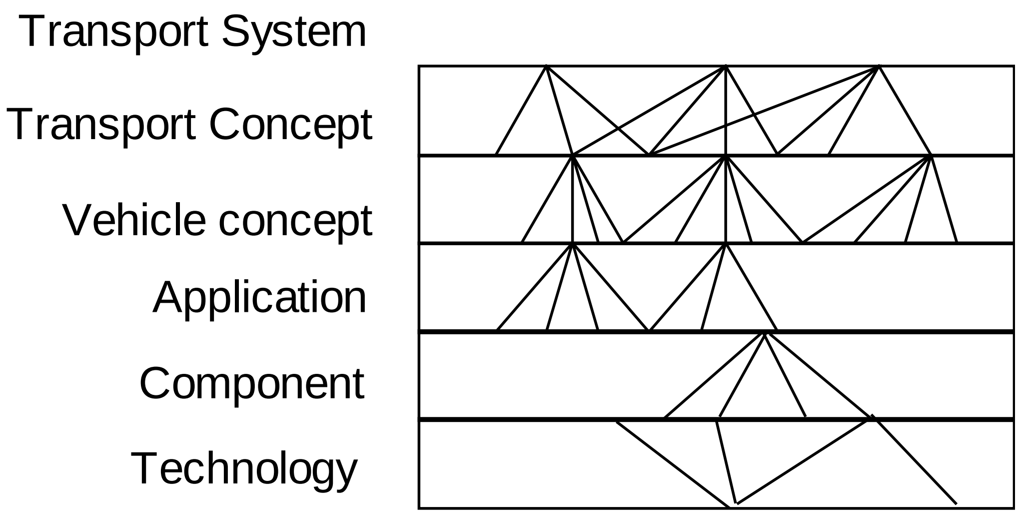
- Transport system, the level of transport markets, and the complex of infrastructure, vehicles and organisation.
- Transport concepts, the system of technological and organisational aspects which make it possible to travel or to transport goods, e.g. taxis and trains are examples of transport concepts.
- Vehicle and infrastructure concepts are technological applications that make transport possible, e.g. roads, rail, lorries, and bicycles.
- Applications of technologies, e.g. automated payment systems with smart cards, automated cruise control, engines.
- Components that constitute the applications, such as batteries, transmission etc.
- Basic technologies, e.g. new materials, generic technologies from ICT, new energy sources.

Innovations at a certain level need various innovations from lower levels and they can be applied in different innovations at higher levels. For example, the fuel cell needs several technologies such as fuel storage, electric propulsion, fuel conversion. On the other hand, the fuel cell might be applied in several vehicle concepts, e.g. cars, trains, ships, etc.

The attention of relative outsiders goes mainly to innovations at the application level. Most of these innovations go into the direction of improvement of the existing transport concepts. From the point of view of policy making innovations on all levels have to be considered.

Modularity of innovations are an advantage. Many innovations are possible in certain vehicle concepts without influencing other groups of innovations. This is seen as a favourable condition for the success of development (Bonner, 1988). The complexity of the innovation process increases by interdependencies. This makes the process difficult to manage while the number of possible reasons for failure increases with every new interdependence. If innovations are not modular, it is necessary to manage the interdependency e.g. by the definition of standards or an architecture.

Figure 7. **Different levels of innovation**



In order to realise innovations at the level of the transport concepts, the market mechanism does not work very well. Modularity is not strong at the higher levels. Governments have to take an active role by creating favourable conditions for innovation. A *top-down* approach is necessary: starting from goals and a vision of the future of the transport system, an innovative transport concept can be chosen. The *vision* acts as a shared picture of the future and as a kind of architecture. If this is accepted and stable, it becomes attractive to develop innovations which support the new transport concept.

Some examples of technological innovations that will not easily be produced by a market mechanism are (INIT 1997, van Zuylen and van Schaik, 1997):

- Intermodal market linking system, an information system which links supply and demand for transport, supports the optimisation of transport chains and provides the necessary information to follow goods along the transport chain;
- Transhipment terminals, the optimisation of intermodal nodes, such that costs and transhipment delays are reduced;
- Integrated intermodal packaging infrastructure: standardized packaging and transport units which are suited for different modes - also new modes like underground transport - and which satisfy the requirements of producers, retailers, carriers and forwarders; the concept includes all the manufacturing and logistics to optimise the use of the standard units;

- Underground (urban) haulage system, a new transport mode which eliminates the need for surface transport in sensitive areas, such as town centres, and improves the quality of life in those areas;
- A fully integrated (public) passenger transport system.

Most of the technological innovations in the rest of this chapter are described at the level of *vehicle and infrastructure concepts* that are expected to have a major impact on a European level up to the year 2030. Each vehicle concept contains a whole range of technologies. The technologies involved are mentioned in the description of the concepts. More details can be found in the different FANTASIE deliverables (e.g. Brand *et al.* 1997, Brandt, Davidson and Moon, 1998).

Technological innovations for transport can be subdivided into:

- Construction of transport means and infrastructure and propulsion of vehicles;
- Utilisation of transport means and infrastructure;
- Other telematics innovations.

6.1. Construction and propulsion

6.1.1 Road

All- purpose car

For road transport the present emphasis was on NO_x, SO, CO and particulates emissions. It has gradually shifted to CO_2 emissions on a European scale. On a local scale the local air quality remains dominant, but there is a clear co-operative effect of both policy objectives. Cleaner road vehicles is becoming a goal both for policymakers and car industry. The forecast is that new propulsion systems will dominate the market in the next 20 years, starting with advanced tailpipe treatment (up to 2010), gaseous fuel (next five years, especially for countries with vested interests) hybrid propulsion (market penetration 2010-2020), fuel cell (market penetration starting in 2025 to 2030). Clean petrol and diesel fuel and advanced conventional propulsion are seen to offer sufficient scope to meet environmental standards for the short and medium term and will remain dominant over this period. The initial costs are still a barrier for the introduction of gaseous fuel and hybrid and all-electric vehicles. In the long term (2025-2030), fuel cells running directly on hydrogen of methanol are possible. Their development and introduction have to be supported by stronger legislative and market conditions.

Lightweight vehicles are expected to come on the market in the next 10 years. The reconciliation of vehicle weight reduction with safety standards in a mixed fleet environment is still a fundamental problem.

The general-purpose car will keep its dominant position and will keep its functional capabilities. Technologies that act to reduce the efficiency the passenger car are less likely to be successful without forces such as legislation and regulation.

Urban car

Urban cars are light vehicles designed especially for individual mobility in urban areas. They are characterised by a zero or low emission propulsion system with high efficiency, lightweight materials and small size. Since speed and range are lower, the attractiveness has to come from functional issues, like the possibility to go into urban areas where all-purpose cars are banned. At present the advanced conventional car with adapted design will have a commercial advantage above the dedicated urban car.

The technology for urban cars is available although for further development more R&D are needed, e.g. for new materials and energy/fuel storage. and a commercial break-through is possible after large-scale demonstration projects in towns. New forms of mobility market, e.g. car-sharing, car-leasing and self-drive public hire fleets, may facilitate market penetration. Without a strong push from urban policy to ban conventional vehicles, the chances for the urban car will remain small.

Vans

The situation with vans is similar to that with the all-purpose car. They will keep a large market share in the next decades. Alternative gaseous fuels may have a larger potential in situations where centralised refuelling is possible. The potential of alternative traction is similar, which means that conventional internal combustion engines will become cleaner in the next few years and fuel cells can penetrate the market only after 2025.

Trucks

Vehicles to carry heavy goods on medium to long distances will dominate the freight transport market in the future. The possibilities to satisfy emission standards are the same as for buses. There is the same dependence on a simultaneous improvement of the fuel quality and tailpipe treatment. A significant investment will be needed by the truck owners as well as the oil refineries. The possibilities for dual mode vehicles exist, especially the combination rail-road. The actual market penetration is still uncertain and sensitive to policy push. The possibility of hydrogen fuelled fuel cell vehicles depends not only on technology but also on safety standards.

Urban bus

The next 20 years the advanced conventional bus will have the largest market share. The requirements of EURO III will be met by present technology. Improved fuel quality coupled with catalytic converters will make EURO IV requirements achievable. Alternative fuels (gaseous and liquid) are limited by national circumstances (e.g. the existence of a distribution infrastructure). In certain conditions an all-electric vehicle will give a contribution to a cleaner urban environment. The introduction of the fuel cell will solve several problems, but as is the case for all-purpose vehicles and vans, it will take until 2025 before market penetration can be expected.

Long-distance bus

The situation is in many respects similar to the urban bus. Hybrid traction (diesel and electric) has a large potential to make access possible also to restricted urban centres. In the long term, fuel cell technology is more promising.

Powered two-wheelers

Motorcycles, scooters and mopeds have a potential for medium and short distances. They especially offer possibilities for access to urban centres with lack of traffic space. Emissions can be improved (50-95 per cent less hydrocarbons and NO_x, 20 per cent CO_2) so that they are acceptable for urban clean air zones. Safety has to be improved by application of telematics and improved design, e.g. enclosed motorcycles and scooters. A common regulatory framework and standards are needed in order to ensure interoperability and certainty for the manufacturers.

Human powered vehicles

Bicycles are already highly efficient, but further innovations are possible (more reliable, enclosed gearing systems, lightweight frame construction, partially or fully enclosed vehicles) The potential market share depends on the image as a healthy way of transport (Davis 1997). The fully enclosed vehicles could become a replacement for the taxi, but the possibilities depend on local urban policy.

6.1.2 Rail

Rail transport includes conventional, high-speed rail and magnetic suspension. The three categories will be considered separately, because most of the technologies involved are only for one category.

Conventional rail

We may expect to see a mix of heavy and light rail on the main infrastructure coming in the next ten years. The mixed trains consisting of passenger and freight vehicles may come back in the next 5-10 years. New control technology will make it possible to let the rail infrastructure be used also by separate items, individually powered with a rolling stock that is automatically controlled.

Transhipment of goods and coupling of rail wagons can be improved. A new signalling system will improve the capacity of rail infrastructure by 180 per cent. Globalisation of rolling stock manufacturers should improve the transfer of technology. Noise reductions are possible for new rail vehicles. The innovation process could be slow unless external incentives are present are provided. Since the competitive conditions of rail with respect to road depend on pricing, regulations and the severity of congestion, the possibilities for successful government influence are present.

A new method of payment of fares with smart cards is possible, but in order to make the electronic payment suited for complete intermodal trips, standardization is necessary, which can be stimulated by governments. Intermodal travelling does not give direct revenues for rail operators, so a market-driven intermodal travel information system is rather unlikely and governments should give incentives to realise such systems.

Governments should take an active role in the following technological issues:

- Give financial incentives for environment-friendly propulsion and suspension systems;
- Ensure interoperability across national networks;
- Stimulate the development of intermodal load units;
- Develop and adapt safety standards for new lighter rail vehicles and for new train control concepts;
- Stimulate the development of standards for electronic payment;

- Stimulate the development of intermodal travel information systems;
- Improve the competitive conditions for rail with respect to road.

There are sufficient possibilities to stimulate rail transport and to further in that way the environmental and economical goals of transport policy.

Light rail, people movers and elevators

Several technologies exist for light vehicles that are guided by rail. Widespread applications are possible in the next ten years. Special forms of alternative rapid transit systems are used already in special places, e.g. airport terminals. Small vehicles for Personal Rapid Transit may have potential as alternative for car use in certain areas.

New materials can increase strength and reduce weight of the vehicles. If automated guidance is applied, the risks for system failures should be extremely low and graceful degradation should be guaranteed in order to gain public acceptance.

In order to realise a real multimodal system, more has to be offered than just a series of unimodal options. Multimodal transport should have "seamless" connections between the modes. Information technology and innovative logistic concepts are needed to create a transparent multimodal system. The industrial possibilities for the production of these systems will be interesting for certain countries and deserve government support.

Underground transport and cable cars

Freight transport through underground infrastructure or along cables is especially interesting in areas with a conflict between accessibility and environment, such as urban areas. Automated handling and absence of conflicts with other traffic will increase safety. Underground infrastructure requires large investments. It allows multiple use of space, which solves very important conflicts in towns. Vitality of town as economic and cultural centres can be sustained. However, it requires considerable political impetus, since development under market forces will probably go in the direction of developments out of town to escape the accessibility problems.

High-speed trains

The technology required for high-speed non-tilt trains with a speed of around 350 km/h will be mature in the next few years. Tilt trains will make speeds up to 300 km/h possible on existing tracks, which will avoid the costs of new infrastructure. High-speed trains with internal energy supply will probably remain rare. The future of freight transport by high-speed trains is uncertain. The advantages of high-speed rail is not only the reduction of travel times, but also that the same transport can be accommodated with fewer vehicles.

The commercial potential of high-speed trains will be enhanced if competing modes are restrained. In the case that air transport is replaced by rail, the net impact on the environment will be positive.

Maglev, the system where vehicles have magnetic suspension, can be distinguished in Electromagnetic Suspension systems (EMS), which can be operational in a few years and Electrodynamic Suspension (EDS), which probably requires more development time. EMS requires guideways with very small tolerance, because the air gap between guideway and vehicle is as small as

10 mm. For EDS the tolerance can be much higher since the distance is 100-150 mm. EDS is only effective, however at speeds above 100 km/h, which makes wheels necessary for low speeds. Maglev has more potential than high-speed trains, since the vehicles can travel on tracks with shorter curvatures and higher slopes.

The industrial opportunities for the development and production of Maglev can increase the national prestige, although the development costs are very high. The question whether Maglev will become economically attractive depends on future economic development and the active role of governments.

6.1.3 Air

It is expected that air transport will considerably grow in the future. In such a relatively certain, growing market innovations have a good chance and the possibilities for governments to influence the innovation process are relatively large.

Experts expect that *high capacity subsonic aircraft* with capacity for 600-800 passengers will come on the market between 2010 and 2025. The technologies that have to be developed are improvement of the aerodynamics, the use of lightweight structures and materials and low-noise, high-efficiency engines. NO_x reduction of 65 per cent in the short term and 85 per cent in the long term are feasible. Fuel efficiency can increase by 25 per cent, which will offer a CO_2 reduction of the same magnitude. The safety standards for such huge aircraft have to be internationally harmonized and made more stringent. Airports will have to be modified and large investments will have to be made there in order to use these aircraft efficiently.

There are large national and European advantages in the development and production of such huge aircraft because it provides highly skilled employment and a competitive advantage for the industry. As a secondary advantage it can be mentioned that also the more conventional aircraft industry will get profit from the technological innovations for the large aircraft.

Subsonic aircraft

The main innovations are the application of lightweight materials and structures between 2010 and 2015), improvements in aerodynamics (from 2015) and improved highly efficient propulsion using contra-rotating propellers (introduction possible between 2015 and 2020).

Direct Operation Costs may be reduced by 3-7 per cent and improved air traffic control will increase capacity.

Supersonic aircraft

The likelihood that supersonic aircraft will be built and used without the co-operation of governments is very low. These aircraft are expensive to build and to operate, while environmental constraints may prohibit their use. The users form a relatively small niche. Especially for large distances the aircraft is an option, although the advantages depend on the possibilities to fit flight schedules in a suitable way in the day-night rhythm of origin and destination.

The technologies can be ready in 2005 to 2010 which means that in 2020 these aircraft may come to the market.

Helicopters

For helicopters the existing technology can be improved. Noise can be reduced considerably and emission of NO_x and CO_2 can be reduced by 85 and 20 per cent respectively. No new market is expected, except that access to urban areas can be improved if the regulatory framework is changed. Willingness of local authorities and sufficient push of the industry will be necessary. The potential to use helicopters to realise policy objectives is small.

Airships

Airships have had a time of frequent use but their weather dependence and the risk of hydrogen as a filling gas has caused their disappearance. Nowadays a revival of the airship is possible with a relatively small application niche. They can be used as cargo lifters to carry bulky loads in areas with limited road structures, but also as transport for people for recreational purpose. The infrastructure for construction and maintenance (hangars with extreme dimensions) are a factor that increase the costs. The independence of infrastructure reduces the operation costs and may become an important competitive advantage.

Cryoplane

A 180-230 seats subsonic aircraft for medium range, propelled by liquid hydrogen or liquefied natural gas. The technology will be mature in 2005 and market penetration will be possible in 2025. Storage of liquid hydrogen will generate higher production and maintenance costs. Since US manufacturers show no interest, co-operation with Russia is anticipated.

Confidence of the public has to be gained by demonstration of the safety of the system. The higher fuel costs (4-5 times more than kerosene) and necessary airport facilities will make this concept only feasible if governments support liquid hydrogen, set more stringent emission targets and impose taxes on kerosene.

6.1.4 Marine

All-electric ship

This ship derives its energy from an in-board electrical-power generation unit. In the short term only for special types of ships (2000-2010), afterwards possibly also for wider application. Integration with fuel cell technology is possible. This kind of propulsion will give a moderate improvement of emissions.

Fast inland ferries

These ferries are lightweight and low-resistance. Their energy consumption is between a car and a conventional bus. Since their operation does not require additional infrastructure, it might be interesting in certain niches. Political support is necessary to make initiatives to a success. The ferries can be integrated with other forms of public transport and give an alternative to choose from.

Fast sea-going ferries

These ferries can be used in the European ferry market. These ferries also benefit from the application of lightweight materials and constructions and low resistance hull design. The ferries will make sea travelling more efficient and due to the speeded up operation the utilisation of the fleet will be better. As regards production European industry will have good chances. Fuel consumption is relatively high compared with conventional ferries. There will be a competition between traditional ferries, air and fast ferries with competitors enjoying more or less equal chances unless regulations or technical problems distort the equilibrium. Fast ferries will be the standard for the 21st century. Since the accessibility of certain parts of Europe depends on ferries, this concept deserves the special attention of policy makers. Also the potential for export might be large.

Whale-tail propulsion of inland ships

This new type of propulsion will improve efficiency by 10 to 30 per cent. The disturbance of the aquatic ecosystem is also smaller than with propellers. A combination with sustainable fuels is possible. The concept still has to be further developed.

6.2. Utilisation and organisation

Many telematics applications make better use of the existing vehicles and infrastructure possible. The technology for multimodal travel information and trip planning is already mature and a 30 per cent market penetration is to be expected in the next ten years. Automatic vehicle location will be implemented on a large scale in the next 5 years. Cargo tracking and intermodal booking of freight will be on the market in 2010. Advanced fleet management for goods vehicles will take until 2020 before it has penetrated the market.

Environmental emission monitoring and hazardous material incident management is expected to be deployed on an average scale within ten years. Experts forecast that external control of speeds will not become common in the next ten years.

Important issues in advanced traffic management and external control are:

- legal liability;
- enforcement; and
- inequity.

Liability for the damage caused by failing electronic equipment or the inability of drivers to control their vehicles completely has to be clarified. If advanced traffic management is applied for specific user classes, e.g. the access to certain lanes, the enforcement of the measures has to be simple and effective. If certain classes of vehicles or travellers are prohibited to use parts of the infrastructure, the risk exists that access to goods and facilities is redistributed in a way which deprives certain groups of their fair rights.

Dynamic traffic management is applied at this moment mainly in a uncoordinated way. This lack of coherence facilitates the speed of introduction of innovations in dynamic traffic management but, on the other hand, it leaves important opportunities unused. New technologies for integrated co-ordinated traffic management will become available to improve utilisation and safety of the infrastructure.

Public transport

Telematics applications will greatly improve the information provision of travellers and will facilitate the daily operation of services. Regularity of service can be controlled and priority for public transport vehicles can be used to improve travel speed. Autonomous driving vehicles will lower operating costs and improve reliability. Monitoring of operations will make it possible to improve service efficiency. Smart cards and electronic purses are necessary preconditions to improve network management.

Anti collision systems and introduction of sensors to monitor operations will improve safety.

Slow moving vehicles

In agriculture and for construction slow moving vehicles are used widely. Some minor impacts are expected with respect to pollution and energy use. Safety can be improved considerably through the application of telematics, as well for the user of the vehicles as for road users who pass construction sites. The slow moving vehicles are expected to be a good niche for automated guided vehicles and “drive by wire”.

Human-powered vehicles and pedestrians

The innovations that are promising are electronic equipment to detect bicycles and pedestrians at a distance, which may improve traffic control and may also improve safety. Furthermore, bicycles and pedestrians have an important role in trip chains. Intermodal travel information and trip planning tools will support these environment-friendly modes. The costs of telematics devices may be prohibitive, since slow modes are very inexpensive by themselves. Subsidies are necessary and justified. The positive effects are a reduction of air pollution, energy consumption and congestion.

6.3. Other telematics innovations

Innovations in telematics are partly independent of other innovations, e.g. route guidance, driver support, parking management, intersection control, route planning and incident management can be introduced and used independently of the kind of traction, fuels etc.

In the next five years the following telematics innovations are expected to be introduced in 50 per cent of the possible application situations:

- Multimodal travel information/ trip planning (a slow market introduction is expected);
- Electronic monitoring of emissions and environment (e.g. noise);
- Dynamic route planning (slow introduction).

The following innovations will penetrate the market in 2010:

- Advanced traffic control with priority for certain user classes;
- Incident management and emergency help on all roads;
- Electronic tolling;

- Automatic vehicle location;
- Smart car;
- “Drive by wire”, electronically steering of vehicles.

Another ten years later, in 2020, the full market penetration of the following innovations is expected:

- In-vehicle traffic information;
- Parking management;
- Navigation systems;
- Autonomous intelligent cruise control;
- Anti-collision;
- Vision enhancement;
- Combined on-board emissions and engine management;
- High Occupancy Vehicle lane management.

There is a tendency to integrate telematics systems. The computerised car will become the carrier of many functions. Some functions will improve trip planning by providing reliable information about traffic conditions, other will make delays in congestion less annoying by offering telecommunication and office facilities to make travel time more useful and make the difference disappear between travel time and working time. In the future (>2020) the exchange of information between the car and roadside intelligence may make it possible to give a multi-user-class traffic control, including access control to restricted urban areas.

The fully automated vehicle on general-purpose roads is probably not feasible in the next 20 years, but in restricted areas these vehicles are operational already on a limited scale.

It is expected that 50 per cent of traffic fatalities can be avoided by telematics. This includes systems to enhance driver perception, driver control, communication such that drivers react earlier to a dangerous situation. Furthermore, incident management and emergency service can shorten the time between and accident and appropriate help measures, which reduces fatalities and prevents further accidents.

New telematics applications depend on the availability of appropriate information infrastructure. The creation of the European geo-stationary satellites will facilitate several innovations in navigation, tracking and tracing, travel information and fleet management.

6.4. Consequences of technological innovations

The environmental problems of exhaust gasses will be reduced considerably by the advanced fuel and traction. The stricter standards will be satisfied in the future. The costs of the cleaner vehicles will be higher than that of conventional cars. A breakthrough in the fuel cell technology may have dramatic effects, not only for the transport sector, but it may open up the possibilities for distributed generation of electric energy for industrial and household purposes.

The efficiency of the transport system will be improved by tracking and tracing of vehicles and cargo and by fleet management. Better organisation of transport modes and the improvement of the connections between modes will make transport “transparent” and multimodal transport a competing option. Integrated payment systems, multimodal information systems, an intermodal packaging infrastructure and intermodal terminals will be building blocks for an innovative, transparent transport system.

The growing transport demand, even though the growth rate will become less in the future, will keep a high pressure on the use of infrastructure. Dynamic traffic and transport management will be necessary to control the utilisation of infrastructure. It will become possible to give preferential treatment to certain user classes. This will limit the right of access during certain times of the day for certain infrastructure users and a differentiation in payment for the use of infrastructure. The consequences in terms of equity still have to be investigated. The process to gain support in society and to develop transport management schemes together with society still has to start.

7. SOME IMPLICATIONS FOR POLICY MAKING

7.1. Conclusions from the technology survey

7.1.1 Congestion management

The congestion problem has a dominant place in the whole range of road traffic issues. The attention to noise and emissions over the last 20 years has led to promising technological innovations. One could hope that the policy objectives for noise and emissions can be achieved. Also for safety, technology offers many possibilities for improvement. The problem of congestion, the lack of functional performance of road transport is not solved yet. There are no signs yet that technology can do much more than increase the utilisation of existing capacity. In the long run this is insufficient to accommodate still increasing transport demand.

The policy of the majority of Western European countries to solve the congestion problem by better utilisation of the existing infrastructure probably will not be sufficient to solve the problems and to accommodate the increasing demand for transport. More research and development is needed to find new technological solutions. Tools and methods have to be developed to manage the access to and use of the infrastructure, where citizens have to accept that their rights and possibilities to travel will be limited, in a controlled way by dynamic traffic management, tolling, pay-lanes and road pricing or by the congestion itself. The relation between the development of these technologies and policy making is very direct, because the technologies are specific for the implementation of policy measures.

7.1.2 Changing costs

New technologies will make transport more expensive. Since the competition in transport and in automotive industry is severe, the changes in the cost structure have to be monitored in order to react timely to undesired developments. The increase of the costs for transport if new technologies are used has to be compensated in some way by taxation of older technology and financial incentives.

Two-wheelers in general and human powered vehicles in particular are cheap and environment-friendly modes of transport. Technological innovations will change the costs of these vehicles and make them less attractive. Improvement of public transport and improvement of these vehicles at the same time may give unwanted impacts on modal choice: the cyclist may prefer to travel by more efficient public transport instead of using his own, increasingly expensive vehicle. The danger that technological innovation only leads to a modal shift from two-wheelers to public transport instead of offering an attractive alternative to private cars should be avoided.

Telematics will make a completely different system possible for charging for the use of infrastructure. The introduction of such an innovation is only possible with support from users. Attempts to introduce congestion pricing have experienced many problems with respect to lack of support. Governments should search for possibilities to introduce new ways of charging and to create support from citizens for the system and the necessary technology.

Air transport is, for long distances, a very powerful and cost-effective mode. Innovation in this sector is not only important for transport but also for science, industry and the European economy. Large subsidies are given to air transport by virtue of the fact that no taxes are levied on aviation fuels and air tickets. This situation makes it difficult for new transport modes to compete in the market.

7.1.3 Monitoring and controlling the improvements

New technologies often deliver improvements with respect to policy goals which are in practice much smaller than expected and also smaller than technically possible. This is often due to the fact that the operating conditions are different from the conditions for which the technology is optimised and in which it is tested. The way in which inspections are done to control compliance to the standards has to be developed further. Test conditions should be representative of the average use of vehicles and methods should be developed to test the quality of vehicles in use.

Telematics will become increasingly important for transport. The whole range of possibilities has not unfolded completely yet and their impact is also uncertain. The speed of innovation is uncertain and it is not too clear for many innovations whether they will simply represent improvements in the existing transport system or they will cause fundamental changes. Over-optimism can be as harmful as late reaction. Monitoring of the innovation process is necessary for timely reaction.

For the enforcement of legislation and regulation telematics can offer very effective tools. Examples are electronic number plates and automatic speed adaptation. The problems with such technologies is more acceptability than the technique. The acceptability of such technological innovations would probably grow if the control functions are integrated with functions that give direct benefit to the user. Furthermore, international harmonization and standardization and agreements on the distribution of competencies are needed.

7.1.4 Urban policy

International harmonization of legislation, standards and testing procedures will create better conditions for industry to improve the quality of the vehicles they produce and the service they offer. On the other hand, harmonization of regulations that control access to urban centres will create a market for environment-friendly urban vehicles. Without restrictions of access to city centres for conventional cars, buses, vans and lorries, innovative transport in cities has little chance of success. Also hybrid trucks and buses are not cost-efficient compared with the improved conventional engines. They can find a position in the market only if emissions standards for city centres are made stricter.

The need to relieve the conflict between mobility and liveability, spatial requirements for infrastructure and for living, leisure, shopping and working in urban areas can be fulfilled by the introduction of structural innovations of the transport system. Suitable technologies exist already or can be developed. The costs of these innovations are high. Furthermore, the innovation process is slowed by institutional, political and other socio-economical problems. One single town cannot easily make much progress and national or European efforts are needed to create favourable conditions for an innovation process.

Reliable, complete travel information will facilitate a larger role of pedestrians in trip chains. The services that are developed by commercial organisations will not lead to an optimum situation unless institutional co-ordination is given to control service quality.

7.1.5 Regulation

In road as well as rail transport, lighter vehicles are possible. This will be beneficial for energy consumption. The safety aspects of such innovation have to be considered by regulatory authorities.

Strategic niche management is considered to be an effective policy instrument to stimulate the transition between the development phase and the market introduction.

Regulation is seen as an important cause of delays for the introduction of new technologies. Changing regulations too fast is risky, because of the coherence between different regulations that must not be disturbed and the possible undesirable side effects of changed regulation. The creation of "*regulatory niches"* might give the possibility for faster implementation of new technology. In such a niche, a limited application area, the authorities may brook the breach of regulations in order to have the possibility of a pilot, a demonstration or the possibility to develop the technology further.

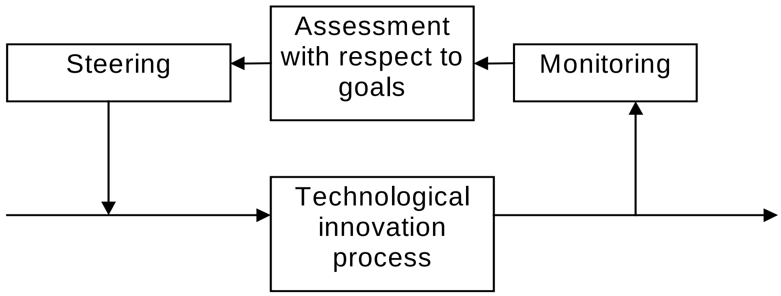
7.2. Coping with uncertainty in technology policy

Technology policy has to be chosen with the objective of achieving a positive result. The result may be defined in the following way:

INFLUENCE * MAGNITUDE * IMPACT = RESULT

The *influence* is the degree to which government agencies are able to steer the innovation process. If the process is completely determined by market forces that can not be changed, policy measures will have no result at all, even if the innovation is very beneficial for policy goals and the innovation process is prosperous. In most cases the possibilities to steer the process of technological innovation are present but the impact of steering is always uncertain. Steering has to be monitored and adjusted continuously in order to be sure that the process goes as much a possible in the desired direction. A *closed-loop* feedback control paradigm is most appropriate. A fast feedback loop is needed where continuous monitoring and adaptation of steering is applied instead of the usual slow feedback where the policy measures are assessed at the end only.

Figure 8. **A fast feedback loop for closed loop steering of the innovation process**



The *magnitude* of the transport mode is also important. Innovations for short distance use of all-purpose cars give more results because all-purpose cars have a large share of the transport market and the proportion of trips of a few kilometres only is rather large. The present share of existing transport modes can be determined from statistical data. The forecasts of future shares can often be made with economic models for consumer behaviour. The reliability of these forecasts is in many situations low, especially if new transport modes are investigated. The resulting uncertainty has to be dealt with by doing experiments and monitoring changes in the magnitude of competing transport modes.

It is very important to know the *impact* of a technological innovation. Some impacts can be determined in advance, some can be estimated. Most of the impacts have some degree of uncertainty. Often rebound effects exist where the impact of improvements are taken away by changing behaviour of users or by changes in vehicles which are made possible by the technology. Drivers of cars with ABS do not have less accidents, but drive faster in dangerous situations because they know that they can brake better. More efficient engines have led to cars with larger weight and more energy consuming accessories. Also here the impact, rebound effects and side effects have to be monitored.

Uncertainty represents not only lack of knowledge, but in many cases also an opportunity for choice. Certain issues become certain if choices are made and each decision changes the character of the innovation process. Therefore, technology policy should not be static, not a document with agreed policy and a package of policy measures, but a dynamic process in a network of actors with a clear vision of the future and well defined roles.

7.3. Discussion

Technology policy offers a lot for improvements in the transport system. The innovation process is only partly determined by technological issues. Innovations are products of new and existing technology, changing culture (preferences, habits, beliefs) and organisation. Even though every innovation has many aspects and relations, the art of technology policy is to find ways to realise changes in a desired direction, without the need to know everything or to change everything related to the innovation. Simplification and separation of the essential components are the essential in an innovation process.

Furthermore, a link has to be established between policy makers and technology experts in order to exchange the necessary, complex information. This report has tried to give a panorama of transport technology, to show some relations and to describe causality and the way to cope with a lack of causality.

The author is aware of the fact that several issues mentioned in this report have a transient character. They may change within a short time. Notwithstanding the rapid changes, the physical reality does not change that fast. The changes are more in the focus of attention, the structure and meaning of technologies than in the technologies themselves.

BIBLIOGRAPHY

AVV (1997), *The influence of the information society on traffic and transport*, Rotterdam, Adviesdienst Verkeer en Vervoer (in Dutch).

Bleijenberg, A.N. and J.M.W. Dings (1998), European transport: emission trends and policy responses, in: T. Schneider (ed.), *Air Pollution in the 21st Century: Priority Issues and Policy*. Amsterdam, Elsevier.

Bonner, J.T. (1988), *The evolution of complexity*, NJ, Princeton University Press.

Brand, C., P. Davidson, A. Lewis and D. Moon (1997), *Forecast of New Technologies with Major Impacts.* FANTASIE Consortium 1997, Deliverable 9. Oxford: ETSU.

Brand, C., P. Davidson and D. Moon (1998), *Characterisation of Technologies for Impact Assessment.* FANTASIE Consortium 1998, Deliverable 12. Oxford, ETSU.

CEC (ed.), The Common Transport Policy Action Programme 1995-2000. Communication to the Council, the European Parliament, the Economic and Social Committee and the Committee of Regions.

Davis, A.L. (1997), Developing a new consensus for physical activities in England. Evidence of a growing convergence of transport and public health policies, *World Transport Policy and Practice* 3/2 pp. 4-10.

Foresight (1995), *Technology Foresight. Progress through Partnership: 5 Transport*, London, HMSO.

Geenhuizen, M. van, P. Nijkamp and H. J. van Zuylen (1998), *Limits to Predictability in Traffic and Transport*, Rotterdam, AVV.

Geerlings, H. (1999), *Meeting the Challenge of Sustainable Mobility. The role of Technological Innovations*, Berlin/Heidelberg, Springer Verlag.

Goodwin, P.B. (1992), A review of new demand elasticities with special reference to short and long run effects of price changes, *Journal of Transport Economics and Policy*, Vol. 26, pp. 155-170.

Grübler, A.(1998), *Technology and Global Change*, Cambridge University Press.

Hofstede, G. (1984), *Culture's consequences*, Sage.

Höjer, M. (1998), Transport telematics in urban systems - a backcasting Delphi study, *Transportation Research D.*, Vol. 3, No. 6, pp. 445-463.

INIT (1997), *Technologiebeleid in Verkeer en Vervoer: Samen werken aan innovatie*, Concept report Technology Policy in Traffic and Transport, Ministry of Transport, Public Works and Water Management, The Hague (Dutch).

Jamison, A. (1998), *Technology Policy meets the Public*, Aslborg University Press.

Korver, W., L. Harell (1999), *Definition of European Transport Systems*, FANTASIE Deliverable 13, Delft, TNO-INRO.

Leach, G. (1985*), Global Land and Food in the 21st Century: Trends and Issues for Sustainability,* Stockholm Environmental Institute (SEI), POLESTAR Series Report 5, SEI, Stockholm.

Modis, T. and A. Debecker (1992), Chaoslike states can be expected before and after logistic growth, *Technological forecasting and social change,* 41, 111-120.

Padgett, J.F. and C.K. Ansell (1993), Robust action and the rise of de Medici 1400-1431. *American Journal of Sociology* 98, Vol. 6, pp. 1259-1319.

Powell-Ladret, E.R. (1999), *A thematic comparison of transport policy approaches in Europe: Comparative survey*, Rotterdam, Ministry of Transport, AVV.

Pratt, J.H. (1991), Travel behavior impact of telecommuting following the San Francisco earthquake, a case study, *Transportation Research Record* 1305, TRB, Washington, DC.

Rosegger, G. (1996), *The Economics of Production and Innovation: An Industrial Perspective*. Oxford, Buttersworth Ltd.

Rothwell, Roy and Walter Zegveld (1981), *Industrial Innovation and public policy*. London, Frances Pinter.

Spittje, H.D. (1999), The influence of teleworking on activity patterns and travel behaviour (Dutch), Groningen, Rijksuniversiteit, thesis.

Van der Hoorn, A. (1993), The Dutch Transport Structure Plan 1986-2010, *Compendium of papers from ITE 63rd Annual Meeting*, ITE, Washington.

Van Wee, G.P., K.T. Geurts, R.M.M. van der Brink, J. van der Waard (1996), *Transport scenarios for the Netherlands for 2030; A description of the scenarios for the OECD project "Environmental Sustainable Transport",* Report 773002009. Bilthoven (NL) National Institute of Public Health and the Environment.

Van Zuylen, H.J. (1995), The Game of the Rules, European Transport Forum, Seminar F, 95-105, London, PTRC.

van Zuylen, H.J., G.H.J. Schaick, (1997), The development of an integrated technology policy for transport. The 25th European Transport Forum, PTRC, London.

Victor, D.G., K. Raustiala, E.B. Skilnikoff (1997), *The Implementation and Effectiveness of International Environmental Commitments*, MIT Press, Cambridge, MA.

Weber, M. R. Hoogma, B. Lane and J. Schot (1999), *Experimenting with sustainable transport innovations; A workbook for strategic niche management. Seville/Enschede*. IPTS/University Twente.

Wee, G.P. van, J.A. Annema (1999), Transport, energy saving and CO_2 emissions: a comparison of European studies of the technical-economic potential, IEA International Workshop on Technologies to Reduce Energy and Carbon, Washington, DC.

Ybema, J.R. and A.J.M. Bos (1998), “Hedging” strategies for CO_2 abatement. In: T. Schneider (ed.), *Air Pollution in the 21st Century: Priority Issues and Policy*. Amsterdam, Elsevier.

Topic 3

PERIPHERALITY AND PAN-EUROPEAN INTEGRATION: EXPERIENCE AND PROSPECTS

ACCESSIBILITY AND REGIONAL DEVELOPMENT: TRANSEUROPEAN NETWORKS AND PERIPHERAL REGIONS (THE CASE OF GREECE)

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ABSTRACT

The importance of transport infrastructure in the process of regional development is widely recognised in regional economics, while in policy terms, infrastructure is considered a good instrument for regional development. In the European Union, transport networks are viewed as an essential contribution for the economic development and integration of Europe and the strengthening of its competitive position in the global network based economy.

In recent years, there is a continuing debate on the question raised by regional and transport theorists about the effects that accessibility improvements have on the economic development and cohesion of disadvantaged peripheral regions. Although it is generally agreed that efficient transport infrastructure is vital for regional economic development, there are arguments that regional development policies based on creating and improving infrastructure in peripheral areas may increase centralisation and reinforce regional disparities.

This paper examines the extent to which trans-European networks have economic and social benefits for EU peripheral regions and explores the relationship between increased peripheral accessibility and peripheral competitiveness. Focussing on Greece as a study area, the paper indicates the necessity for a policy of providing the appropriate transport infrastructure and ensuring equal terms of competition. This leads to the conclusion that, in order for improvement of transport infrastructure to be effective for peripheral areas, it should also be accompanied by other regional policy measures to encourage the creation of jobs and the competitiveness of local economies.

SUMMARY

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1. INTRODUCTION

The role of transport in regional development is a subject which has always excited the interest of regional and transport theorists. The way in which transport infrastructure affects regional growth and economic development has been the subject of growing interest during the last few decades. This discussion has revealed the difficulty of assessing the effect of specific transport investment projects on the development of the regions. Regional development is the result of a very complex process, a consequence of interactions between a multitude of economic, political and social factors. Although a good transport system is widely recognised as a prerequisite for national and regional development, transport infrastructure is not considered to be a sufficient condition which automatically guarantees positive results for accelerated development, especially where transport infrastructure already exists. However, lack of a proper transport system, is definitely regarded as a barrier to economic development. The role of transport can thus be determined more easily in a negative way, when lack of infrastructure or transport services in a region diminishes regional potential for development.

The development of a region depends, *inter alia*, upon the accessibility of the region to internal and external markets. Mobility between and within regions encourages competition and in this respect has a dynamic effect on growth. The question still to be answered is whether central and peripheral regions benefit equally from infrastructure improvement and integration. An important indicator for assessing the contribution of infrastructure to integration is accessibility. Regional accessibility is defined by the relative position of the region on transport networks and therefore, any change in transport infrastructure will eventually lead to changes in regional accessibility. Changes in accessibility lead to changes in the value of regional economic potential (Keeble *et al*., 1982, 1988). Thus, variations in transport infrastructure between regions can be seen as a cause of variations in regional performance. Even though the clear association between the level of infrastructure and regional development is widely recognised, the nature of the causal link is still the subject of intense debate. As Vickerman (1996b:228) indicates, while there is an overall relationship between levels of transport, infrastructure provision and regional performance, it is difficult to identify and evaluate the regional benefits of transport infrastructure and accessibility improvement in a convincing way. A conclusive answer has never been found, mainly due to measurement problems and difficulties in establishing the order of causality - whether good infrastructure results from, or causes, better economic performance.

Accessibility is currently an important issue in European transport and regional planning policies. Transport and communications infrastructure has always played a critical role in the political and economic history of Europe, which evolved from a set of relatively independent nation states into a collection of interacting economies connected by means of various types of network infrastructure (Nijkamp *et al.*, 1994:3). Transport systems have gained a major role in promoting the integration and cohesion and in improving the accessibility of peripheral regions, since connections to markets and sources of supply are of critical importance. The completion of the internal market, the move to the expansion of the Single European Market into a wider European Economic Area and the recent geopolitical and socioeconomic changes in East-European countries, reoriented the European Union's (EU) regional development and transport infrastructure strategies. As globalisation, the new keyword, stressed the importance of linkages between economic and political developments and decisionmaking in all the regions of the world, the need for open and competitive markets, innovation, private-public partnership initiatives, infrastructure connections and accessibility improvements became imperative.

The purpose of this paper is to discuss the consequences of accessibility for regional disparities, mainly the disparities between central and peripheral areas within the context of European integration and especially the impact of trans-European transport networks on the development of peripheral areas, with a case study of Greece. The general questions that arise here are whether improvements occurring in trans-European transport networks will lead to greater concentration of economic activity and therefore to regional inequality, or whether they will lead instead to greater dispersion and thus contribute to greater economic cohesion at the European and national levels.

The impact of transport networks and associated accessibility on the evolution of regional disparities will be explored in theoretical and empirical analyses, considering transport infrastructure as a) an input in the production function, b) a factor affecting the location of activities interregionally and c) external economies contributing to the growth of productivity (total factor productivity). We shall in particular examine the consequences of integration, due to trans-European transport networks, for Greece.

The structure of the rest of the paper is as follows. In Chapter 2, the historical evolution of the "widening" and "deepening" of the EU is reviewed, followed by a presentation of theoretical approaches to and empirical analyses of the debate concerning the centre-periphery paradigm in Europe. In Chapter 3, the involvement of transport infrastructure in European integration and the evolution of regional disparities are discussed. In Chapter 4, the origins and goals of current EU transport plans are outlined, followed by an analysis of the impact of trans-European transport networks on the development of peripheral regions. In Chapter 5, the case of Greek regions and the impact of trans-European networks are explored. Finally, in Chapter 6, general conclusions are drawn concerning regional and transport policies in relation to peripheral regions.

2. UNEVEN REGIONAL DEVELOPMENT IN THE EUROPEAN UNION : "CENTRE- PERIPHERY" RELATIONS AND ACCESSIBILITY

2.1. The historical evolution of the "widening" and "deepening" of the EU

A distinctive characteristic of international economic relations is their regionalisation into commercial blocks, the most important of which are : the European Union (EU), the North American Free Trade Area (NAFTA) and the Association of South-East Asian Nations (ASEAN). Significant reasons behind regionalisation are: a) the need to confront competition; b) disillusionment with global integration; and c) the conviction that regional integration contributes to economic development (Greenway, 1992). Of the three blocks mentioned above, the EU is considered to be the most highly developed regional entity within the international trade system. Integration has contributed significantly to the growth of commercial transactions within the EU and has driven forward intra-industrial trade in relation to inter-industrial trade (Sapir, 1992).

Since 1957, when it was founded by the Treaty of Rome, the EU has made many significant steps on the path towards integration. These steps have been in the directions both of "widening" and of "deepening". In relation to "widening", we have observed the enlargement of the EEC, from six to nine Member States with the accession of Great Britain, Ireland and Denmark in 1973, to ten Members with the accession of Greece in 1981, to twelve Members with the accession of Spain and Portugal in 1985 and finally to fifteen Members with the accession of Austria, Finland and Sweden in 1995. Positive decisions have already been taken concerning the accession of two other Mediterranean countries, Cyprus and Malta.

The European Council, at its Copenhagen summit in 1993, expressed its intention of extending the eastern border of the Union, for political as well as economic reasons. This resolution was followed in the first phase, by the signing of "European Agreements" concerning six candidate Member States in central and eastern Europe (Poland, Hungary, the Czech Republic, Slovakia, Romania and Bulgaria), and in the second phase, the signing of similar agreements with four other states (Estonia, Lithuania, Latvia, Slovenia). Finally, Turkey is to be added to the list of candidates. The countries mentioned above, however, will need a substantial amount of time before their accession can occur, since they have low per capita income, and their agricultural sector will create problems to existing EU policies (Baldwin, 1995). Thus, scenarios which project that the EU may have twenty-five Member States by the year 2010 should be viewed as unrealistic (Rollo, 1995).

The first step in the "deepening" process was the customs union, which was completed in 1968. During the seventies and the early eighties, very few steps took place towards deepening the economic integration of the EU, with the exception of the establishment of the European Monetary System (EMS) in 1979. Deepening has been accelerated since the mid-eighties, first with the acceptance of the White Paper on the establishment of the Single Market (CEC, 1985) and the enforcement of the Single European Act in 1987, followed by the Maastricht Treaty introducing Economic and Monetary Union (EMU) in 1991. European Monetary Union completed and deepened, we could say, the plans for the establishment of the internal market, since all transactions will now be conducted in a single European currency (EURO), which will contribute significantly to the reduction of transaction costs. As things are evolving, at the beginning of the twenty-first century, European integration appears to be moving towards a Pan-European Union and could therefore be considered to be a concept far broader than EU membership, in the sense of the precise measures of integration deriving from it.

Within the framework of European integration, however, two divisions are included: the "North-South" and the "West-East" division (Van Geenhuizen and Nijkamp, 1996). The North-South division arose after the first and second accessions to the European Union and is expected to be intensified by the coming accessions of two other Mediterranean countries, Cyprus and Malta. The "West-East" division was created with the re-orientation of the countries of central and eastern Europe towards the EU, which arose due to the fall of the communist bloc and which was expressed through the signing of the "European Agreements".

Alongside this, two other trends can be identified on the European political scene (Nijkamp *et al.*, 1994:6): a) a trend towards political unification in western Europe, including both decentralisation and centralisation, that is power shifted from national to regional level and from national governments to Brussels respectively; and b) a trend towards decentralisation in eastern Europe, where national governments are removed from their capitals, and states are split up into their founding constituents. Within both trends, the position of national governments is likely to weaken and the regional scale to become the relevant dimension for economic development.

The declining trend observed in nation-state power and the strengthening of the role of the region as an independent and autonomous entity, was also expressed by the concept of a "Europe of Regions". This concept has gained strength since the 1980s and has been widely used to supply an image of the ongoing development of the united and more democratic Europe (Vartiainen *et al.*, 1995:98). The idea of a "Europe of Regions" was tied to the bottom-up strategy in regional development which places stress upon the individual nature of each "region" with respect to the universality of capitalism and the nation state. In this perspective, regional development is based upon the idea of diversity rather than unidimensional concepts such as growth and equality (Stohr and Todtling, 1977). The federalist conception of a "Europe of Regions" thus, differs from that of the European Single Market, since it puts emphasis on the claim of regional autonomy and self-government and on the increasing acceptance of the principle of subsidiarity (Cappellin, 1995:45).

2.2. The "centre-periphery" paradigm and accessibility

With European integration, the orientation of the regions towards the internal market is reinforced and in this way, competition between them is intensified. As a result, the structure of the regions in the European arena takes the form of a division between "centre and periphery", pertinent to regional accessibility. The regions of northern Europe, in their majority, constitute the "centre", having a dominant central position in their relationship with the internal market. The "periphery" is composed of the South of Europe (regions of Portugal, Spain, southern Italy, Greece), the regions of Ireland and Scotland in the North, as well as the regions of central and eastern Europe (Gripaios and Mangles, 1993).

The terms *periphery*, *peripheral* and/or *peripherality* are often used in a rather imprecise way. The word *peripheral*, in itself, signifies a distant location in relation to a central one, i.e. on the circumference. The etymological interpretation goes back to the original meaning of the Greek word "peripheria", deriving from a verb that means "bring round about". Such a purely geometric interpretation of the term, however, does not imply whether it is a good or bad situation (Illeris, 1995:116). The geographical dimension is a necessary, but not sufficient condition for a remote region to be characterised as peripheral. Nevertheless, geographical location implies distance and physical constraints, which give rise to transport needs and real costs like high costs for the transport of goods and people towards the central area, increased and unreliable travel times, low frequencies and levels of service, restrictions and various "obstacles" to overcome in order to reach the central location etc. (Giannopoulos and Boulougaris, 1995:254).

As Eskelinen and Snickars (1995:6) indicate, "from a narrow and static perspective, peripherality boils down to the problem of accessibility". An inevitable consequence of peripherality is low accessibility, and higher cost of interaction with other regions, because of longer distances, compared to the core. Accessibility is a concept not easy to define and measure. As frequently used, it encompasses at least two concepts : location and market or economic potential (Vickerman, 1995a:29). In more general terms, it has been defined as some measure of spatial separation of human activities, to denote the ease with which activities may be reached from a given location by means of a particular transport system (Morris *et al.*, 1979). There is a long and rich literature on indicators measuring accessibility, including, among others, major works by Keeble *et al.* (1982, 1988), Lutter *et al.* (1992), Vickerman (1994, 1995b, 1996b), Vickerman *et al.* (1995). Each indicator introduced could be characterised according to "the purposes it is needed for", as: a) geographical index, to describe the existing distribution of accessibility (i.e. Kostopoulou, 1995); b) traffic engineering index, to describe transport network impacts of a change; c) regional planning index, to describe simple aggregate changes in employment and incomes; d) economic geography or regional science index, to explain the process of economic development in terms of changing competitiveness and the spatial distribution of economic activity at a disaggregate level (Vickerman, 1996b:228).

Peripherality, as a "syndrome" characterising the periphery, is usually connected with economic backwardness, expressed more precisely through low Gross Domestic Product (GDP) per capita and measured also by other indicators of quality of life, such as education centres or telephones per 100 inhabitants. The concept of peripherality refers also to exploitation by the core, which for example, reserves for itself the high-value-adding activities, leaving the low-productivity, low-wage activities to the periphery, like the production of raw materials from local natural resources (Illeris, 1995:120). Peripheries, in addition to their natural resources (minerals, fishery, tourist attractions), have always offered the core regions new human resources during the growth periods of national economies (Vartiainen and Kokkonen, 1995:98). In general, peripheral areas are characterised by structural handicaps like, a dependence upon resource-based industries, high proportion of public sector employment, low population density, intense periods of population decline, an ageing population and high unemployment, that render them synonymous with disadvantaged, depressed and problematic areas. In the peripheries, scale economies in production and in the use of infrastructure cannot always be developed and utilised to the same extent as in the centres, where there are large numbers of potentially mobile people and socio-economic activities (Eskelinen and Snickars, 1995:6). That is why, the notion of peripherality, as reconsidered by the European Commission, is "often used to explain why certain regions consistently fail to catch up with developments in other more centrally located ones" (EC, 1994:105).

The existence of a "centre-periphery" structure in Europe is accepted by most researchers and many models have been introduced (for a brief review, see Meijer, 1993), in order to describe the concept of the "centre" of Europe, as a concentration of population and wealth in the core regions of the EU. The best known one is the "European Banana", an attempt commissioned by the French national planning agency Datar from Reclus (Datar, 1989). The authors identified a highly developed area including a series of urban regions, of large and wealthy markets which constitute the most important economic centres of Europe. The "centre" starts in the Southeast of Great Britain and reaches the North of Italy, passing through Paris, Brussels, Randstad, the Rhine area and southern Germany. In 1991, the Commission of the European Communities published a document entitled "Europe 2000" (CEC, 1991), in which the creation of a second banana of urban areas is mentioned, from northern Italy to northern Spain, including urban regions, such as Barcelona, Nice and Marseilles, i.e. urban centres which constitute the boundaries of the Mediterranean and which are less significant in a European context, but very significant in a national context.

The "centre-periphery" paradigm is generally used to characterise asymmetrical relationships and the disparities of regional systems. However, numerous studies in various academic disciplines have concluded that the relations between the dimensions of centrality and peripherality are complex, since different boundaries may exist on different scales (Eskelinen and Snickars, 1995). A region which is peripheral in one field, can be central in another. Furthermore, a region which was once a periphery, is not necessarily a periphery for ever, since the territorial system is always changing. This is particularly the case for Europe, where major political and economic changes in central and eastern European countries during the past two decades have dramatically changed relations among cultural, political and economic centres and peripheries.

Besides the measures establishing the internal market and accomplishing Economic and Monetary Union, important for the integration of Europe is the development of transport infrastructure and in particular international transport and telecommunications networks. As already mentioned, European integration promotes the orientation of regions towards the internal market and, through this, it contributes considerably to the growth of commercial transactions within the EU. Increased European trade, in turn, contributes to an increase in demand for international transport infrastructure, since the accessibility of the regions to the internal market really means their accessibility to international transport and telecommunications networks. In general terms, accessibility is therefore inversely related to the cost of transport.

Theoretically, one might argue that in comparison to the lagging "peripheral" regions, the economically stronger and more prosperous "central" regions have greater accessibility to international transport networks, since networks are more dense in the "centre" with an increased volume of transactions, and therefore volume of transportation. Empirical analyses relating to this topic show that this claim is not far from reality, even though it must be noted that differences in accessibility have changed dramatically during the last few decades, due to technical improvement and lower cost of transport : for centrally located western European cities, accessibility increased by 26 per cent from 1976 to 1988, and 5 per cent from 1988 to 1992, while for cities in the periphery, accessibility increased by 29 per cent and 12 per cent, respectively (Illeris, 1995:117). The accessibility index of the European regions, defined by Rodenburg (1989) for the Commission, shows that peripheral regions indicate less accessibility than the central ones. The difference in accessibility between regions, given the advantage of "central" regions, is verified by several empirical studies which were concerned with the estimation of the accessibility of European urban regions (Bruinsma and Rietveld 1993, 1998). All these studies come to the conclusion that the level of inequality in accessibility between regions varies, depending upon transport modes (air, road, rail). For example, a study introduced in the Fifth Periodic Report (EC, 1994), that measured the accessibility of 194 major economic centres in the Community, the EFTA countries and central Europe for business travellers from over a thousand Community NUTS3 regions, concluded that : when air travel was considered, then the distinction between central-peripheral regions was much less evident, since peripherally located larger centres with international airports, are also relatively well-connected.

Another verification of the "centre-periphery" division and the closely related differentiation of regional accessibility, is seen through the behaviour of European multinational corporations. As it is clear from relevant empirical analyses, European multinational corporations, in their overwhelming majority, prefer their activities and especially their headquarters to be located in central regions, owing to higher accessibility (Meijer, 1993; Rozenblatt and Pumain, 1993). Regarding the location within the centre, however, it seems not to support morphologically the concept of the first banana. Another conclusion that emerges from the above mentioned empirical studies is that several peripheral urban regions of southern Europe, especially the larger cities in Spain and Italy, were favoured to a great extent by multinational corporations as their place of establishment. This fact could point to a support for the second banana concept, although the growing cities are not the ones bordering the Mediterranean (Meijer, 1993:987).

The general conclusion is that regional development within the EU is characterised by the "centre-periphery" relationship and that regional accessibility to the multinational transport and telecommunications networks plays a vital role in this relationship. We may also conclude that the development of each region, to the degree that it is related to the accessibility to the internal market, is not necessarily going to follow the development of the states to which it belongs.

3. EUROPEAN INTEGRATION, ACCESSIBILITY AND THE EVOLUTION OF REGIONAL DISPARITIES IN THE EU

3.1. Theoretical approaches

In Europe, much of the debate on the regional effects of the Single European Market (SEM) has been focused on the degree to which the "centre" and the "periphery" will be affected. It is generally accepted that increased economic, social and cultural interaction will be to the benefit of all societies involved and thus integration will affect positively the overall EU economy. It is also accepted that, since European integration contributes to the acceleration of economic growth within the EU, part of this growth would spill over to the less developed peripheral regions.

The effects of integration on the overall EU economy may be distinguished in static and dynamic terms. The static effect indicates the benefit from the reallocation of resources, while the dynamic effect represents the increase in the productive capacity, being the essence of regional integration.

The net welfare benefit from integration depends upon the relative magnitude of the "creation of trade" and the "diversion of trade" (Viner, 1950), as well as upon the reduction of cost due to economies of scale in the production process (Corden, 1972). Existing empirical estimates indicate that the net positive static effect is significant (Sapir, 1992).

The growth of productive capacity is viewed as a result of the increased productivity due to utilisation of the economies of scale. Ceccini in his report (CEC, 1988), estimates a growth rate in the productive capacity between 2.5 per cent and 6.5 per cent, while other researchers estimate much less growth in production: Baldwin's (1989) estimate is between 0.25 per cent and 0.9 per cent, and Grinols' (1993) between 1 per cent and 2 per cent. Since the improvement of transport infrastructure also contributes to the integration of the internal market, this means that, to a certain extent, the increases in productive capacity presuppose an increase in the average accessibility of the EU regions.

The basic questions that arise here are the following: Would all EU regions benefit equally from the distribution of benefits that will arise for the EU as a whole? If not, which regions will benefit more and which less? More generally, how is EU integration expected to affect regional disparities in general, and in particular the "centre-periphery" relationship? In this chapter, we attempt to explore the answers to the above questions and show the significance of the transport factor in its relationship to the accessibility of regions.

The effect of market forces on the regional concentration of wealth is considered as the main issue in the debate about regional disparities. Two competing schools are identified in their attempt to provide an answer to this issue, although oversimplifying the problem : the neoclassical and the post-Keynesian theoretical frameworks (Armstrong and Taylor, 1985; McCombie, 1988, 1988a).

The dominant neoclassical approach assumes that "an unfettered working of the market mechanism will be equilibrating. Any differences in regional productivity growth are seen as being fundamentally the result of the gains accruing from a progressive reduction in an initial interregional misallocation of resources. Consequently, any disparities in productivity growth will eventually vanish as the misallocation is progressively corrected and regional growth rates approach the steady state" (McCombie, 1988:267). Thus we can say that "the persistence of regional disparities would, from the neoclassical perspective, be due to factor market imperfections and to the temporal lags inherent in the process of development" (Suarez-Villa and Roura, 1993:371).

The Post-Keynesian model argues that "since increasing returns to scale are prevalent in manufacturing industry, a substantial proportion of productivity growth is determined by the growth of output. Disparities in regional productivity growth are thus predominantly due to differences in output growth which allow some regions to benefit more than others from economies of scale. Since a faster growth in productivity will lead to an increase in a region's competitiveness, this, in turn, will give a further stimulus to output growth. Growth becomes self-reinforcing with strong endogenous forces tending to increase regional differences in productivity growth" (McCombie, 1998a:399). In essence it is a model of cyclical and cumulative causation (Myrdal, 1957) in which the increasing returns to scale generate the principal of cumulative causation (Kaldor, 1970; Faini, 1984). According to this model "in many less-favoured regions the persistence of problems suggests that the cumulative effect of disadvantage, rather than insufficiently open markets, is the main reason for a lack of competitiveness. If so, market liberalisation may well exacerbate the difficulties of less-favoured regions by intensifying competitive pressures" (Begg and Mayes, 1993:434).

The problems with the above mentioned theoretical schools are the following: Neoclassical theory favours the equilibrium methodology, neglecting the historic role determining economic growth. The theory of cumulative causation takes into account basically the historic heritage. Besides the historical predetermined initial conditions, no other aspect of the historical growth process matters in the determination of the long-term relative growth rates. High (low) relative growth rates lead over time to corresponding high (low) relative growth rates. Setterfield (1997) recently extended the basic model of cumulative causation. His contribution is to suggest that the course of growth affects long-term growth. The cumulative growth effects of a specific relative growth trajectory determine, besides the initial conditions, the long-term relative growth rate. This extended model suggests a process of cumulative causation, which takes place in the context of specific technological and institutional regimes. Understanding the impact of growth on these regimes, and their changes (or failure to change), plays an essential part in understanding the long-term growth process.

Traditional neoclassical orthodoxy has obviously influenced the theory of international trade. Nevertheless, recent theories of economic growth and trade have started to take seriously into account the increasing returns to scale, arising from the spillover of research and development, of learning by doing, and of human capital, as well as the imperfect competition that they imply – factors which constitute the heart of the modern theory of endogenous growth (Romer, 1986; Lucas, 1988). Within the framework of this new theoretical direction, there are several models dealing in particular with the impact of integration on the growth of regions. The results of these models do not allow definitive conclusions to be drawn. In the case where comparable regions of the centre are integrated, there is almost complete agreement that the process of integration contributes to the growth of all regions (Romer, 1990; Rivera-Batiz and Romer, 1991, 1991a; Grossman and Helpman 1990, 1991, 1994). On the contrary, in the case where non-comparable regions are integrated, and in particular regions of the centre and the periphery, conclusions diverge: On the one hand, there are models that argue that the effects of integration benefit mostly the regions in the centre (Lucas, 1988; Young, 1991; Feenstra, 1996). On the other hand, there are models arguing that the results of integration may benefit mostly the regions in the periphery, with the assumption that they will be innovative (Rivera-Batiz and Xie, 1993). It is, however, doubtful if the latter assumption is valid for peripheral regions in the EU (CEC, 1991:37). Alternatively an assumption is made that there is a diffusion of knowledge from the innovative and developed to the non-innovative less developed economies. According to Feenstra (1996: 231-232) this is not supported by existing empirical evidence.

Furthermore, the diffusion of knowledge depends upon the existence of conditions within the non-innovative less developed economies such as, the level of human capital, the rate of structural changes, the rate of investment and the amount of investment in infrastructure, as well as institutional changes (Abramowitz, 1986; Targetti and Forti, 1997). Education and training of labour forces policies, industrial and transport infrastructure policies within European Regional Policy, can contribute significantly to regional convergence through changes that affect technological and institutional regimes of the peripheral economies.

Up to this point, we have examined the effect of integration on the centre-periphery relationship, based on models which do not take into account the spatial dimension. In the discussion that follows, the impact of integration will be studied, taking into account transportation cost and the associated concept of regional accessibility. The role of transportation in the evolution of the "centre–periphery" relationship in the context of European integration can be analysed in terms of an endogenous growth model (Barro, 1990; Barro and Sala-i-Martin, 1995: sec. 4.4). In this model transport infrastructure as a complementary input supports the capital productivity and through this affects endogenously the economic growth whenever capital increase is combined simultaneously with the expansion of transport infrastructure. As a result of the above prediction, one can state that the relative delay in peripheral development is caused by the inadequate capital inflow due to poor transport infrastructure and thus inadequate accessibility (CEC, 1990; Bradley *et al*. 1995:98). However, this model does not provide specific mechanisms through which transport infrastructure affects economic growth. Such mechanisms can be analysed with the aid of recent dynamic models of location of economic activities in the context of regional development.

Within the framework of neoclassical tradition, Henderson (1974) formed a model, taking into account congestion costs in urban centres (commuting costs, urban land rent), functioning as a decentralising force in economic activities. Henderson's model forecasts the dispersion of economic activities and population to optimum size urban centres. Such an optimum depends upon the tension between agglomeration diseconomies (congestion costs) and agglomeration economies (as pure external economies). The conclusion of the model is based on the hypothesis that inter-regional transport cost is zero.

In contrast to Henderson, Krugman (1991), continuing the tradition of the theory of "cyclical and cumulative causation", showed the trend of a strengthening centre relative to the periphery, through the interdependencies of economies of scale, market size and inter-regional transportation costs. The impulse towards the agglomeration of economic activities and population in the centre reflects the benefits that firms obtain from locating themselves in a concentrated market, which are the growth in productivity, due to increased demand and reduced transportation costs. In other words, the power of agglomeration of economic activities concerns pecuniary external economies that result from the access to the market of final products (backward linkages) and from the access to the market of intermediate products (forward linkages) (Hirschman, 1958). This is not a new proposal, since Hoover (1971) had already studied these relationships as part of the theory of location, but rather a new formalistic expression of the principle of cyclical and cumulative causation. Also, according to Martin and Rogers (1994a) the decrease in the cost of transporting commodities interregionally reinforces the concentration of economic activities in the centre. This phenomenon occurs because the reduction of difficulties in transporting commodities between centre and periphery strengthens the advantage of the centre as a location for the increasing returns industries.

In his augmented model, Krugman (1996) took into consideration the agglomeration diseconomies (congestion cost) which function as a deconcentration force. The augmented model predicts the strengthen of the centre, when inter-regional transportation costs are high. With the reduction of transportation costs below a critical level, concentration falls. This is because at a low level of transport costs it does pay for the industries to locate production in the low-cost peripheral regions and transport output to the centre. This conclusion is also found in a similar model of Tabuchi (1998) which is a synthesis of Krugman's (1991) and Henderson's (1974) models. Tabuchi's model predicts that, after a long period of time passes and transport costs decline below a critical level, concentration forces weaken. Weak concentration forces, together with decentralisation forces, contribute gradually to the dispersion of economic activities and population. This occurs, because whenever inter-regional transport costs are very low, accessibility of peripheral regions in relation to the central ones increases to such an extent that there is no strong cause for concentration. Similar conclusions are found in analyses by Krugman and Venables (1995), Puga (1998) and CEC (1991).

From the above discussion one could conclude that integration associated with gradual reduction of inter-regional transportation costs, can lead to a gradual relative increase in the accessibility of peripheral regions, and thus to the gradual convergence of the regions, as long as transport costs are below a critical level. This means that, over a certain range of values for transport costs, the reduction of inter-regional transport costs and associated relative increase in the accessibility of peripheral regions, could hurt rather than improve peripheral regions, strengthening the divergence between centre and periphery. The increase in accessibility of peripheral regions could be achieved by the improvement and expansion of transportation networks in these regions, where transport infrastructures are inadequate. Moreover, the form of the improved transport network plays a significant role as well. It can be proven that improvement and extension of a transport network the hub of which are the central regions, may add to their accessibility and their attractiveness as a location for the increasing returns economic activities (Krugman, 1993:14; Mun, 1997:218-9; Hart, 1992:496). Thus, it should be underlined that improvement and extension of transport networks in peripheral regions should facilitate transport in all directions, and in particular between peripheral regions.

The trend of gradual dispersion, may, to a certain degree, be slowed down by the existence of factors that contribute to the decline of deconcentration forces, since they cause a decline in demand for commuting into the central urban regions. The main factors are (Hart, 1992, 1994; Small, 1997; Schuler, 1992): a) decongestion measures (congestion tolls or other pricing, land use regulation), b) change of commuting preferences with a shift towards public transport, walking and cycling, c) increase in the service sector and decentralisation of office work through telecommunications and linked computer networks, d) telemarketing and catalogue shopping, e) automation, decrease in the manufacturing sector's share in GDP and an increase in the flexible production, that allows, via subcontracting, several production processes to be carried out close to the places of distribution.

3.2. Existing empirical evidence

In the discussion that follows, the evolution of income disparities among various economies, and in particular between the centre and the periphery within the EU, will be examined, using existing empirical evidence. Early empirical analyses conducted by scholars of the endogenous growth approach for the period 1950-75, reject the neoclassical growth model, which predicts that rich countries (regions) will grow at a lower rate than poor countries (regions) (Romer, 1986). Baumol (1986) comes to a similar conclusion, although he identifies a clear convergence with respect to a group of sixteen developed industrial regions, for the same time period. This finding is questioned by Romer, and particularly by De Long (1988), since there is an ex-post biased selection of the sample. In any case, Baumol and Wolff (1988) verify the above mentioned convergence in a group of sixteen ex-ante industrial economies over the same period.

In the nineties, numerous empirical studies appeared, dealing with the systematic analysis of the integration issue. Robert Barro (1991) pioneered the way, proposing two concepts of convergence: a) the β-convergence, referring to the trend of the less developed economies to develop faster than the developed ones and b) the σ-convergence, referring to the decrease in disparity between the per capita income levels of various economies. Since economies usually have different steady per capita income levels, the determination of β is carried out under the condition that the differences between them will be controlled. In this case, it becomes a reason for conditioning β-convergence. Although the two convergence concepts are correlated, β-convergence is considered to be more significant (Sala-i-Martin,1994, 1996). Barro and Sala-i-Martin (1991, 1992 and 1995) studied the convergence attitudes of regions within the USA, Japan, Canada and the EU. They conclude that: a) there exists both β and σ convergence, b) the speed of the β-convergence is approximately 2 per cent (Sala-i-Martin, 1996). It should be stressed however that, in the case of the EU, the sample is composed of seventy-three central regions. Other analyses (Armstrong, 1995) which also include peripheral regions, estimate an annual convergence rate of 1 per cent within the EU. In any case, a convergence rate of 1 per cent or 2 per cent annually is considered very low. For example, in seventy years, the difference may be reduced by 75 per cent with an annual convergence rate of 2 per cent and by 50 per cent with an annual convergence rate of 1 per cent. One may stress once again that conditional β-convergence means that different economies converge to different steady-state per capita income levels, determined by factors such as the investment rate, human capital, and population increase. Islam (1998), in a recent empirical analysis, found convergence greater than 2 per cent, controlling the differences in production functions among economies that, among other things, are dependent on institutional and transport infrastructure. This means that transportation infrastructure is among those elements determining the steady-state per capita income level and the rate of economic growth. Therefore, peripheral regions can improve their relative economic position through the improvement of transport infrastructure.

Observed annual rates of convergence are not similar throughout the period 1950-1990. Regarding the σ-convergence, one may say that income differences among regions were obviously in decline up to the mid-seventies. This phase of convergence was followed by a phase of divergence, which lasted up to 1985 and as a result, the level of regional differences reached the level of 1970. Since the mid-eighties, regional differences have been stable, although there is some evidence that they may have increased at the beginning of the nineties (CEC, 1991a; Dunford, 1993; Fielding, 1994; Suarez-Villa and Roura, 1993). The speed of β-convergence declined during the period 1980-90, compared to the previous period, while it remained stable over the period 1985-90 (Neven and Gouyette, 1995; Armstrong, 1996).

It is essential to examine the characteristics of convergence between central and peripheral regions. According to estimates of Neven and Gouyette (1995), since 1985, while central regions have been converging among themselves, peripheral regions have remained in stagnation. If one combines the above evidence with the identification that the β-convergence tended to remain stable over the period 1985-90, then one can conclude that the process of European integration, which started in 1985 with the establishment of the Single European Market, is very possibly favouring the central regions rather than the peripheral ones (Neven and Gouyette, 1995:62; Camagni, 1992; Steinle, 1992; Begg and Mayes, 1993; and Nam and Reuter, 1991). On the other hand, Lever (1993) estimated that the average growth rate of peripheral urban regions would be slightly higher than that of central urban regions for the periods 1985-89 and 1989-95.

Emerson (1988) pointing out the problems of estimating the aggregate gains from market integration and forecasting its distribution by country or region stated that, “neither economic theory nor relevant economic history can point to any clear-cut pattern of likely distributional advantage or disadvantage". Even though it is generally accepted that some regions will benefit more than others, nothing can be said a priori about which ones are more competitive, since that must be examined in each particular case (Illeris, 1995:128).

Empirical studies seem to verify the theoretical position of the accessibility effect on the centre-periphery relationship. Central regions developed at a faster rate than peripheral ones, because, inter alia, they had greater relative accessibility (Keeble et. al., 1982; Peschel, 1990; Vickerman, 1992; Cheshire, 1990; Dunford, 1993; Begg, 1989; Quevitt, 1992; Chisholm and O'Sullivan, 1973; Beckerman, 1956). On the other hand, Peschel (1985), studying over an earlier and lengthy period of time, 1900 to 1975, demonstrated the stability of trading patterns, reflecting the influences of distance and political factors, where distance was less important than political and other obstacles to trade. Suarez-Villa and Roura (1993) have concluded that some peripheral regions (mainly Spanish) managed to achieve growth rates above the EU average, due also to greater relative accessibility.

In sum, one may conclude that the interference of space in economic transactions, particularly via transport costs and the associated accessibility of regions, will not allow the process of European integration to reduce at a rapid rate regional income differences, which have taken the form of centre-periphery. Income differences between centre and periphery in the EU is 1:5, while in the USA it is 1:2. The extension of the eastern border of the EU will probably bring a very significant increase in disparities and will have important consequences for the people who reside in the Cohesion countries. The main challenge for any individual region within a Europe of regions is how to strengthen itself through both intra-regional and inter-regional integration (Vartiainen and Kokkonen, 1995:109).

4. EU TRANSPORT POLICY: TRANS-EUROPEAN NETWORKS

4.1. The upgrading of EU transport policy

The previous discussion has shown that the European Union cannot rely on further integration for the convergence of peripheral economies. This has been recognised by the European Commission, since it is acknowledged in the White Paper (CEC, 1985; Begg, 1989:368) that, after 1992 "…existing discrepancies between regions could be exacerbated and therefore the objective of convergence jeopardised". As a result, the existence of strong and continuing European Union intervention is considered to be necessary, since it is recognised (CEC, 1988; Begg, 1989:372) that "in any case, policy instruments exist to provide an insurance policy to help losers recover". The necessity of EU intervention, aiming to promote the development of peripheral regions, arises also from its commitment to the Single European Act and the Treaty of Maastricht, to increase "economic and social cohesion through actions aimed at promoting the overall harmonious development of the Community and reducing disparities between the various regions and the backwardness of the least favoured regions in particular" (Hall and Van Der Wee 1992:400). This necessity is also stressed in the "Agenda 2000" where emphasis is given to the need "to narrow the gaps in wealth and economic prospects between regions" and where Structural Funds" aid is concentrated on "those areas and regions whose local economies are clearly in need of revival" (EC, 1999:5).

In pursuit of these commitments, the European Union proceeded to a substantial upgrading of regional policy, reforming the structural funds that finance it. The first intervention in 1988, was ensured by the Single European Act, while the second in 1993, was provided by the Treaty of Maastricht. At the summit meeting in March 1999, the financing of regional policy was decided up to 2005. The structural funds today amount to up to 35 per cent of the budget of the Community. Of these resources, 70 per cent consists of finance investments in less developed peripheral regions (Objective 1) (Armstrong, 1996:194-5; EC, 1999:11). It is worth noting that 55-60 per cent of these resources is absorbed by investments in infrastructure, transport included (Hall and Van Der Wee, 1992:400). Transport infrastructure was given a major role in the Treaty of Maastricht and the White Paper on Competition, Growth and Employment, where for the first time growth and employment objectives were seen as a central issue. According to Bradley *et al.* (1995:239), "the emphasis of Community Support Framework (CSF) on financing investment in the Objective 1 economies is likely to pay dividends in the medium to long-term".

Transport network development in Europe was shaped, apart from the major topological features like mountain ranges or sea crossings, by national boundaries and political differences. European transport was developed and implemented in a segmented way, reflecting national needs and concerns where each country was seeking its own solution for each transport mode. National infrastructure policies have in most cases been short-term demand-oriented, mainly focused on the further extension of the national infrastructure networks in order to improve internal accessibility (Nijkamp *et al.*, 1994:25). Extension of infrastructure usually followed the growth of mobility, resulting in a "mobility gap". Thus, the main trend of post-war European transport policy was the development and improvement of existing transport infrastructure, without anticipating a new, more homogeneous and balanced regional structure of transport networks (Izquierdo, 1992). A cumulative process was introduced that resulted in a greater concentration of traffic on the improved networks, which in turn required further extensions, thus contributing to larger regional accessibility imbalances and reinforcing the centre-periphery pattern.

During the last few decades, the economic and political scene in Europe has changed dramatically, as economic and political borders were reduced and finally removed. Within this period, it has been widely recognised that in order to remain competitive, the European Union needed a new transport strategy to ensure the creation of efficient international rail, road, combined transport, waterborne and aviation links between the fragmented national transport systems (Blonk, 1998). For a "Europe without internal borders", conventional transport infrastructure policies based on piecemeal and ad hoc linking of national networks proved to be outdated and the need for multinationally planned and implemented interconnected infrastructure networks became more and more apparent (Nijkamp *et al.*, 1994:27).

The need for a Community gradually moving to a closer and wider Union to diminish differences in transport infrastructure was, as already said, recognised in the Maastricht Treaty. Recognising networks as "the arteries of the single market and the lifeblood of competitiveness", the EU set as a priority task the establishment of networks of the highest quality throughout the whole Union and beyond its frontiers. The objective was to develop Trans-European Networks (TEN) that would enable the Union's citizens, economic operators and regional and local communities to derive full benefit from the setting up of an area without internal frontiers and to link island, landlocked and peripheral regions to the central regions of the Community. The legal guidelines for the TEN seek to develop an integrated network that would promote the use of environmentally less harmful, less congested transport modes, such as rail, inland waterways and short sea shipping. In order to facilitate the interchange between different modes, the role of main transport nodes and transfer points, such as ports and inland terminals, is to be reinforced. Within this intermodal approach, connecting ports to the inland networks, and more generally, linking the trans-European networks with secondary networks at regional and local level, are the “logical and important steps” to be expected (Blonk, 1998:23).

In December 1992 the Edinburgh Council Meeting called for the establishment of a new and temporary lending facility to accelerate the financing of infrastructure. Loans of a total value of 1.6 billion ECU for 21 projects were approved, over 90 per cent going to projects which were part of TENs. The network project was given a new dimension in December 1993 with the White Paper on Competitiveness, Growth and Employment, when the financial requirements for the TENs were identified as more than 400 billion ECU for over 15 years. Investment of 82 billion ECU for 26 priority infrastructure projects was approved. In June 1994 the Corfu European Council Meeting, based on the interim report produced by a group led by Commissioner Henning Christopherson approved a total list of 34 projects, of which a group of 11 projects were selected to be given high priority, meaning that construction work was to start within two years. This list was refined in December 1994 by the Essen Council Meeting with the addition of three new projects to reflect the enlargement towards the north of the EU (Table 1). Following these decisions an enormous wave of changes started to occur in the transport networks of Europe. New major links and networks are being constructed, changing the transport map of Europe in a way that has not been seen since the mid nineteenth century with the development of the railways (Vickerman, 1994).

Table 1. **Priority TEN projects**

1	High speed train / combined transport north-south	I / A / D
2	High speed train north (PBKAL)	B / UK / NL / D
3	High speed train south	E / F
4	High speed train east	F / D / L
5	Rail / combined transport, Betuwe Line	NL / D
6	High speed train / combined transport, Lyon - Turin	F / I
7	Greek motorways	GR
8	Motorway Lisbon-Valladolid	E / P
9	Rail, Cork – Dublin – Belfast – Larne	IRL / UK
10	Malpensa Airport, Milan	I
11	Oresund fixed link, Denmark – Sweden	DK / S
12	Nordic triangle (rail road)	(N) / S / SF
13	West Coast Main Line (rail)	UK
14	Benelux – Ireland road corridor	B / UK / IRL

The restructuring of transport networks in Europe, as far as the provisions of physical infrastructure is concerned, involves two main objectives: a) the overcoming of major physical and political barriers and bottlenecks that have obstructed the efficiency of existing transport networks and b) the creation of new transport networks to face capacity problems in congested core regions, improve accessibility to peripheral regions and promote greater integration (Vickerman, 1996a:17). Both objectives have important impact at the local, national and trans-national levels.

For the elimination of bottlenecks and barriers, relevant infrastructure projects can be classified in different categories, according to the type of barrier they are designed to overcome and their location (Vickerman, 1994:128) : 1) physical barriers, that have been maintained for reasons of technology or cost, 2) political barriers, due to the political fragmentation of Europe that has obstructed planning of transnational infrastructure, 3) bottlenecks due to increasing volume of international traffic, especially through major metropolitan areas like London and Paris. Although these projects may involve the completion of a small number of short "missing" links, and thus be regarded as "filling gaps in networks" (Nijkamp *et al.*, 1994), they are planned to affect not only the regions immediately connected, but also other regions in a broader context. Within Europe, there are many such examples, among which the most important are the Channel Tunnel, the Scandinavian links and the Alpine transits. These "strategic megaprojects" (Nijkamp, 1994:7) were planned to contribute to the achievement of greater integration for areas in the UK, Scandinavia, Austria and northern Italy, which constitute part of the economic core of developed Europe. Furthermore, there are projects that seek either to expand this economic core or to provide better links with more peripheral and less developed regions, like links in and between Spain and Portugal, Messina to Sicily, and improvements to transit routes through the Balkans to Greece and Turkey (Vickerman, 1994:127).

The development of whole new and faster transport networks is of the greatest long term significance in Europe. As Nijkamp (1994, 1995) remarked, not only "missing links", which are generally to be found in the centre of the EU, but also "missing networks" are observed, in most peripheral areas, where new networks are required to assist development incentives. The opening of the European market has led, in recent years, to an emphasis on international infrastructure networks. To create a competitive market, all the major urban regions need to be connected to high-speed rail and highway networks(principally those of motorway standard), combined transport and inland waterways, and so on (Bruinsma and Rietveld, 1998:499). Furthermore, conventional rail networks, and especially the relationship between high-speed rail and conventional rail and the links with central and eastern Europe are considered, as well as airport and seaport infrastructure, especially in lagging regions (Vickerman, 1996b).

4.2. The impact of trans-European networks in peripheral regions

We see from the plans made by the European Commission that Europe will be covered by a dense pattern of infrastructure networks, evolving into a network society with a host of nodal centres and regions linked by infrastructure connections of different quality (Hall, 1993). Changing conditions of movement and communication are affecting the concepts of space and time, producing what Janelle (1969) called "time-space convergence" and Harvey (1989) "time-space compression", since new transport infrastructure reduces travel times and thus improves accessibility. Thus Europe becomes a "shrinking space" (Spieckermann and Wagener, 1994) in which the relative locations of places are constantly being modified, since new spatial concentrations of accessibility are created.

It is generally accepted that this large restructuring and development of transport infrastructure will have an important overall impact on the future pattern of regional development in Europe, since it is expected to change accessibility at both the aggregate and disaggregate local levels (Vickerman, 1996b). The major questions that arise here concern the extent to which there are spillovers between regions, mainly towards peripheral regions. Do the differences in regional accessibility increase or decrease as a consequence of the improvements in European transport networks ? In order to estimate the effects that such an investment policy would have on accessibility on the European level, over the past few years a number of studies have been produced in which accessibility was defined and/or operationalised in different ways.

In an early study on the further extension of EU international road, rail and air transport networks (Lutter *et al.*, 1992), it appears that the degree of peripherality of outlying regions is reduced, since the estimated reduction in average travel time to 194 major economic centres in the Community, the EFTA countries and central Europe is greater for peripheral than for central regions. However, when access to nearby markets is measured, implying a three-hour limit on one-way travel time, then the largest gains are likely to accrue to the densely populated, central areas and their surroundings, mainly due to the high-speed rail network.

Bruinsma and Rietveld (1993,1994) measuring accessibility of 42 European agglomerations in a future scenario of an improved road network concluded that differences were relatively small, compared to other transport modes. They estimated that accessibility inequity would decrease further, favouring peripherally located areas, if all roads were to be raised to highway quality. They also indicated that, accessibility inequalities in the road network are least pronounced when effects of physical or non-physical borders were ignored.

Vickerman (1995b) analysing the impact of the development of the trans-European high-speed rail network concluded that this is clearly of benefit to more central EU regions. Vickerman *et al.* (1995) came to the same conclusion, that the impact of the high-speed rail network will be towards widening rather than narrowing the differences in accessibility between central and peripheral regions. Even though they admit that their analysis is only of one mode, which has most advantageous accessibility effects on the densely populated central areas, they believe that "further work would show that all TENs would have similar effects".

In a recent study, Bruinsma and Rietveld (1998) give a brief overview of seven studies with different approaches to definitions and measurements of accessibility within European cities. For some studies the only information required is concerned with spatial data such as the location of nodes, the length of links and data on transport costs, whereas for others additional information about the mass of nodes is also included. Several variations to those definitions are introduced related to measurement of the mass of a node (population size, employment, GDP, volumes of sales in cities etc), transport costs (distance and travel time and dependent costs including fares, vehicle use or value of time, waiting times, inconvenience or uncertainty costs), unimodal or multimodal approach with transshipment points, trip purpose, point in time, spatial interaction function. Differences among approaches, that yield different results, relate also to factors like the demarcation of the research area and the choice of the group of cities, delimitation and population size measurement and transport modes considered. Studying the results from the construction of the high-speed train (HST) network only, Bruinsma and Rietveld concluded that in northwestern Europe this will improve the accessibility of the cities which are already most easily accessible by the existing rail network, since the proposed HST network often connects cities which already have a high level of accessibility by rail. Thus, the dispersion of accessibility over Europe will be affected, indicating a tendency towards a decrease in equity. Based on the results of a multimodal approach, Bruinsma and Rietveld proposed an accessibility map of Europe, where the most easily accessible area -a summation of the ten most accessible cities of four proposed rankings - is an almost circular area containing London, the Benelux cities, the Ruhr area and Paris, another large spur contains Munich, Switzerland, Milan, Marseilles and Spain, and two small spurs contain areas towards the Midlands in the UK, and areas in the direction of Berlin, Hamburg and Copenhagen.

From the above discussion we can reach the conclusion that , the overall impact of current new large infrastructure development in Europe on the future pattern of regional disparities in accessibility at the international, national and local levels, will be substantial. However, despite the massive evolution and expansion of European transport infrastructure, and the removal of physical and political barriers, it seems that the contraction of space will not be uniform, since it benefits some places more than others, according to their location on transport networks. It is generally accepted that a new accessibility space will take shape in Europe, one that is more and more discontinuous, polarised and hierarchised (Plassard, 1992), in which the chief beneficiaries would seem to be the great cities, because they are rapidly and efficiently connected to each other. This does not mean that peripheral regions will not benefit from relative gains in accessibility. It only means that, compared with the more populous central regions, in the less densely populated peripheral areas, the increase in easily accessible population from transport investment will tend to be relatively small, and accessibility to be lower. However, the productivity of investment (return) in transport infrastructure, is lower in central, congested regions than in peripheral, lagging ones (Hansen, 1965).

Considering the hypothesis mentioned earlier, that EU transport network policy (TEN) is probably going to hurt the development of peripheral areas, we could say that this is not supported by existing, however poor, empirical evidence (Martin and Rogers, 1994b; Bradley *et al.*, 1995). One may argue, that this could be an encouraging sign for the eventual positive impact of trans-European networks on the development of peripheral regions. In any case, difficulties in competitiveness that might arise due to the development of TENs, could be overcome by other adequate regional policy measures, financed by the CSF, mainly by measures for education and training aimed at providing the industries with appropriate skilled labour force and technological support (Begg and Mayes, 1993, Bradley *et al.,* 1995:117).

Another question that arises when accessibility is studied at the European level is how to demarcate “Europe” (Bruinsma and Rietveld, 1998). The choice of EU members only, apart from the need for special treatment for the EU because of its importance in economic and policy terms, has the advantage of more or less available standardized data. Nevertheless, the dynamic evolution of mobility patterns with and within non-EU countries could not be neglected, even though interest is focused on accessibility at the EU level.

As Lundqvist (1993) rightly observed, looking ahead to a EU opening up towards central, East and South-East Europe, some of the “core” regions and major urban centres like London, Paris, Frankfurt or Brussels may lose some of their dominance in view of strategic location in the evolving new transportation networks. These “global cities” may be complemented by growing regional centres with increasingly important roles as nodal interchange points, serving broad subdivisions of Europe. Reaching a similar conclusion, Nijkamp (1995) observes that in Europe regions of different countries are becoming part of a transnational economic network in which established economic centres are losing part of their innovative potential in favour of regions with medium-sized cities. Furthermore, the geopolitical changes in Europe do not concern only the position of European centres, but also border areas, which may improve their competitive positions, being transformed from “dead ends” to new gateways (Nijkamp, 1995:35). This seems to be the case for Greece, where for any accessibility improvement evaluation plan, it seems more important to include its neighbouring countries than countries of northern Europe.

5. TRANS-EUROPEAN TRANSPORT NETWORKS AND PERIPHERALITY IN GREECE

5.1. The geographical, socioeconomic and transport context

Before we describe the problem of peripherality in Greece and the role of the country as a transport hub in the emerging South-east regional market, a brief introduction to the "Greek setting" is in order. With a total surface area of 131 990 Km^2, where 19 per cent consists of islands and where 42.3 per cent of the total mainland and insular areas is covered by mountains, Greece has a geomorphology very different from the other European countries. Population was 10 259 900 in 1991, of which 15 per cent live on the 112 inhabited islands, where average population density is 60 inhabitants per km^2 (79.7 for the country). The country is administratively divided into thirteen regions or *peripheries* (NUTS 2), which are composed of 51 counties or *nomi* (NUTS 3) (Table 2).

Following the European Union's classification of regions (EC, 1994), Greece could be characterised as an extreme case of a peripheral region in geographical and accessibility terms, since all relevant characteristics can be identified. The country is geographically remote in reference to central Europe, situated at the south-east end of the European continent. Moreover, it is geographically isolated from the heart of the EU, consisting as a whole of an "island" physically separated from other member-countries by water and politically by unstable regions of low income (Mitropoulos, 1997:129). As an extreme peripheral insular region, it is not able to use inter-regional land infrastructure for intra-regional needs and requires more port and airport facilities. With the exception of the larger (touristically) developed islands, most insular areas of Greece are considered as "peripheral regions within a peripheral country" (Giannopoulos and Boulougaris, 1995). As a border area, and moreover an external border, Greece has to co-operate with neighbouring countries that have different social, economic, legal and political systems, limiting the economic and administrative linkages which are normally established between adjacent politically integrated areas. Finally, as a coastal area, it is considered as a border area separated from its neighbours by the sea.

Moreover, the remote sparsely populated regions of the country are likely to need greater provision in terms of road or rail track length per head of population than less remote regions. Remote areas face severe transport problems, since the economic returns on major investment in transport infrastructure are often insufficient to justify the expenditure required, whether private or public. Nevertheless, a minimum degree of access is required in order to sustain economic activity in such peripheral areas. Peripheral Greek regions are usually characterised by low per capita income levels that may reflect their remoteness from centres of wealth, but also their dependence on the national major metropolitan area. Development problems for such regions are primarily due rather to inter-regional interdependence at the national scale, than to their remoteness from core European markets like Brussels or Paris.

In Greece the regional problem can be identified in four major issues : a) changes in the labour market, due to technological evolution, informatics progress and their practical implementation in production and administration, b) recent trends in international trade and economic integration in Europe, with increasing competitiveness leading to major restructuring in the location of production activities, c) environmental problems, requiring a sustainable development model to deal with ecological constraints to regional strategy, d) mobility of population, that affects the restructuring of urban concentrations. Since the early seventies, regional policies in Greece have aimed, in the context of a balanced regional development strategy, at the reduction of regional disparities in living conditions, where transport was not always included as part of an integrated Europe-oriented policy.

Nowadays, the complexity of the problems calls for complex regional programmes within a Europe-oriented regional strategy for the amelioration of quality of life, that is better conditions for employment, economic equality, environmental balance, infrastructure.

Table 2. **Greek administrative regions: geodemographic and economic data**

Regions (peripheries)	Surface		Population				GDP	Unemploy-ment
	% total country	Mountain % region	% total country 1998	Pop. Density	Urban % total region	Rural % total region	% country	(country =10,3%)
Attiki	2.9	5.8	32.8	906.2	94	1	37.4	12.1
Ionian Islands	1.8	23.7	1.9	87.4	26	63	1.7	6.4
Islands of Northern Aegean	2.9	34.2	1.7	47.9	28	55	1.3	7.5
Islands of Southern Aegean	4.0	28.3	2.6	51.1	35	40	2.8	4.9
Eastern Macedonia & Thrace	10.7	39.6	5.3	39.7	40	43	4.8	9.4
Central Macedonia	14.5	22.0	17.1	93.6	57	26	17.0	10.2
Western Macedonia	7.2	51.9	2.9	32.0	29	56	2.6	14.5
Thessaly	10.6	45.6	7.1	52.9	44	40	6.6	8.5
Ipeiros	6.7	74.2	3.5	40.5	31	59	2.3	11.2
Western Mainland	8.6	45.1	7.0	64.9	45	44	5.9	8.4
Central Mainland	11.8	47.3	6.3	42.6	25	45	6.1	12.8
Peloponnese	11.7	50.0	6.4	43.2	24	57	5.5	8.2
Crete	6.3	49.4	5.3	67.5	42	46	5.7	4.6

Source: National Statistical Service of Greece (1997, 1998).

5.2. The evolution of regional disparities and the role of transport policy in post-war Greece

The process of post-war economic development in Greece has been heavily influenced by historical and political factors and marked by the deficiencies and problems of peripherality, where all the elements of the interaction of transport and development can be identified (Giannopoulos and Boulougaris, 1995). The existence of the "centre-periphery" paradigm is identified in modern Greek regional development patterns, due also, to the historical configuration of the national transport network, where the capital city of Athens was the unique "centre" of all transport modes and the rest of the country constituted the periphery (Argyris, 1981:24).

By the end of the second World War, the transportation network in Greece was practically destroyed. During the decades of the 50s and 60s, a major effort was made to connect villages and other areas, mainly by road connections, and at the same time to create the main axes of an appropriate transport network (Abakoumkin *et al.*, 1996:197). Priority was given to the provision of transport links to areas where no links existed, as a prerequisite for development. Unfortunately, the results were not the appropriate ones, owing mostly to the lack of resources and proper planning, and the large number and urgent need for transport connections. Low quality road networks were mainly developed to the detriment of railways. Transport links, especially in frontier regions like Macedonia, Thrace and Ipeiros, were designed to serve mainly defence goals rather than development ones. The development of urban transport infrastructure was delayed, while at the same time urban centres, especially the metropolitan centres of Athens and Thessaloniki, grew at an alarming rate.

The enormous concentration of population and economic activities in the two major urban centres that had started by the end of the 40s, lasted till the mid-1970s. During this period development strategy was determined by the goal of national economic growth, mostly neglecting regional development objectives (Argyris, 1998). Two main regions were identified : metropolitan Athens and the rest of the country, with the former attracting 29 per cent of the total population and 41 per cent of GDP in 1971 (compared with 19 per cent and 32,7 per cent respectively for the year 1961, and only 18 per cent of the total population in 1951).

This large immigration movement resulted in major changes in socioeconomic and demographic patterns which have had a dramatic impact upon local regional societies (Abakoumkin *et al.*, 1996:200). The continuing urban growth produced diseconomies like increasing living costs, unemployment patterns, housing problems and declining environmental quality. By the end of the 1970s these urban problems started to create a reversed migration trend from the two metropolitan areas towards medium and lower size cities. Another trend that appeared simultaneously was an increasing urban sprawl as a result of the decline in the quality of life in the urban environment and an expansion of urban amenities like telephone and television to rural areas. Structural, economic and social changes resulted in changes in lifestyle and mobility patterns, such as time available for travel and leisure, increase in car ownership and use, which caused intense transportation congestion and air pollution in urban areas. These environmental threats created an increasing awareness that has urged policy decision makers to focus on policy issues of industry relocation and household movement outside the polluted and congested urban centres.

During the period of the seventies balanced regional development incentives started to be considered, aiming mainly at attracting firms to the periphery, using two policy instruments : the provision of infrastructure, transport included (Table 3), and investment incentives to create a better environment for firms and reduce the cost of capital. Louri (1989) using a generalised neoclassical investment function to evaluate the relative effects of regional policy measures on investment in Greek manufacturing industry, concluded that both instruments of policy had a significant effect on investment behaviour. However, urbanisation economies, due partly to infrastructure expenditures, influenced capital goods-producing sectors more significantly. This policy reinforced urbanisation towards medium-sized cities, resulting in the decrease of rural population to 30.5 per cent in 1981, whereas concentration of population in the capital city of Athens increased slightly to 31 per cent in 1981, attracting 35.4 per cent of the GDP. Income differences between the Athens region and the rest of the regions diminished considerably, and the trend of convergence that had started at the beginning of the decade, continued all through the seventies (Argyris, 1997) (Table 4).

Table 3. **Greek administrative regions: Investment in transport 1976-86 (millions drs)**

	Eastern Macedonia	Thrace	Central & Western Macedonia	Thessaly	Ipeiros	Eastern Mainland & Islands	Pelopon-nese	Islands of Eastern Aegean	Crete
1976	1103405	1291724	3315228	1089995	1298232	9921305	4281482	871332	1070192
1977	1304609	1521674	4012495	1145119	1219741	14601942	3995489	806392	1165844
1978	2023020	1507471	5121609	1433917	1463284	13704841	3380911	925961	1119746
1979	1917411	2500429	6514434	1820595	1672394	16286788	4643977	1243338	1778787
1980	2210602	1910271	7167682	2226778	2151520	13858962	5250023	1326516	1746253
1981	2486963	3054380	8801481	3249417	3595773	14887353	7440488	1865457	3556660
1982	2492759	3872589	11504735	4074321	3707219	16364986	9978452	2851527	4646307
1983	3911308	6530876	17911208	6191468	6174945	31942206	15011858	4354571	7656082
1984	5692141	8274919	22435319	8652526	8830365	49843784	20279727	6575852	9940553
1985	6559597	9114528	28173568	11737007	11645005	58556768	25976819	9159714	14203531
1986	7290773	7818666	30725124	11665042	12767454	72771182	28541883	8776665	15656565

Table 3a. **Greek administrative regions: Investment in transport 1987-95 (millions drs)**

	Eastern Macedoni & Thrace	Central Macedonia	Western Macedonia	Thessaly	Ipeiros	Ionian Islands	Western Mainland	Central Mainland	Attiki	Pelopon-nese-	Northern Aegean Islands	South Aegean Islands	Crete
1987	10538256	20618062	4602516	10651674	10790772	3967739	9649512	18187404	48891366	14577236	4416269	5658327	14574314
1988	12653539	26725529	5869758	13504120	12117045	4732175	12077528	18974184	51851155	19133210	5106349	8611210	17826821
1989	15069770	29072958	8084639	16375981	14124064	5313416	16268524	17422523	66810556	25353035	6608952	8770608	20609293
1990	16653647	30374545	6709973	17543576	14932477	5185018	15810102	20135644	71120940	25971362	7729762	8553450	23010068
1991	36794650	43947391	11473526	24853816	21871339	9063570	16412167	38206444	111904812	22026327	13253308	12357496	26211472
1992	45189461	66534187	17895845	33569146	29812846	15805639	25743586	47439525	72068744	26960357	17529328	13882566	38292238
1993	38246315	74771861	19435452	29217480	34653699	19106218	42984712	54176787	91890363	29250466	23841142	19862025	40593053
1994	41591912	69360005	16651321	33377431	26090928	23376078	54273194	37549250	129144898	28175485	21381379	17127671	37483296
1995	45464182	116680878	24241816	45441646	40280342	17862510	66022876	52591944	128052583	33724521	22798358	21461802	50083516

Source: National Statistical Service of Greece.

Table 4. **Greece: Differences in regional income**

	(Country = 100)	(Eastern Mainland & Islands = 100)	(Country = 100)	(Eastern Mainland & Islands = 100)	(Country = 100)	(Eastern Mainland & Islands = 100)
	1970		**1979**		**1985**	
Eastern Mainland & Islands	131	100	119	100	108.6	100
Islands of Eastern Aegean	76	58	78	64	79.3	75
Thrace	61	47	68	57	75.8	70
Eastern Macedonia	73	56	86	73	98.2	93
Central & Western Macedonia	95	73	97	81	98.2	92
Thessaly	77	59	86	73	96.5	88
Ipeiros	66	50	73	61	82.7	77
Western Mainland & Peloponnese	83	63	88	74	101.7	96
Crete	78	60	81	68	93.1	89

Table 4 (continued). **Greece: Regional Income Differences**

	1988		**1991**		**1994**		**1996**	
Attiki	106.8	100.0	108.7	100.0	111	100.0	113.2	100.0
Ionian Islands	91.6	85.8	90.8	83.5	83	75.0	91.1	80.5
Islands of Northern Aegean	72.8	68.2	73.1	67.3	71	64.0	76.4	67.5
Islands of Southern Aegean	101.4	95.0	108.5	99.8	100	90.0	110.2	97.4
Eastern Macedonia & Thrace	102.3	95.8	90.0	82.7	85	76.5	89.7	79.2
Central Macedonia	96.3	90.2	97.2	89.4	97	87.3	98.5	87.0
Western Macedonia	85.2	79.8	104.3	96.0	105	94.5	91.1	80.5
Thessaly	94.1	88.2	90.8	83.5	86	77.4	92.6	81.8
Ipeiros	74.5	71.6	75.2	69.2	66	59.4	64.7	57.1
Western Mainland	91.2	85.8	84.8	78.0	83	75.0	85.2	75.3
Central mainland	122.8	115.0	120.5	110.8	109	98.0	95.5	84.4
Peloponnese	102.9	96.4	98.3	90.4	91	82.0	86.7	76.6
Crete	88.5	83.0	94.5	86.9	98	88.0	102.9	93.5
	(Country = 100)	(Attiki =100)	(Country = 100)	Attiki =100)	(Country = 100)	Attiki =100)	(Country = 100)	(Attiki =100)

Sources: a) Glytsos, N.P. (1988), *Regional Disparities in Greece*, KEPE, Athens.
b) Theodori-Markoyannaki, E., P. Kavadia, D. Katohianou (1986), *Basic Regional Data*, KEPE, Athens.
c) Commission of the European Community, *Third Periodic Report* (1987), *Fourth Periodic Report* (1991), *Fifth Periodic Report* (1994).
d) OECD (1997), Territorial Development Service, Working Paper No. 6.
e) Eurostat (1999).

During the eighties and the nineties the dominant model of endogenous regional development aimed at the decentralisation of decision making procedures, the spatial expansion of innovation and the adequate provision of regions with advanced communications systems. During this period, a number of significant structural changes occurred in Greece : a) In January 1981 Greece entered the European Economic Community (EEC) as a full member. The development of lagging regions which has always been a major challenge, was further reinforced. b) The government elected in October 1981 introduced, within the EEC regional policy, public policies to achieve regional development and reduction of regional disparities. c) The internal and external migration flows, particularly of young and skilled labour, decreased drastically, in comparison to the 1960s and 1970s. d) The European Commission decided to financially support the building and improvement of infrastructure in order to speed up the integration process of the less developed EU regions, like Greece (Table 3, 3a). The allocation of these structural funds started in 1985 with the Mediterranean Integrated Programmes and are planned to last until 2006, in accordance with the Maastricht Treaty and the Agenda 2000.

The regional development policy implemented during this period has contributed further to the narrowing of regional differences (Argyris, 1997, 1998) (Table 4). Papanikos (1998) studying regional convergence of 51 NUTS3 Greek regions (*nomi*) during 1981-1991, concluded that: a) there was a tendency for β-convergence (2 per cent) in terms of both per capita output and productivity of labour and b) there were large differences among the 51 regions of Greece in terms of the type of development (convergence) achieved. Most regions did not achieve “sustaining” convergence, since increases in productivity were achieved by employment cuts, which do not lead to long term growth. However, as indicated by the author, definite conclusions on the determinants of regional economic convergence could not be drawn, since the period of study was very short to permit any generalisation.

The evolution of regional allocation of economic activities and population has determined the evolution of regional disparities in post-war Greece as follows: During the 60s regional income differences remained stable, while in the decade of the 70s and 80s they diminished considerably. In the early 90s a slight increase is observed, which however is lower than in the previous decades. The income difference between the poorest and the richest region in Greece was 1:2,1 in 1970, 1:1,8 in 1980, 1:1,49 in 1991, 1:1,68 in 1994 and 1:1,75 in 1996. Compared with EU standards, Greece seems to be among the countries with the lowest regional disparities in Europe (Dunford, 1993; Argyris, 1997, Eurostat, 1999). Nevertheless, important differences can still be identified at the inter-regional and moreover, intra-regional level, especially in mountainous (Ipeiros), insular (northern Aegean Islands) and frontier (Thrace) regions.

Regarding the national development of the country, the following has been observed : until 1979 the per capita GDP in Greece was increasing with an average growth rate higher than that of the EU. From 1979 till 1995 the per capita GDP increased, but with an average growth rate, lower than that of the EU (Argyris 1997, 1998). Starting in 1996, however, the per capita GDP has been increasing at a higher rate than that of the EU (Table 5). According to recent OECD estimates for the period 2001-2005, the growth rate of the Greek economy will be higher than the EU(15) average. Under the assumption that the growth rate of population in Greece and EU will be the same for this period, Greek GDP per capita is expected to continue converging towards the EU (15) average.

Table 5. **Per capita GDP (% average evolution)**

Per capita GDP	**1960-73**	**1973-79**	**1979-85**	**1986-93**	**1994**	**1995**	**1996-00**
Greece	7.1	2.6	0.5	0.9	2.0	2.1	3.3
EU	4.0	2.0	0.9	1.9	3.0	2.4	1.5

Sources: a) Commission of European Community, "*Periodic Reports*" 1987, 1991,1994;
b) Estimates of CEC (1998) for EU and Hellenic Ministry of National Economy (1999) for Greece.

Empirical analyses (Capros and Karadeloglou, 1989; Lolos and Zonzilos, 1992; Bourguignon *et al.*, 1992) about the demand-side effect of the Community's Support Framework I (CSF) 1989-1993 on GDP show that, if CSF financing had not been realised, the divergence of per capita GDP in Greece in relation to the per capita GDP of EU, would have been larger for the above mentioned period. The Greek Community Support Framework I aimed mainly to offset the effects of peripherality by improving communications and the movement of goods and services, and narrowing the disparity between the Attica region and the rest of the country. If we consider that a large part of CSF I investment concerns infrastructure, and mainly transport, one could argue that investment in transport within the CSF I had a positive effect on the way that the rate of divergence was slowed down. The CSFs II and III focused on expenditure on roads and railways, on the possibility of extra-finance for transport projects of trans-frontier interest and on the improvement of communication links with the Greek islands. Thus, one could reach the conclusion that CSF II had a furthermore positive effect, since convergence between the Greek GDP per capita and EU average started to appear by the mid-90s.

5.3. Greece in the new emerging regional market : the role of trans-European networks

Reviewing post-war regional development and transport policies in Greece, up to the early nineties, a general conclusion is that they have been bounded by the national context of internal balances, without considering the country's geopolitical relations with the broader surrounding region. In the official reports of the Five-year Economic and Regional Development Plans, dating from 1976 to 1992, only brief references are made to the country's international orientation objectives, which are general and rather vague, without any thorough examination and further specialisation (Kostopoulou, 1996a:160). This is mainly due to the fact that "cold war" policies prevented any commercial or cultural relationship with the neighbouring East European countries (Giannopoulos and Boulougaris, 1995). As a result political and economic external relations were oriented towards western European partnerships, and the peripheral position of the country was further aggravated, since it was situated at the very edge of the geographical and economic "space" of Europe.

During the last decade in Greece, as in Europe, regional development strategy and transport policy have been reoriented under the impact of major international structural alterations and geopolitical realignments that opened up new perspectives, opportunities and constraints in transregional, trans-national and trans-European co-operation. The end of the "cold war", the collapse of the former Soviet Union, the liberalisation of east-European economies, the restructuring of the Balkans and peace initiatives in the Middle-East, all contribute to redefining the role and relationships of Europe with its external periphery, widening regional planning horizons to include the prospect of a potentially strong economic regionalism in the broader surrounding region (Kostopoulou, 1996a:151). For the decades around the millennium, the horizon for the EU is to open up towards central and eastern European countries, moving also towards South-Mediterranean countries.

Within this long-term vision, Greece seems to have a unique characteristic advantage, compared to other European peripheral areas: the opportunity to improve its peripheral position so as to become a *"peripheral core"* of the enlarging EU in terms of geostrategic importance and transport services. Located in the most favoured position at the crossroads of three continents, the country is strategically placed as a springboard for business developments not only in the Balkans but, as well, in the Black Sea basin and the south Mediterranean. Greece, the only full member-state of the European Union in the Balkans and, as such, a factor of stability in the region, faces the challenge of restoring its historical, economic and political relations with its "natural" hinterland towards the north and the south and upgrading its role in this rising new regional market (Petrakos, 1997).

As a result, at the beginning of the nineties, a major change emerged in regional planning policy, leaving behind the nation-wide, Athens-centred regional development model that dominated Greece for nearly forty years after the second World War. A more complex strategy is being introduced, where medium and long-term development scenarios are influenced by a broader geographical perspective and national vision. The need for the dynamic support of regional development and the exploitation of regional potential has been emphasized, mainly focusing on the country's border areas, which at the same time constitute the EU's external borders. Within this strategy, the improvement of transport infrastructure would have dramatic effects on formerly less accessible, isolated, remote regions, opening up their hinterlands and increasing possibilities for trade with geographically proximate markets (Vasenhoven, 1993). This could be for example the case for Thrace, the Aegean Islands and Crete, which could form a development zone linking Europe and the Balkans with South-Mediterranean and Middle-East countries (Kostopoulou, 1996a:162).

To promote economic equality among the 15 Member States, the European Commission has devised a massive structural adjustment programme which included the 2nd Community Support Framework 1994-99 and a special Cohesion Fund for transport and environmental projects. At the turn of the century an enormous, unprecedented long-term investment programme for the development of transport infrastructure is under way in Greece (Tables 6, 6a), where long-term investment decisions in resource allocation and infrastructure are designated to serve not only internal links of the regions with the rest of the country, but also external links with the neighbouring countries.

Table 6. **Transport projects 2000–2006**

	Estimated cost of intervention (billions DRS / 1999 prices)		
	Total cost	**Public expenditure**	**Private participation**
Road infrastructure	3 294	2 164	1 130
Port infrastructure	102	102	0
Urban development	831	536	295
Other	52	52	0
Total	4 279	2 854	1 425

Table 6a. **Road infrastructure programmes**

Road Infrastructure Project	Estimated cost of intervention (billions DRS / 1999 prices)		
	Total cost	Public expenditure	Private participation
PA.TH.E. Motorway	1 816	925	891
Egnatia Motorway	804	724	80
Western axis	265	195	70
Tripolis-Kalamata-Sparti	104	37	67
Central Greece Highway	173	151	22
Other regional mainland axes	14	14	0
Crete North road axis	56	56	0
Main road axes of insular areas	62	62	0
Total road network	3 294	2 170	1 130

Source: Ministry of Planning, Environment and Public Works.

The Greek State has embarked - in co-operation with private sector partners, many of them foreign - on a vast programme of strategic transport infrastructure projects, the most important of which are the following :

a) *Egnatia Motorway*: The Egnatia Highway is the first high standard road axis to cross Greece "horizontally", traversing northern Greece from the Adriatic to the Black Sea. Starting from the Northwest port of Igoumenitsa it heads eastward passing by all major urban centres and ports of northern Greece: it is linked with 5 ports and 6 airports (Figure 4). With a total length of 680 Km, the Egnatia Highway will decrease the total travel time from its starting point Igoumenitsa (Ipeiros) to its terminal point Kipi (Thrace), from 11½ hours to 6½ hours. The Egnatia Highway constitutes a part of the Trans-European Network and is one of the fourteen priority projects of the European Union. Nine perpendicular road axes provide access to the Balkans and the other countries of eastern Europe : axis IV to Berlin through Sofia, axis X to Austria and Hungary (Figure 4a). The Alexandroupoli-Ormenio section is incorporated into axis IX of the European transport network connecting the North Sea (Helsinki) with the Mediterranean (Alexandroupoli). The Egnatia axis has also a specific importance from the EU's point of view, since it provides direct road access to four Balkan States, i.e. access to the main transit corridors, which ensures trade irrespective of political fluctuations (Gonzalez-Finat, 1993). It will also, when improved, permit direct shipping of goods from the port of Alexandroupolis to the Black Sea States at a lower cost.

b) *PA.TH.E motorway*: The expanded Patras-Athens-Thessaloniki–Eidomeni motorway, running from the largest western Greek harbour of Patras to the country's northern borders, is connected to the Rio-Antirio suspension bridge across the western mouth of the Gulf of Corinth, the new Athens International Airport at Spata, as well as the port of Thessaloniki and the Egnatia Highway. With a total length of 730 km, this vertical main road axis is a part of the Trans-European Network, providing access to nine ports and six airports, six regions and 14 large urban centres and thus constituting a transport infrastructure project of major importance for the economic and social development of Greek regions.

c) *Ports*: Ports have an important role to play in the context of National Transportation Strategy and trans-European Transportation networks, especially in relation to the geopolitical location of Greece. The strategic programme for the development of a national network of harbours, aims at the establishment of Greece as a principal gateway of the European Union and the eastern Mediterranean. Greece has 123 ports with cargo- or passenger-handling facilities the most important of which are: a) those of Igoumenitsa, Thessaloniki, Kavala and Alexandroupolis, situated along the new Egnatia Highway; b) the ports of Patras and Volos, alongside the PA.TH.E. and the "capital" port of Piraeus. These ports, affording access to previously isolated areas of Greece and the Balkans, as well as direct connections with the rest of the European Union, will contribute to the integrated operation of transportation routes along the European Networks, and thus to the upgrading of Greece as an integral part of the transportation corridors of combined and containerised shipping between Europe, northeastern Africa, the Middle East and Asia. The container terminal at Piraeus, the port for the capital, and that of Thessaloniki, which is also a major oil port, are undergoing expansion programmes to improve dry cargo capacity and rail and road links. Furthermore, improvements in insular ports like those of Corfu, Mykonos, Rodos, Mytilene, Iraklion and Souda in Crete, aiming to contribute to better service for increased tourism traffic, greater safety for cruise ships and ferryboats, are expected to benefit the islands' economic activities, tourism, local production and exports and thus regional development.

d) *Airports:* Greece has 39 international-standard airports, more than any other country in Europe; two-thirds are in the islands to service the tourism industry. An extensive programme of construction of new airports and renovation of existing ones is in progress, together with the implementation of a highly reliable, innovative and computerized air navigation system, to serve the continuously growing needs of air transport in the region. The five-year programme 1996-2001 for the Modernisation and Development of Greek Airports, at an estimated cost of 400 billion Drs., is currently in the stage of implementation. During the 1996-99 period various top priority projects and interventions have upgraded the services offered, while by the end of 2001 improvement works will be completed in the airports concerned, namely those on the islands of Kerkyra, Ikaria, Kos, Paros, Santorini, Mykonos, Rodos and Iraklio and Chania in Crete, as well as those of the two major metropolitan areas, Athens and Thessaloniki. The Athens International Airport at Spata, 25 km east of the capital, is scheduled for completion by the year 2000. This Ecu 1.9 billion hub airport will have initial capacity for 16 million passengers and 125 000 tons of cargo a year, with room for expansion to 53 million passengers a year.

e) *Railways:* The Greek Railways Organisation has embarked on a modernisation programme (1995-99) to electrify and double-track most of the line from Athens to the northern border with Bulgaria and to improve rolling stock. Subsequent plans call for the expansion of the Patras-Athens metre gauge line to regular gauge and the construction of a freight terminal and marshalling yard Northwest of Athens.

f) *Urban transport:* A 105 million passenger-a-year underground system has being constructed for Athens by Attiko Metro, a joint venture of French, German and Greek interests.

The long-term development effect of the above-mentioned strategic infrastructure mega-projects, will mainly come from the supply side. This is mostly due to the fact that the short-term demand side effect will cease, as soon as these investment programmes come to an end. The supply side effect is directly connected to the improvement of accessibility resulting from these strategic infrastructures, to the European Single Market and especially to the emerging new regional market. Accessibility improvement will diminish considerably the negative effects of the country's peripherality, creating the necessary environment to attract the location of economic activities. Existing empirical evidence, besides any criticism and reservations, seems to support to some degree the above position (Heller, 1979; Aschauer, 1989; Barro, 1990; Wheler and Mody, 1992; Munnell, 1992; Gramlich, 1994; Cain, 1997; Islam, 1998). Thus, the importance of the participation of Greece in the implementation of the EU TENs policy, beyond the construction of transport infrastructure, relies on the new spectrum of opportunities appearing to change the geographical peripherality of the country to a significant advantage, making it the natural link and communication channel between Europe and the rising new regional market of the Balkan, central and eastern European and south-Mediterranean countries. Failure by Greece to participate in the "puzzle" of the TENs 21st century transport system, would definitely harm the national economy and act as a barrier to regional development and economic integration.

The spatial configuration of these transport infrastructures has been designed so as to contribute to narrowing the dispersion between the Attica metropolitan area and the rest of the country. Northern Greek regions are expected to benefit more from the improvement in accessibility, because of their advantageous geographic position in relation to the Single European Market and especially the emerging new regional market. After the second World War and until the late 80s, northern Greece was regarded as a frontier area in both economic and military terms and as a result, incentives for development offered up to that time bore little fruit. During the last decade, however, as south-eastern Europe and the Balkans hasten towards market economies, as the needs of commerce and industry become more varied and as the country's economic centre of gravity appears to be shifting slowly northwards, northern Greece is once again becoming crucial to the broader area.

The recent destabilisation of the Balkans, has made the need for the exploitation of Thessaloniki's special geopolitical position and its linkage with the rest of Europe and the Middle East even more apparent (Kostopoulou, 1996b). Thessaloniki, the capital city of northern Greece and the second largest urban centre in the country, is a meeting point for the main axes of transport networks between North-South and East-West, at both national and international level (i.e. Egnatia, PA.TH.E.). The city's significance is closely linked with its port, which is the country's biggest port for exports, the main transit centre in the Balkans, an extremely important commercial harbour in the South-East Mediterranean, and one of the most important nodes in Europe for combined transport. Structural changes in the economies of Balkan and eastern European countries are shaping a new situation, leading to an increase in the flow of trade through the port of Thessaloniki which, owing also to the investments being made, is becoming the epicentre for the traffic of goods in the Balkans. With an economic hinterland extending over the broader Balkan region, Thessaloniki is expected to play an important role as the most attractive location for economic activities and multinational companies in the country.

5. CONCLUSIONS

The re-orientation of European regions due to the "widening" and "deepening" processes of the EU, introduced the "centre-periphery" relation among regions in Europe. This relation was further aggravated by transport infrastructure provision among European regions and the related accessibility to the Single European Market. The accessibility of central areas is significantly higher than that of peripheral areas, which may lead to their entering the Single Market on unequal competitive bases. This competitive disadvantage of peripheral regions is more or less reflected in the evolution of regional disparities, since centrally located regions appear to have a higher growth rate, due, among other things, to higher accessibility.

A thorough reading of the outcome resulting from growth theoretical approaches and empirical analyses, suggests that growth processes “when left to their own devices are extraordinary slow in bringing about the equalisation of regional disparities” and “free market convergence processes cannot be relied upon to act quickly enough” (Armstrong, 1996:202, 206)). The continuation of regional disparities is placing great strains on EU economic and social cohesion. Thus, there is an urgent need for EU regional policy to assure equal opportunities and an equal competitive basis for peripheral areas, given that “they have inherent disadvantages, like low accessibility”, that may require “transport infrastructure in excess” (Begg and Mayes, 1993:443). For such goals to be achieved the trans-European networks investment programme should focus on transport links within and between peripheral regions, “not in addition to, but at the expense of transport investment in the core of Europe” (Vickerman *et al.*, 1995).

In the past, important transport infrastructure projects in peripheral European areas have been financed by EU Structural Funds. However, TEN’s finance policy is characterised by a bias towards centrally located regions, given that High-Speed Train Networks were given priority in comparison to highways, and therefore, central areas were favoured over peripheral ones. Even though these large transport investments will cause an increase in average accessibility at the EU level, they will not unambiguously promote the cohesion between regions in Europe, since they will probably create the necessary preconditions for the widening of regional disparities.

As already mentioned, the attractiveness of a region as a business location is increasingly determined by the connections provided by transport networks to main centres of economic activity in Europe and beyond. Infrastructure and networks may not provide growth, but the reverse is also true: there is no possibility of growth nor use of advantages without these infrastructure systems (Cuadrado-Roura, 1994). The centrality or peripherality of a region’s location can be improved through investment in transport, but not fundamentally changed : other important developments are also required like, the further extension and modernisation of telecommunication networks, reforms of institutional structures leading towards European integration and industrial change. Investment policies should therefore not be restricted to the “basic regional infrastructure” only. They should also focus on horizontal measures like, continuous formation and training of regional human capital, provision of adequate support for regional entrepreneurship and innovation, technical assistance for the improvement of existing methods of organisation, production of and trading in new products and services, creation of information centres and marketing services for the exploration of new markets.

Concerning Greece, transport infrastructure investment within Community Support Frameworks I, II and III, as we may conclude from the previous analysis, have an overall positive effect on the economic development of the country. It contributed at a certain degree, to the narrowing of regional disparities and to the convergence of the economy of Greece to that of EU (15). Trans-European Networks are apparently going to reinforce the country’s accessibility towards the EU, and mainly to the countries of the Balkans and central and eastern Europe, therefore contributing to their integration within Europe.

BIBLIOGRAPHY

Abakoumkin, K., G. Giannopoulos, M. Giaoutzi and B. Stephanis (1996), "Greece" in: Nijkamp, P., S. Reichman and M. Wegener (eds.), *Eurobile: Transport, Communications and Mobility in Europe. A Cross-National Comparative Overview*, Avebury, England, pp. 197- 213.

Abramowitz, M. (1986), Catching Up, Forging Ahead, and Falling Behind, *Journal of Economic History*, Vol. 46, pp. 385-406.

Argyris, A. (1981), Griechenlands Regionale Entwicklung. Das Problem der Disparitäten und der Investitinsanreize zur ihrer Überwindung, *Sülosteuropa Mitteilungen*, No.1/2, pp. 23-38.

Argyris, A. (1997), The Socio-economic Development of the Region of Trikala, *Proceedings of the 4th Symposium on Regional Problems*, Trikala, pp. 437-471.

Argyris, A. (1998), The Strategy of Regional Development in Greece within the framework of the European Union, Paper presented at the 1st Symposium on Regional Development Problems, Department of Economics, Aristotle University of Thessaloniki, March.

Armstrong, H.W. (1995), Convergence among Regions of the European Union, 1950-90, *Papers on Regional Science*, Vol. 74, pp. 143-152.

Armstrong, H.W. (1996), European Union Regional Policy: Sleepwalking to a Crisis, *International Regional Science Review,* Vol. 19, pp. 193-209.

Armstrong, H.W. and J. Taylor (1985), *Regional Economics and Policy,* Oxford.

Aschauer, D.A. (1989), Is Public Expenditure Productive?, *Journal of Monetary Economics,* Vol. 3, pp. 177-200.

Baldwin, R.E. (1989), On the Growth Effect of 1992, *Economic Policy,* Vol. 9, pp. 3-54.

Baldwin, R.E. (1995), The Eastern Enlargement of the European Union, *European Economic Review*, Vol. 39, pp. 474-481.

Barro, R.J. (1990), Government Spending in a Simple Model of Endogenous Growth, *Journal of Political Economy,* Vol. 98, pp. S 103-S 125.

Barro, R.J. (1991), Economic Growth in a Cross-section of Countries, *Quarterly Journal of Economics,* Vol. 106, pp. 407-501.

Barro, R.J. and X. Sala-i-Martin (1991), Convergence across States and Regions, *Brookings Papers on Economics Activity*, No. 1, pp. 101-179.

Barro, R.J. and X. Sala-i-Martin (1992), Convergence, *Journal of Political Economy,* Vol. 100, pp. 223-251.

Barro, R.J. and X. Sala-i-Martin (1995), *Economic Growth*, McGraw Hill.

Baumol, W.J. (1986), Productivity Growth, Convergence and Welfare: What the Long-Run Data Show, *American Economic Review*, Vol. 75, pp. 1072-1085.

Baumol, W.J. and E.N. Wolff (1988), Productivity Growth, Convergence and Welfare: Reply, *American Economic Review*, Vol. 78, pp. 1155-1159.

Beckerman, W. (1956), Distance and the Pattern of the intra-European Trade, *Review of Economic Studies and Statistics*, Vol. 38, pp. 31-40.

Begg, I. (1989), The Regional Dimension of the "1992" Proposals, *Regional Studies*, Vol. 23, pp. 368-376.

Begg, I. and D. Mayes (1993), Cohesion in the European Community. A Key Imperative for the 1990s?, *Regional Science and Urban Economics*, Vol. 23, pp. 427-448.

Blonk, A. (1998), The Role of EU in Promoting Intermodal Freight Transport, Proceedings of the 2nd Conference on Combined Transport and Transit Flows of Southeast Europe, Thessaloniki, pp. 20-30.

Bourguignon, F., S. Lolos, A. Suwa-Eisermann and N. Zonzilos (1992), Evaluating the Community Support Framework with an Extended Computable General Equilibrium Model: The Case of Greece (1988-1995). Paper presented at the Annual Conference of the European Economics Association, Trinity College, Dublin, September.

Bradley, J., N. O'Donnel, N. Sheridan and K. Whelan (1995), *Regional Aid and Convergence - Evaluating the impact of the structural funds on the European periphery*, Averbury, England.

Bruinsma, F. and P. Rietveld (1993), Urban Agglomeration in European Infrastructure Networks, *Urban Studies*, Vol. 30, pp. 919-934.

Bruinsma, F. and P. Rietveld (1994), Borders and barriers in the European road network: A case study on the accessibility of urban agglomerations, in: P. Nijkamp (ed.), *New Borders and Old Barriers in Spatial Development*, Avebury, England, pp. 139-151.

Bruinsma, F. and P. Rietveld (1998), The accessibility of European cities: Theoretical Framework and Comparison Approaches, *Environment and Planning*, Vol. 30, pp. 494-521.

Cain, L.P. (1997), Historical Perspective on Infrastructure and US Economic Development, *Regional Science and Urban Economics*, Vol. 27, pp. 117-138.

Cambering, R.P. (1992), Development Scenarios and Policy Guidelines for the Lagging Regions in the 1990s, *Regional Studies*, Vol. 26, pp. 361-374.

Cappellin, R. (1995), Regional Development, Federalism and Interregional Co-operation, in: Eskelinen, H. and F. Snickars (eds.), *Competitive European Peripheries*, Advances in Spatial Science Series, Springer-Verlag, Berlin-Heidelberg, pp. 41-57.

Capros, P. and P. Karadeloglou (1989), Macroeconomic Impacts of Structural Funds on the Greek Economy, Report to the Economic and Industrial Research Institute, Athens, December.

Cheshire, P.C. (1990), Explaining the Recent Performance of the European Community's Major Urban Regions, *Urban Studies*, Vol. 27, pp. 311-333.

Chisholm, M.J.D. and P. O'Sullivan (1973), *Freight Flows and Spatial Aspects of the British Economy*, Cambridge University Press.

Commission of the European Community (1985), Completing the Internal Market, White Paper from the Commission to European Council, COM (85) 310.

Commission of the European Community (1986), Single European Act, *Bulletin of the European Community*, Supplement 2/86.

Commission of the European Community (1988), The Economics of 1992, *The European Economy*, No. 35.

Commission of the European Community (1990), One Market, One Money: An Evaluation of the Potential Benefits and Costs of Forming an Economic and Monetary Union, *The European Economy*, No. 44.

Commission of the European Community (1991), Outlook for the Development of the Community Territory, Brussels.

Commission of the European Community (1991a), *The Regions in the 1990s: Fourth Periodic Report on the Social and Economic Situation and Development of the Regions of the Community*, Office for Official Publications of the European Communities, Luxemburg.

Corden, W.M. (1972), Economies of Scale and Customs Union Theory, *Journal of Political Economy,* Vol. 80, pp. 465-475.

Cuadrado-Roura, J.R. (1994), Regional Disparities and Territorial Competition in the EC, in Cuadrado-Roura, J.R., P. Nijkamp and P. Salva (eds.), *Moving Frontiers: Economic Restructuring, Regional Development and Emerging Networks,* Avebury, pp. 3-22.

Datar-Gip/Reclus (1989), *Les Villes Européennes: Rapport pour le DATAR,* Montpellier: Groupement d'Intérêts Reclus (R. Brunet, Director).

De Long, J.B. (1988), Productivity Growth, Convergence, and Welfare: Comment, *American Economic Review*, Vol. 78, pp. 1139-1154.

Dunford, M. (1993), Regional Disparities in the European Community: Evidence from the REGIO Databank, *Regional Studies,* Vol. 27, pp. 727-744.

Emerson, M. (1988), The Economics of 1992: An Assessment of the Potential Economic Effects of Completing the Internal Market of the European Community, *European Economy,* No. 35.

Eskelinen, H. and F. Snickars (1995), Competitive European peripheries? An introduction, in: Eskelinen, H. and F. Snickars (eds.), *Competitive European Peripheries,* Springer-Verlag, Berlin, pp. 1-14.

European Commission (1994), *Competitiveness and Cohesion: Trends in the Regions*, Fifth Periodic Report on the Social and Economic Situation and Development of the Regions in the Community. Office for Official Publications of the European Communities, Luxemburg.

European Commission (1999), *Europe's Agenda 2000. Strengthening and widening the European Union,* Office for Official Publications of the European Communities, Luxemburg.

Faini, R. (1989), Increasing Returns, Non-Traded Inputs and Regional Development, *The Economic Journal,* Vol. 99, pp. 308-323.

Feenstra, R. (1996), Trade and Uneven Growth, *Journal of Development Economics,* Vol. 49, pp. 229-256.

Fielding, A.J. (1994), Industrial Change and Regional Development in Western Europe, *Urban Studies,* Vol. 31, pp. 679-704.

Giannopoulos, G. and G. Boulougaris (1995), Overcoming Isolation and the Role of Transport: The case of the Aegean Islands, in: H. Coccossis and P. Nijkamp (eds.), *Overcoming Isolation. Information and Transportation Networks in Development Strategies for Peripheral Areas,* Springer-Verlag, Berlin-Heidelberg, pp. 254-268.

Gonzalez-Finat, A. (1993), Transeuropean transport networks and spatial development, Paper presented at the International Conference "Greece in Europe. Spatial Planning and Regional Policy towards 2000", Technical Chamber of Greece, European Commission, Directorate General for Transport, Athens, December.

Gramlich, E.M. (1994), Infrastructure Investment: A Review Essay, *Journal of Economic Literature,* Vol. XXXII, pp. 1176-1196.

Greenway, D. (1992), Policy Forum. Regionalism in the World Economy. Editorial Note, *The Economic Journal,* Vol. 102, pp. 1488-1490.

Grinols, E.L. (1993), Increasing Returns and the Shift from Custom Union to Common Market, *Regional Science and Urban Economics*, Vol. 23, pp. 315-335.

Gripaios, P. and T. Mangles (1993), An Analysis of European Super Regions, *Regional Studies,* Vol. 87, pp. 745-750.

Grossman, G.M. and E. Helpman (1990), Comparative Advantage and Long-Run Growth, *American Economic Review,* Vol. 80, pp. 796-815.

Grossman, G.M. and E. Helpman (1991), *Innovation and Growth in the Global Economy,* MIT Press, Cambridge.

Grossman, G.M. and E. Helpman (1994), Endogenous Innovation in the Theory of Growth, *Journal of Economic Perspectives,* Vol. 8, pp. 23-44.

Hall, R. and D. Van Der Wee (1992), Community Regional Policies for the 1990s, *Regional Studies,* Vol. 26, pp. 399-419.

Hall, D. (1993), Impacts of Economic and Political Transition on the Transport Geography of Central and Eastern Europe, *Journal of Transport Geography,* 1:1, pp. 20-35.

Hansen, N.M. (1965), Unbalanced Growth and Regional Development, *Western Economic Journal,* Vol. IV, pp. 3-14.

Hart, T. (1992), Transport, the Urban Pattern and Regional Change, 1960-2010, *Urban Studies,* Vol. 29, pp. 483-503.

Hart, T. (1994), Transport Choices and Sustainability: A Review of Changing Trends and Policies, *Urban Studies,* Vol. 31, pp. 705-727.

Harvey, D. (1989), *The Condition of Post-modernity,* Basil Blackwell, Oxford.

Heller, P.S. (1979), The Under-financing of Recurrent Development, *Finance and Development,* Vol. 65, pp. 38-41.

Henderson, J.V. (1974), The Sizes and Types of Cities, *American Economic Review,* Vol. 64, pp. 640-656.

Hirschman, A. (1958), *The Strategy of Economic Development,* New Haven.

Hoover, E.M. (1971), *An Introduction to Regional Economics,* New York.

Illeris, S. (1995), Peripherality and European Integration: The Challenge Facing the Nordic Countries, in: Eskelinen, H. and F. Snickars (eds.) *Competitive European Peripheries*, Advances in Spatial Science Series, Springer-Verlag, Berlin-Heidelberg, pp. 115-130.

Islam, N. (1998), Growth Empirics: A Panel Data Approach, *Quarterly Journal of Economics,* Vol. CXIII, pp. 1127-1170.

Izquierdo, R. (1992), Infrastructure capacity and network access, *12th International Symposium of the European Conference of Ministers of Transport* on Theory and Practice in Transport Economics, Lisbon.

Janelle, D.G. (1969), Spatial Reorganization: A Model and Concept, *Annals of the Association of American Geographers*, Vol. 59, pp. 348-364.

Kaldor, N. (1970), The Case for Regional Policies, *Scottish Journal of Political Economy,* Vol. 17, pp. 309-319.

Keeble, D., P. Owens and C. Thompson (1982), Regional Accessibility and Economic Potential in the European Community, *Regional Studies,* Vol.16, pp. 419-432.

Keeble, D., J. Offord and S. Walker (1988), *Peripheral Regions in a Community of Twelve Member States*, Office for Official Publications, European Commission, Luxembourg.

Kostopoulou, S. (1995), Transport networks and Insular Isolation: Measuring Spatial Inequality, in: Coccossis, H. and P. Nijkamp (eds.), *Overcoming Isolation: Information and Transportation Networks in Development Strategies for Peripheral Areas,* Springer-Verlag, Berlin-Heidelberg, pp. 235-253.

Kostopoulou, S. (1996a), European Union Regional Planning towards a Mediterranean Prospect: the Case of Greece, *Middle East Forum*, Issue 1, pp. 149-169.

Kostopoulou, S. (1996b), Thessaloniki and Balkan Realities, in: Hall, D. and D. Danta (eds.), *Reconstructing the Balkans: A Geography of the New Southeast Europe*, John Wiley, Chichester, England, pp.149-155.

Krugman, P. (1991), Increasing Returns and Economic Geography, *Journal of Political Economy,* Vol. 99, pp. 483-499.

Krugman, P. (1993), The Hub Effect: Or, Threeness in Interregional Trade, in: Ethier, W.W., E. Helpman and J.P. Neary (eds.), *Theory, Policy and Dynamics in International Trade,* Cambridge, 1993.

Krugman, P. (1996), Urban Concentration: The Role of Increasing Returns and Transportation Costs, *International Regional Science Review,* Vol. 19, pp. 5-30.

Krugman, P. and A.J. Venables (1995), Globalisation and the Inequality of Nations, *Quarterly Journal of Economics,* Vol. 110, pp. 857-880.

Lever, W.F. (1993), Competition within the European Urban System, *Urban Studies,* Vol. 30, pp. 935-948.

Lolos, S. and N. Zonzilos (1992), The Impact of European Structural Funds on Growth: The Case of Greece, Working Paper, Economic Research Department, Bank of Greece, November.

Louri, H. (1989), Regional Policy and Investment Behaviour: The case of Greece, 1971-1982, *Regional Studies,* Vol. 23, 3, pp. 231-239.

Lucas, R.E.J. (1988), On the Mechanics of Economic Development, *Journal of Monetary Economics,* Vol. 22, pp. 3-42.

Lundqvist, L. (1993), Traffic and Environment in Nordic Capitals – Competitive Advanatages in a European Context?, in: Lundqvist, L. and L. Persson (eds.), *Visions and Strategies in European Intergration. A North European Perspective,* Springer-Verlag, pp. 193-206.

Lutter, H., T. Pütz and M. Spangenberg (1992), *Accessibility and Peripherality of Community Regions: the Role of Road, Long-distance Railways and Airport Networks.* Report to DGXVI, Commission of the European Communities. Bonn: Bundesforschungsanstalt für Landeskunde und Raumordnung.

Martin, P. and C.A. Rogers (1994a), *Industrial Location and Public Infrastructure*, CEPR, Discussion Paper No. 909.

Martin, P. and C.A. Rogers (1994b), *Trade Effects of Regional Aid*, CEPR, Discussion Paper No. 910.

McCombie, J.S.L. (1988), A Synoptic View of Regional Growth and Unemployment: I – The Neoclassical Theory, *Urban Studies,* Vol. 25, pp. 267-281.

McCombie, J.S.L. (1988a), A Synoptic View of Regional Growth and Unemployment: II - The Post-Keynesian Theory, *Urban Studies*, Vol. 25, pp. 399-417.

Meijer, M. (1993), Growth and Decline of European Cities: Changing Positions of Cities in Europe, *Urban Studies,* Vol. 30, pp. 981-990.

Mitropoulos, M. (1997), Euro-islands: Towards a European Union islands policy for development, *Ekistics*, Vol. 63, Nos. 382/383/384, pp. 122-129.

Morris, J., P. Dumble and M. Wigan (1979), Accessibility Indicators for Transport Planning, *Transportation Research A*, Vol. 13, pp. 91-109.

Mun, Se-il (1997), Transport Network and System of Cities, *Journal of Urban Economics,* Vol. 42, pp 205-221.

Munnell, A.H. (1992), Infrastructure Investment and Economic Growth, *Journal of Economic Perspectives,* Vol. 6, pp. 189-198.

Myrdal, G. (1957), *Economic Theory and Underdeveloped Regions,* Duckworth.

Nam, C.W. and J. Reuter (1991), The Effect of 1992 and Associated Legislation on the Less-Favoured Regions of the Community, Office for Official Publications of the European Communities, Luxemburg.

Neven, D. and C. Gouyette (1995), Regional Convergence in the European Community, *Journal of Common Market Studies,* Vol. 33, pp. 47-65.

Nijkamp, P. (1994), Borders and Barriers: Bottlenecks or Potentials?', in Nijkamp, P. (ed.), *New Borders and Old Barriers in Spatial Development,* Avebury, England, pp.1-11.

Nijkamp, P. (1995), The European Network Economy: Opportunities and Impediments, in: Eskelinen, H. and F. Snickars (eds.), *Competitive European Peripheries,* Springer-Verlag, Berlin, pp. 18-39.

Nijkamp, P., J. Vleugel, R. Maggi and I. Masser (1994), *Missing Transport Networks in Europe,* Avebury, England.

Papanikos, G. (1998), The Process of Regional Convergence; The Case of Greek regions, 1981-1991, Paper presented at the 1st Symposium on Regional Development Problems, Department of Economics, Aristotle University of Thessaloniki, March.

Peschel, K. (1985), Spatial structures in international trade: an anlysis of long-term developments, *Papers of the Regional Science Association*, 58, pp. 97-11.

Peschel, K. (1990), Spatial Effects of the Completion of the Single European Market, *Built Enviroment,* Vol. 16, pp. 11-29.

Petrakos, G. (1997), A European Macro-Region in the Making? The Balkan Trade Relations of Greece, *European Planning Studies,* Vol. 5, No. 4, pp. 515-533.

Plassard, F. (1992), 'L'impact territorial des transports a grand vitesse, in: P.-H. Derycke (ed.), *Espace et Dyinamiques Territoriales,* Economica, Paris, pp. 243-261.

Puga, D. (1998), Urbanization Patterns: European *vs* Less Developed Countries, *Journal of Regional Science,* Vol. 38, pp. 231-252.

Quevit, M. (1992), The Regional Impact of the Single Market: A Comparative Analysis of Traditional Industrial Regions and Lagging Regions, *Regional Studies,* Vol. 26, pp. 349-360.

Rivera-Batiz, L.A. and P.M. Romer (1991), Economic Integration and Endogenous Growth, *Quarterly Journal of Economics,* Vol. 106, pp. 531-555.

Rivera-Batiz, L.A. and P.M. Romer (1991a), International Trade with Endogenous Technological Change, *European Economic Review,* Vol. 35, pp. 971-1004.

Rivera-Batiz, L.A. and D. Xie (1993), Integration among Unequals, *Regional Science and Urban Economics,* Vol. 23, pp. 337-354.

Rodenburg, H. (1989), Central Locations in the European Common Market, Research Memoradum, No. 59, The Hague: Central Planning Bureau.

Rollo, J. (1995), EU Enlargement and the World Trade System, *European Economic Review,* Vol. 39, pp. 467-473.

Romer, P.M. (1986), Increasing Returns and Long-Run Growth, *Journal of Political Economy,* Vol. 94, pp. 1002-1037.

Romer, P.M. (1990), Endogenous Technological Change, *Journal of Political Economy,* Vol. 98, pp. 71-102.

Rozenblatt, C. and Pumain, D. (1993), 'The Location of Multinational Firms in the European Urban System', *Urban Studies,* Vol. 30, pp. 1691-1709

Sala-i-Martin, X.(1994), 'Cross-sectional Regressions and the Empirics of Economic Growth', *European Economic Review,* Vol. 38, pp. 739-747

Sala-i-Martin, X. (1996), 'Regional Cohesion: Evidence and Theories of Regional Growth and Convergence', *European Economic Review,* Vol. 40, pp. 1325-1352

Sapir, A. (1992), 'Regional Integration in Europe', *Economic Journal,* Vol. 102, pp. 1491-1504.

Schuler, R.E. (1992), Transportation and Telecommunication Networks: Planning Urban Infrastructure for the 21st Century, *Urban Studies,*Vol. 29, pp.297-310.

Setterfield, M. (1997), History versus Equilibrium and the Theory of Economic Growth, *Cambridge Journal of Economics,* Vol. 21, pp. 365-378.

Small, K.A. (1997), Economics and Urban Transportation Policies in the United States, *Regional Science and Urban Economics,* Vol. 27, pp. 671-691.

Spiekermann, K. and M. Wagener (1994), The shrinking continent: new time-space maps of Europe, *Environment and Planning B,* Vol. 21, pp. 653-673.

Steinle, W. J. (1992), Regional Competitiveness and the Single Market, *Regional Studies,* Vol. 26, pp. 307-318.

Stohr, W. and F. Todtling (1977), Spatial equity - some antitheses to current regional development strategy, *Papers of the Regional Science Association,* Vol. 38, pp. 33-53.

Suarez-Villa, L. and J.R.C. Roura (1993), Regional Economic Integration and the Evolution of Disparities, *Papers in Regional Science,* Vol. 72, pp. 369-387.

Tabuchi, T. (1998), Urban Agglomeration and Dispersion: A Synthesis of Alonso and Krugman, *Journal of Urban Economics*, Vol. 44, pp. 333-351.

Targetti, F. and A. Foti (1997*), Growth and Productivity: A Model of Cummulative Growth and Catching-Up,* Vol. 21, pp. 27-43.

Van Geenhuizen, M. and P. Nijkamp (1996), Progress in Regional Science: A European Perspective, *International Regional Science Review,* Vol. 19, pp. 223-245.

Vartiainen, P. and M. Kokkonen (1995), Europe of Regions - A Nordic View, in: Eskelinen, H. and F. Snickars (eds.), *Competitive European Peripheries,* Advances in Spatial Science Series, Springer-Verlag, Berlin, Heidelberg, pp. 98-114.

Vasenhoven, L. (1993), Regional and Spatial planning: the European Strategy of Greece, Paper presented at the International Conference "Greece in Europe: Spatial Planning and Regional Policy towards 2000", Technical Chamber of Greece, European Commission, Directorate General for Transport, Athens, December.

Vickerman, R. (1992) *The Single European Market,* Harvester.

Vickerman, R. (1994), Changing European Transport Infrastructures and their Regional Implications, in: P. Nijkamp (ed.), *New Borders and Old Barriers in Spatial Development,* Avebury, England, pp. 125-137.

Vickerman, R. (1995a), Accessibility and peripheral regions, in: Coccossis, H., P. Nijkamp (eds.), *Overcoming isolation: Information and Transportation Networks in Development Strategies for Peripheral Areas,* Springer-Verlag, Berlin-Heidelberg, pp. 29-40.

Vickerman, R. (1995b), The regional impacts of trans-European networks, *The Annals of Regional Science*, Vol. 29, pp. 237-254.

Vickerman, R. (1996a), Restructuring of Transport Networks, *Eureg,* 3/96, pp. 16-26.

Vickerman, R. (1996b), Location, Accessibility and Regional Development: The Appraisal of Trans-European Networks', *Transport Policy*, Vol. 2, No. 4, pp. 225-234.

Vickerman, R., K. Spiekermann and M. Wegener (1995), Accessibility and regional development, Paper to European Science Foundation Conference on European Transport and Communications, Espinho, Portugal, April.

Viner, J. (1950), *The Custom Union Issue,* New York.

Young, A. (1991), Learning by Doing and the Dynamic Effects of International Trade, *Quarterly Journal of Economics,* Vol. 16, pp. 369-405.

Wheeler, D. and A. Mody (1992), International Investment Location: The Case of US Firms, *Journal of International Economics*, Vol. 32, pp. 57-76.

COMMUNITY AID FOR THE CONSTRUCTION OF TRANSPORT INFRASTRUCTURE IN SPAIN: IMPACT AND PERSPECTIVES

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SUMMARY

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1. SOME COMMENTS CONCERNING THE CONCEPT OF PERIPHERALITY

As a first approximation we could say that the concept of peripherality has a strictly geographical meaning, or at least one closely connected with physical reality. In this sense -- which is indeed close to the etymological meaning of the word -- “peripheral” would be that which is far from the centre, due to distance or difficulty of access. The first of these two factors -- distance -- remains ineluctable, while on the other hand it may be possible to intervene on the second one through actions aimed at improving accessibility between the region concerned and the main activity centres.

However, during the past decade, studies in which the concept of peripherality is discussed have been reshaping the initial idea to include more complex elements than those just mentioned. As an example, it suffices to mention the findings of the already classic study by Keeble, carried out in 1988. Map 1 summarises these findings.

Two aspects of Keeble’s study are of particular relevance for our presentation. First, the fact that the parameters used for the analysis have to do with accessibility in relation to economic activity. This confers a significant advantage on industrial activities located close to the decision centres of the European Union and reflects the fact that physical distance not only imposes costs in terms of money and time, but also in terms of difficulty of access to information sources.

Second, Map 1 strikingly shows what is also clear from other evidence: the considerable impact of the geographical factor in determining the final result, whatever the evaluation method. It is striking to note in this respect that virtually the only areas that constitute exceptions to this rule in Map 1 are the regions surrounding the capitals of France and Spain. That is to say, in Keeble’s study the geographical distance to the large economic decision centres determines the degree of peripherality *almost without exception*.

To understand the special characteristics of these exceptions (the Paris and Madrid regions), whose degree of peripherality turns out to be less than the purely geographical peripherality, we recall that the equation used in Keeble’s study defines peripherality as follows:

$$P_i = \Sigma M_j / D_{ij} + M_i / D_{ii}$$

where:

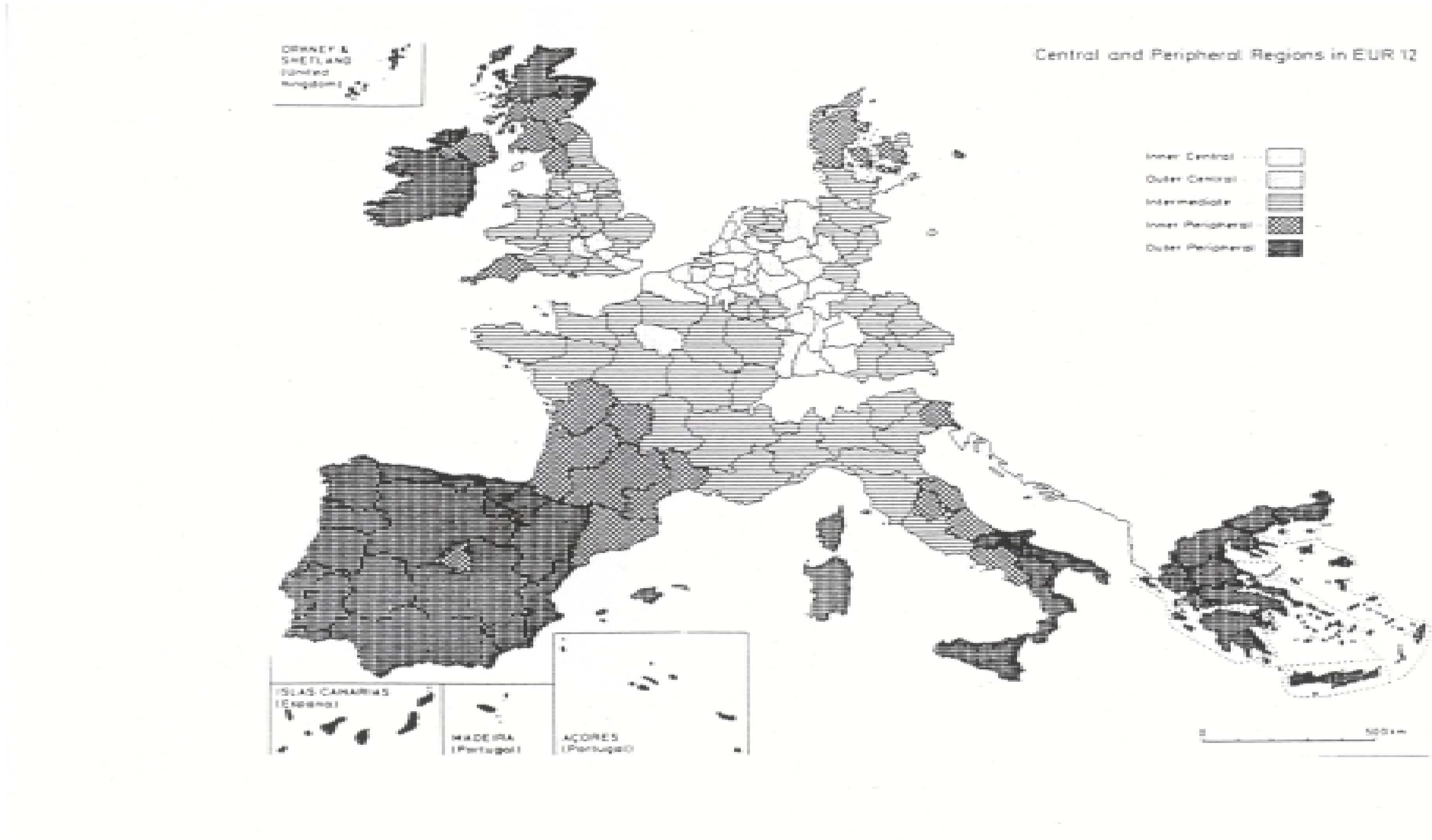
Pi is the peripherality index of region I,

Mi and Mj express the economic activity of regions i and j in terms of regional GDP,

Dij is the distance between the two regions measured as the shortest distance by road between the two biggest cities of each region,

Dii is one-third of the radius of the circle with the same area as region i.

Map 1. **Central and Peripheral Regions in EUR-12**



It is worth analysing the explanatory parameters of the concept used here, which have been widely used as a basis for a number of later studies.

As can be seen, the formula seeks to consider, on one hand, the position of the region concerned with respect to all of the other regions and, on the other hand, the specific intraregional peripherality. It is obvious that the first term ($\Sigma M_j / D_{ij}$) increases with the number of addends, but these become less and less meaningful as a function of the distance between regions, which is of an adverse nature and therefore appears in the denominator. Without doubt what determines the special nature of the Paris and Madrid regions is the second term, M_i / D_{ii}, where the higher the value, the greater the economic activity of the region considered will be.

Though with hindsight it is easy to criticise the weaknesses of the proposed equation; for example, the quality of intraregional communications does not appear to have been taken into account, it is important to underline that the determinant factor in defining the degree of peripherality of a given region is related to its economic strength, measured in terms of regional GDP.

In practice this fact calls into question the very concept of the peripherality indicator, obscuring the differences between this concept and any other indicator that serves to express the idea of regional development.

In fact, regional development indicators, though usually expressed in more elaborated forms, tend to resemble the second term of the formula that we are considering. Indeed it could not be otherwise: if by regional development we understand the improvement of the quality of life of the inhabitants of a region, it is evident that the only easily handled aggregate indicator that to some extent expresses this improvement in the quality of life is GDP growth.

There is no doubt however that this simplification leaves many important factors out of account: what about concepts such as freedom, justice, leisure opportunities, and so on? We could also say that there is sometimes even contradiction between economic growth and quality of life (the increase in the material standard of living may be accompanied by the deterioration of the environment). However, in spite of all its shortcomings this indicator has the great advantage of being easy to use.

The other type of indicator often employed in the analysis of regional development reveals the concept of accessibility in some of its forms. In its simplest form this concept is used to evaluate the potential beneficiaries' possibilities for access to services or centres of economic activity within a given region. In so far as we use it in this way, we do not enter into conflict with any concept linked to the idea of peripherality.

But regions are not self-sufficient entities. Their development supposes exchanges of persons and goods beyond the strict limits of their territories. This is why the concept of accessibility must be considered in all its aspects, incorporating the idea of ease of access to decision centres, services or leisure activities that are available in areas beyond those strictly regional.

The conclusion we would draw in this introductory section might be summarised as follows:

Whatever the procedure used to evaluate the degree of peripherality of a region within its overall sociopolitical environment, it will have to take three factors into account:

- The first is of a purely geographical nature (and, hence virtually ineluctable) and concerns the physical distance to certain major political and economic decision centres.

- The second has to do with obstacles of a not strictly physical nature that hinder equality of access to participation in decisions of an economic and, occasionally, political nature. Examples of such obstacles are difficulty in using a foreign language or ignorance of commercial practices in a particular activity, which are handicaps as regards access to some services and are therefore manifestations of peripherality.
- The third has to do with the level of intraregional development, in the terms normally accepted in our society: access to services and leisure activities, among others, on an equal footing with the regions at the centre of Europe.

If we consider these three factors, the possibilities for intervention on the first are, in a way, considerable but the return is very limited. By this we mean that no matter how much the European communications system is improved, the generalised cost of transport (tariff, time, effort) over the Paris-Brussels link will always be very much lower than over the Athens-Brussels link. This fact is so evident that we shall not dwell on it here and shall not return to it in our presentation.

The second and third factors, on which we shall focus the following pages, in our view constitute the two areas in which the most interesting possibilities for intervention are to be found, not only intervention on the part of the public authorities but by all the social agents.

Our intention in what follows is to discuss the significant advances recorded in a good many of the regions of my country in recent years as regards the reduction of peripherality. We make this analysis by closely examining the investment effort resulting from collaboration between the Spanish and Community administrations in the field of transport infrastructure. But in any event we would point out that the only indicators of peripherality that seem to us appropriate for this presentation are those that express the improvement in regional development.

In this connection, the use of the term "economic and social cohesion" as an expression of one of the main aspirations of those responsible for the European Common Policy seems very appropriate. We shall develop this presentation around the concept of cohesion.

2. EUROPEAN COHESION POLICY: BACKGROUND

Although the geographical framework in which this Congress is taking place greatly exceeds that of the European Union, it is obvious that if what we are trying to describe here is the Spanish situation as it has developed in recent years, it will be necessary for us to centre our attention on the EU area.

As mentioned above, our intention is to trace the evolution and effects of the European Union actions that have been directed at improving the well being of the peripheral regions and promoting their economic development. Here we would point out that since the creation of the European Common Market in 1957 the development of these actions has by no means been linear.

Specifically, in a long first phase that lasted until nearly 1975, the activity of the Common Market was centred on the removal of tariff barriers and there was a firm belief that the dynamic of a liberalised market would be capable of reducing, and even eliminating, the imbalances that existed in the regions of the six countries that then formed what was to become the European Union.

It is therefore no surprise that the Treaty of Rome mentions the common agricultural policy and the common transport policy, but contains no mention of a regional support policy. It should be remembered however that in those days, with the exception of the Italian Mezzogiorno, the GDP of the regions of the signatory countries of the Treaty of Rome was relatively uniform.

Cohesion policy, in its early form, began to be developed in 1975. It was then that the ERDF (European Regional Development Fund) was created, coinciding with the entry of the United Kingdom, Ireland and Denmark as new member countries of what had been until then, the Europe of the Six. This period also coincides with the first oil crisis.

The territorial imbalances that the new members introduced into the Community made it advisable to introduce this redistribution tool. In principle, and although history would end up demanding the contrary, this tool was created with the intention of providing the less favoured regions with the necessary input so that, *within a reasonable period of time*, they would be capable of reaching the general level of development and social welfare of the Common Market.

With the beginning of the 80s and the entry of first Greece (1981) and then Portugal and Spain (1985), the Community's Regional Policy was recast when it became evident that market mechanisms, on occasion, can increase territorial imbalances instead of reducing them.

The Single European Act therefore included among its objectives not only the definitive establishment of the single internal market but also the achievement of economic and social cohesion. Policy for achieving regional balance and development had been until then the direct responsibility of each Member State, the Community contribution being only of a subsidiary nature. However, the new course imposed by the Single European Act means that as from that time it has been possible to speak of a true Common Regional Policy.

As regards the case of Spain, it must be taken into account that our new Constitution, promulgated in 1978, establishes interregional solidarity as one of the bases for the construction of the State. Specifically, in its section 2, in addition to the recognition of the right to regional autonomy, it guarantees solidarity among all regions. This solidarity must be ensured by the State. The instrument for the practical application of these principles was the creation of the Inter-territorial Compensation Fund in 1984, that is to say somewhat before our joining the EU.

The function of the Inter-territorial Compensation Fund, whose relationship to the ERDF will be discussed below, is to help correct regional imbalances and to equalise the territorial distribution of public services, which means that every citizen is guaranteed an acceptable level of essential services, regardless of his or her place of residence.

Returning to the evolution of the ERDF, the first result of the new orientation after the promulgation of the Single European Act, was the virtual doubling of the budget allocated to the Structural Funds, among which the ERDF is the biggest item. Since then these funds have been increasing year after year.

Since 1994 the term "Cohesion Policy" has been consolidated and the Treaty of Maastricht reinforces the constitutional nature of this policy, establishing internal solidarity within the Community as one of the objectives of the Union. This resulted in the establishment of a new financial instrument, the Cohesion Fund, which is directed specifically to the countries with the lowest level of economic development within the European Union: Ireland, Greece, Portugal and Spain.

The indicative allocation from these funds for the above countries was the following:

Spain:	52-58%
Portugal:	16-20%
Greece:	16-20%
Ireland:	7-10%.

It must be taken into account that the distribution criteria were determined according to the initial situation of each country, above all, parameters related to the population and the size of the country. Spain, with the biggest population and the largest area in absolute terms, benefited most.

The most recent stage in this policy for the reduction of regional disparities (Cohesion Policy as from the beginning of the 90s) is the text of the Treaty of Amsterdam, which introduced for the first time a Title specifically devoted to employment, with the aim of taking a further step towards achieving interregional balance in Europe.

3. PRESENT SITUATION OF THE STRUCTURAL AND COHESION FUND

The resources at present allocated to Structural and Cohesion Fund constitute section 2 of the Community Budget. The amount of these resources is determined, as is well known, for multi-year periods. The present financial arrangements, resulting from the Council of Edinburgh Agreements of 1992, remain in force until the end of this year. The standing regulations for Structural Funds were drawn up in June 1993, and those for the application of the Cohesion Fund in May 1994.

This means that the EU is expected to establish new financial criteria for the period beginning in the year 2000. These criteria will define the new objectives regarding economic and social cohesion. For the periods 1989-93 and 1994-99, the proposals going in this direction presented by the Commission were known as Delors Package I and Delors Package II, respectively. The new proposal appeared in June 1997, under the title “Agenda 2000: for a stronger and wider Union”. We shall have the opportunity to comment on the content of this document at the end of our presentation.

It now seems appropriate to focus first on the analysis of the actual contribution of the different European funds to the investment efforts of the Spanish Administrations in recent years and second on the effects achieved by these efforts.

4. COHESION FUND: CONTRIBUTION TO THE CONSTRUCTION OF TRANSPORT INFRASTRUCTURES IN SPAIN

Even though Regulation 1164/94 on the application of the Cohesion Fund concentrates mainly on projects of an environmental nature, there is a specific paragraph of particular interest to us, according to which it will be possible to grant financial aid to transport infrastructure projects included in the guidelines of the Trans-European Network.

As mentioned above, these funds were for the benefit only of certain countries: those whose per capita GDP was below 90 per centof the European Union average at the time the Regulation was written.

Probably one of the most interesting issues to analyse in connection with new projects to be implemented with the aid of these funds is concerned with the selection criteria. National administrations very often base their decisions on the use of capacity or endowment indices. These indices, introducing more or less complex refinements, permit comparisons through expressing the amount of infrastructure per inhabitant or per unit area.

There is no doubt that this methodology, although widely used due to its simplicity, has serious shortcomings, above all because it does not take into consideration whether the projects to be implemented will meet the real needs of the people who are supposed to benefit from them. But, how to evaluate these needs? Are they in fact measurable or comparable as a whole?

Regarding the Spanish case, the guidelines to follow were included in the Infrastructure Master Plan, drawn up by the Administration in 1993 and intended, at least in broad terms, to guide action in the transport sector for the whole of the Spanish State until 2007. Concretely, the Infrastructure Master Plan chose to use accessibility indicators in its analysis to express both the adequacy of the infrastructures for meeting the needs arising from the socioeconomic activity of the population and the effectiveness of these infrastructures in fulfilling their function.

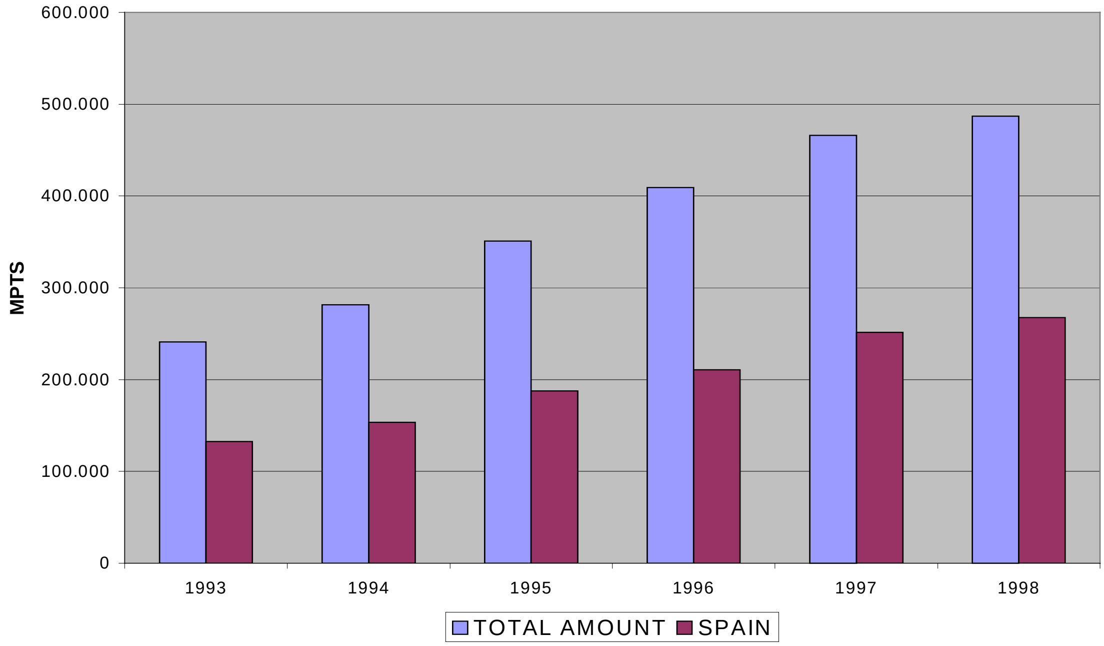
In this connection it must be born in mind that the results to be expected from an investment in transport infrastructure sometimes depend very much on their degree of complementarity and interdependence with respect to other already existing or planned infrastructures. At the same time there is a minimum efficiency threshold below which the desirable level of service will not be reached, thus to a large extent making the investment useless.

All this obviously means that decisionmaking with respect to which projects should be implemented, and in what order, requires a detailed knowledge of the physical environment and, above all, the socioeconomic environment. That is why the Community authorities have left any decision concerning the ranking of priorities in the selection of projects in the hands of the countries concerned (the four already mentioned).

In any event, the Brussels Administration naturally requires guarantees that there will be adequate proportionality between the investment made and the social and economic benefits derived from it, and that the projects to be implemented will be compatible with the rest of the Community policies.

The total resources allocated, according to the forecasts made in 1993 for the period 1993-99 amounted to 15,150 million 1992 ECUs. As Figure 1 (which is expressed in current pesetas) shows, the corresponding amount for Spain totals almost 1.5 billion pesetas for the period, i.e. about 54.4 per cent of the total allocated, which falls within the anticipated initial range.

Figure 1. **Cohesion Fund: Total allocation and Spanish share**



The transport sector projects implemented, within the total budget, are shown in Figure 2. As can be seen, the figure shows data only up to 1998, which were the latest available at the time of writing this document.

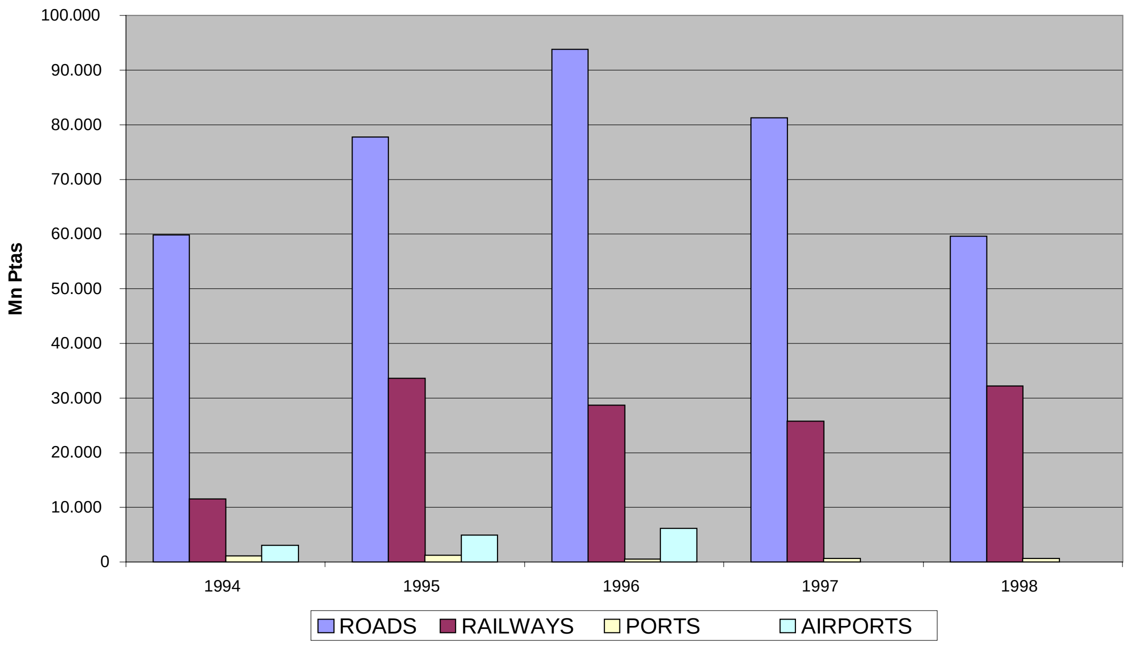
The figure reveals some particularly interesting features for understanding the strategy of the Spanish Administration regarding transport infrastructures.

The most striking feature is the relative importance attached to investment in roads, which accounts for 71 per cent of the total projects implemented over the period as a whole and for almost 80 per cent in some years (1994 and 1997). Investment in railways, concentrated on the Madrid/Zaragoza/Barcelona high-speed line, amounted to 131 billion pesetas over the period, that is to say, approximately a quarter of the total investment.

The amounts allocated to ports and airports come last and are marginal, probably for two reasons: in the first place, because they are not of primary importance for the achievement of cohesion within the European Union and, second, because the *philosophy* of the Commission regarding these infrastructures is that they should become self-financing through their operating revenue.

Regarding the trend over time of the amounts invested during the period under consideration, it is interesting to see that the growth curve of the total community contributions and the Spanish share of them (Figure 1) does not correspond at all to that of investment in the transport sector (Figure 2).

Figure 2. **Cohesion fund aid for transport infrastructure projects: Spain**



In fact, while the Community budget contribution to the Cohesion Fund grew each year at an almost constant rate, the aid devoted to Spanish transport infrastructure projects reached a maximum in 1996 to decrease later, in absolute terms, to the figure of 92,500 million pesetas, or less than 73 per cent of the maximum.

It should be pointed out here that the data in Figure 1 correspond to the financial aid for *all* sectors, and that environmental projects financed by these funds underwent a trend over the period that we are analysing which, in a way, was the opposite of that recorded in the transport sector.

We have already seen the resources allocated to infrastructure investment for each transport mode. It now seems appropriate to direct our attention to the geographical distribution of these funds among the different Spanish regions. In this presentation we shall use the term *region* as a synonym for "Autonomous Community", which is the term normally used in Spanish administrative language.

We would point out, however, that the Autonomous Communities constitute relatively new entities within our administrative structure. In fact they were created during the past two decades, following the promulgation of our new Constitution, dating from 1978.

In fact, in its section 2, the Constitution recognises and guarantees the right of the provinces to be grouped in Autonomous Communities, and section 148 authorises these new territorial entities to assume powers in the field of road and rail infrastructures, as well as in the provision of transport services.

At present Spain is divided into 17 Autonomous Communities. For practical purposes and for future comparisons between the data originating from the Spanish and Community administrations, we shall consider that the organisation as Autonomous Communities coincides with the geographical division criteria of the Community organisation (NUTs).

Table 1 summarises the data corresponding to the distribution of Cohesion Fund aid for the period 1994-97, broken down by type of infrastructure and recipient Autonomous Community. In order to simplify the presentation and reduce the number of figures, the information corresponds to the period as a whole.

Table 1. **Cohesion Fund, 1994-97: Aid provided to Spanish regions (in million pesetas)**

	ROADS	RAILWAYS	PORTS	AIRPORTS	TOTAL
ANDALUCÍA	50 615	0	0	0	50 615
ARAGÓN	27 646				27 646
ASTURIAS	17 939				17 939
CANARIAS	9 051			15	9 066
CANTABRIA					0
CASTILLA-M.	20 278				20 278
CASTILLA-L.	6 741				6 741
CATALUÑA	52 071	841			52 912
CEUTA					0
VALENCIA	8 848	2 443			11 291
EXTREMADURA					0
GALICIA	41 915				41 915
BALEARES				13 980	13 980
RIOJA	333				333
MADRID	44 313	14 133			58 446
MELILLA					0
NAVARRA	4 250				4 250
P. VASCO	6 029				6 029
MURCIA					0
INTER REGIONS	82 332	114 344	4 006		200 682
TOTAL	**372 361**	**131 761**	**4 006**	**13 995**	**522 123**

Of a total of some 522 billion pesetas, the greater part of the investment went to roads (372 billion pesetas, 71 per cent of the total), while in second place the railways received virtually all of the remainder, i.e. 25 per cent. The harbour and airport share of the total investments is almost negligible for the reasons previously mentioned.

The case of the Balearic Islands is an exception to this comment however. As the table shows, almost 14 billion pesetas were directed to their airport facilities. As can be readily understood, in this case the purpose was to attempt to reduce the problems resulting from the *insularity*, and in fact involved one of the busiest airports in Spain.

Looking at Table 1 in more detail, special attention must be drawn to the importance of the “supraregional” category, which refers to those projects whose significance goes beyond the area of a specific Autonomous Community. As can be seen, this item amounts to over 200 billion pesetas, or about 38 per cent of the total amount of aid. The greater part of this item corresponds to rail infrastructure with 114 billion pesetas (87 per cent of the total allocated to railways), but the amount corresponding to road investment is also significant, with over 83 billion pesetas or 22 per cent of the total allocated to the sector.

The volume of supraregional investment should not surprise us and simply indicates that the Spanish administration seriously takes into consideration the guidelines of the regulations for the application of these funds, which, it will be recalled, give priority to projects forming part of the Trans-European Network (TEN). As mentioned above, this is the case of most railway investments.

The distribution of funds allocated to the regions, which as can be seen are concentrated almost entirely on investment in roads, puts Catalonia in first place, with 52 billion pesetas allocated over the period and Madrid in third place with over 44 billion. We underline this fact, which is surprising in a way, because as can be seen from Map 1, Catalonia and Madrid, together with the Balearic islands, are privileged regions in Spain, being the only ones whose per capita GDP is at the level of the community average. The reason is that the Cohesion Fund was conceived as a complementary tool of the ERDF Funds, but destined not for achieving balance between regions, but between the countries of the Union.

In second place in Table 1 is Andalusia, with a total of 51,600 million pesetas. In this case, the situation is entirely different from that of Catalonia and Madrid since this region suffers a situation of great disadvantage with respect to the community average, and specifically, as we shall see in the section devoted to the structural funds, it is to be found in what is known as “Objective 1”.

In any event, if in the analysis of the application of these funds we introduce some type of ratio, for example the average per capita investment over the period (which, without forgetting our earlier comments before, seems to be one of the most meaningful), we see that the biggest beneficiaries of the Cohesion Fund were not Catalonia, Madrid or Andalusia, but rather Aragón, Asturias, Galicia and Castilla La Mancha, in this order and, what is more, Asturias and Galicia had not only a high ratio of investment per inhabitant but also per km^2.

In order to present a complete picture of the group of actions that we are describing we have included Maps 2 and 3, which give an overview of road and rail investment projects respectively.

Map 2. **COHESION FUND: Road infrastructure projects**

Map 3. **COHESION FUND: Rail infrastructure projects**

5. STRUCTURAL FUNDS: USE FOR THE TRANSPORT SECTOR IN SPAIN

As already stated, the creation of the European Fund for Regional Development represented a significant change in the activity of the European Community since it made a set of problems that had previously been addressed from the strictly national standpoint an integral part of Community policy.

The process, however, as we have already said, did not evolve in a homogeneous way. More specifically, the first implementing Regulation, of 1975, restricted the use of ERDF resources to the financing of infrastructure in certain disadvantaged areas, mountain agriculture and directly productive activities.

This situation did not change until the promulgation of the new Regulation of 1979, when the limitations on the financing of infrastructure projects were removed, so long as they contributed to the development of the region concerned and with the proviso that they must not exceed 70 per cent of the proposed investment. This partial limitation with respect to infrastructures investment was also maintained in the Regulation of 1984.

The last and very important reform of community regional policy came at the end of the 1980s with the promulgation of the Single European Act, which introduced the concepts of economic and social cohesion. This meant, as first measure, the immediate doubling of the funds allocated to this policy.

This is very significant. It should be noted that the ERDF funds, from their creation until 1988, had contributed a total of almost 23 billion ECU in aid, of which over 19 billion or about 85 per cent was allocated to infrastructure. Transport infrastructure was the most favoured, receiving about 38 per cent of the total aid, or over 44 per cent of that allocated to infrastructure. The outlook for the less favoured regions of the Union therefore became rather more promising.

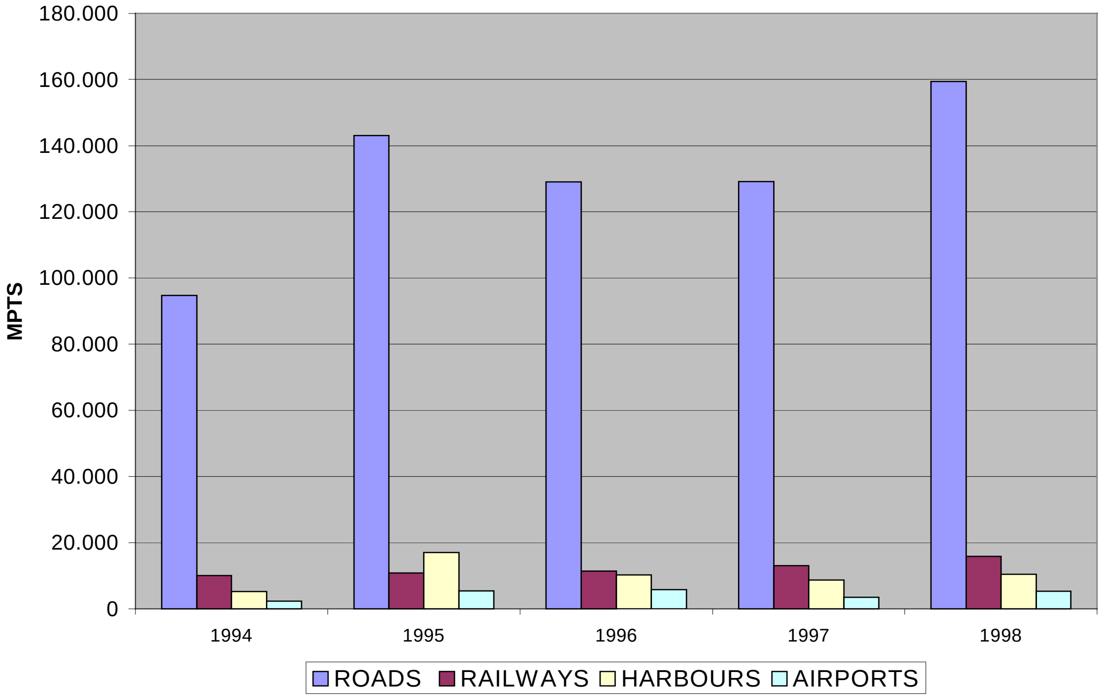
The so-called *concentration criterion*, whose reform we shall discuss at the end of this text, has so far directed the application of the ERDF funds towards achieving five objectives, the last of which is divided in two. Three of them are of a sectoral nature and are therefore of less interest to our study, since they are addressed to the Community as a whole. The remaining three, on the other hand, are of a territorial nature and, in particular, Objective 1 aims specifically at promoting the development and the structural adjustment of the most disadvantaged regions.

Regions whose per capita GDP is less than 75 per cent of the community average benefit from this Objective. This means that at present 10 of the 17 Spanish Autonomous Communities benefit from this Objective. These are Andalusia, the Canaries, Cantabria, Castilla-La Mancha, Castilla-León, Extremadura, Galicia, Murcia and the Community of Valencia.

Objectives 2 and 5b which, together with Objective 1, determine the actions of a territorial nature qualifying for ERDF funds, make reference to both the reconversion of regions seriously affected by declining industries and the development and structural adjustment of rural areas. Both Objectives are having a certain impact on the Spanish regions.

To enter into more detail on the allocation of ERDF funds among the different transport infrastructures we shall now analyse the content of Figure 3.

Figure 3. **ERDF, 1994-98 : Transport infrastructure in Spain**



As can be seen, the total volume of aid allocated to the sector, almost 800 billion pesetas, exceeds by a good percentage the corresponding allocation from the Cohesion Fund. Again roads, with 655 billion pesetas, are the biggest beneficiary, since the other transport modes (railways, harbours and airports) only received 4 to 9 per cent of the total.

Investment is supported in accordance with European Union guidelines. Because of this, in global terms as well as for each mode, the differences between the funds applied in one year and the next are not significant. The year with the highest volume of investment, in total as well as for roads, was 1998.

The breakdown of the investments we have just analysed among the Spanish regions, is shown in Table 2. To make the analysis of the data easier, as in the case of the Cohesion Fund, we give overall figures for the whole period. This period again goes from 1994 to 1997, since at the moment of drafting this document the regional data for 1998 were not available.

A quantitative and qualitative comparison of the Table 2 data with those already analysed for Table 1, shows not only the distribution of the investment effort, but above all the different philosophies guiding the EU in the application of the two different types of fund.

In fact, in Table 2, the “supraregional” item is zero, since ERDF projects are by definition circumscribed to the region. Heading the investment table is Andalusia, with over 114 billion pesetas for this period, of which almost 95 billion pesetas were allocated to roads. The second place, in global terms as well as for roads, was occupied by Galicia with almost 98 billion pesetas.

Table 2. **ERDF, 1994-97: Aid to Spanish regions (in million pesetas)**

	ROADS	RAILWAYS	PORTS	AIRPORTS	TOTAL
ANDALUCÍA	94 901	8 653	7 273	3 846	114 673
ARAGÓN	669				669
ASTURIAS	25 647	3 509	2 081	684	31 921
CANARIAS	23 089		3 899	8 390	35 378
CANTABRIA	16 838	1 473	1 204	289	19 804
CASTILLA-M.	41 307	4 456			45 763
CASTILLA-L.	68 809	6 425		230	75 464
CATALUÑA	20 444		6 252		26 696
CEUTA	3 605		236		3 841
VALENCIA	50 136	16 908	8 738	1 658	77 440
EXTREMADURA	17 816	719			18 535
GALICIA	85 604	3 978	6 785	1 385	97 752
BALEARES	0				0
RIOJA	384				384
MADRID	4 279				4 279
MELILLA	194		348	312	854
NAVARRA	1 398				1 398
P. VASCO	9 703		2 967		12 670
MURCIA	25 059	590	1 267		26 916
INTER REGIONS					0
TOTAL	**489 882**	**46 711**	**41 050**	**16 794**	**594 437**

After them come Valencia and Castilla-León and, already in a third group, Castilla-La Mancha, the Canaries and Murcia, among others. The Balearic Islands did not receive any budgetary allocation, but it should be born in mind that the region's per capita income is now at the level of the community average. We have here a case, exceptional among the Spanish regions, where the evident geographical peripherality does not equate with socioeconomic peripherality. It must not be forgotten however that the Balearic Islands are being favoured by the Cohesion Fund.

Reversing this reasoning in a way, the importance of the ERDF aid allocated to the Canary Islands, in absolute values, can readily be seen, and in particular, as is logical, the amount devoted to the improvement of airport facilities. This is an example of a case in which there is a double peripherality: in addition to being over 2 000 km from the capital of the Spanish state, and over 4 000 km from Brussels, the Canary Islands are among the group of seven Autonomous Communities with the lowest per capita GDP, significantly below the Spanish average and, of course, that of the Union.

On the other hand if we consider the volume of investment per capita or per unit area of the regional territory, the result is more meaningful since in these terms the Canaries Community is in first place. A very similar situation results in the case of another community, Galicia, which received a higher amount of aid from the ERDF funds.

On the other hand, again logically enough, Madrid and Catalonia, which as already mentioned appeared in the results of the Keeble study with an intermediate peripherality level, come last with respect to the financial aid received, if we evaluate it in relative terms.

Contrary to what happens with the projects financed by the Cohesion Fund, as a rule few in number and of very high budget, the ERDF projects are, as would be expected, very widely spread throughout the different regions, and they are not usually very big. For this reason we did not consider it appropriate to include any map of these projects.

6. THE CONTRIBUTION OF THE CENTRAL, REGIONAL AND PROVINCIAL GOVERNMENTS

Right from the birth of what we call in Spain the "State of the Autonomies", investment in transport infrastructure in our country has come from three different sources: the Central Government, the Governments of the Autonomous Communities and the Provincial Administrations. As we shall see in the following tables the investment capacities of these different levels of government differ greatly, as do the transport networks for which they are responsible.

Let us begin by briefly considering the main features of the latter aspect, the networks:

- The State road network totalled 23 500 km at the beginning of this year, of which somewhat over 7 000 km were motorways (both free and toll). The roads assigned to the Autonomous Communities totalled 72 000 km, which also includes a modest motorway network (1 400 km). Finally, the Provincial Administrations account for a further 67 000 km. This gives a grand total of almost 163 000 km. Table 3 shows the breakdown for each of the regions.

- The railway network has a less complex distribution due to the fact that most of its length is under the responsibility of only two companies directly linked to the Central Administration -- RENFE and FEVE -- which manage 12 300 and 1 200 km of network respectively. However there are several Autonomous Communities that manage small networks of regional nature. The total rail network amounts to 14 300 km.

Table 3. **Spanish road network (kilometres)**

	Central Government			Autonomous Government			Provinces
	Motorway	Road	Total	Motorway	Roads	Total	Total
Andalucía	1 195	1 947	3 142	548	10 119	10 667	10 876
Aragón	405	1 748	2 153	6	5 399	5 405	2 553
Asturias	151	537	688	3	4 083	4 086	--
Baleares	0	--	0	65	1 372	1 437	757
Canarias	0	--	0	231	1 749	1 980	2 346
Cantabria	121	427	548	0	2 033	2 033	--
Castilla-La Mancha	817	2 506	3 323	1	7 886	7 887	7 270
Castilla-León	847	3 716	4 563	54	11 156	11 210	16 783
Cataluña	717	1 196	1 913	190	5 085	5 275	4 582
Extremadura	267	1 072	1 339	9	3 479	3 488	3 959
Galicia	494	1 570	2 064	4	5 085	5 089	9 882
Madrid	482	112	594	173	2 591	2 764	--
Murcia	253	322	575	74	2 922	2 996	--
Navarra	39	--	39	75	3 540	3 615	--
País Vasco	196	4	200	0	--	0	4 139
Rioja	135	282	417	2	1 376	1 378	--
Valencia	800	1 014	1 814	75	2 713	2 788	3 807
TOTAL	6 919	16 478	23 372	1 510	70 623	72 098	66 954

- As regards the port and airport infrastructures, totalling 80 facilities, it should be mentioned that even though constitutionally they are direct responsibility of the Central Government, the current trend, which follows European Union guidelines, is to endow them with the maximum autonomy, in both their commercial activity and the management of their resources. That is why, with some exceptions, and as we have just seen in the case of the Community Funds, public investment in them is quite limited in relative terms.

As in most other European countries, roads are where most of the investment effort of all levels of government is concentrated, in particular at regional and provincial levels. This is shown in Table 4. To clarify the previous observation, we should take into account that of the almost 649 billion pesetas invested in roads in 1997, over 227 billion were invested by the Autonomous Communities and over 48 billion by the Provinces.

Table 4. **Public investment in roads (in million pesetas)**

	1995	1996	1997	1998
Central Government	365 200	375 126	330 603	450 638
Autonomous comm.	270 899	220 415	227 820	n.a.
Provinces	41 891	41 899	48 476	n.a.
Toll motorways	15 276	18 999	42 099	n.a.
TOTAL	**693 266**	**656 439**	**648 998**	

Let us focus now on the data corresponding to the *biggest investor* in transport infrastructurewithin the Spanish State, the Central Government. Data on its investment activity during the period 1994-98, broken down by region, are given in Table 5. For the sake of simplicity these figures cover all transport modes.

As can be seen, with a total of over 3.67 billion pesetas, 22 per cent (0.83 billion pesetas) corresponds to the “supraregional” item, whose characteristics have already been described, so we shall not comment further on this point. The rest, totalling 2.83 billion pesetas, corresponds to investment projects specifically for the 17 Spanish Autonomous Communities. The largest sums were invested in Andalusia, Catalonia and Madrid, which together accounted for over 50 per cent of total regional investment. The following group was formed by the communities of Valencia and the two Castillas where approximately 25 per cent of the investment was concentrated. The remaining 25 per cent was distributed among the remaining nine Communities together with the autonomous cities of Ceuta and Melilla, both located on the North African coast, outside the Spanish mainland.

If we analyse the annual investment in the individual regions we see that the amounts tend to be rather uneven. This is largely due to the variations in the amount of *supraregional* investment, which was very high in some years, since, as Table 5 shows, the trend in total investment over the whole period, with the exception of 1996, was of quite regular growth, with a considerable increase in investment in 1998.

We should make clear, and probably this is a good moment to do it, that the data we are presenting (Cohesion Fund, ERDF funds and investment by the Spanish central, regional and provincial governments) are not additive, that is to say the investment figures shown in Table 5, like those in Table 4, reflect not only the corresponding contribution from the State budget, the Autonomous Communities and the Provinces but also all of the aid from Brussels under the different headings described above, together with certain other funds such as the TEN funds which we have not mentioned up to now because of their relative unimportance.

Table 5. **Ministerio de Fomento: Investment in transport infrastructure**

	1994	1995	1996	1997	1998	TOTAL
ANDALUCÍA	89 214	87 566	82 370	71 720	84 841	415 711
ARAGÓN	17 750	21 222	31 666	19 773	26 945	117 356
ASTURIAS	25 548	21 519	19 044	17 882	24 953	108 946
CANARIAS	23 635	16 683	17 381	26 624	39 863	124 186
CANTABRIA	30 417	20 366	14 946	10 668	16 752	93 149
CASTILLA-M.	26 497	26 228	28 358	27 631	39 140	147 854
CASTILLA-L.	35 051	30 483	50 089	56 742	78 503	250 868
CATALUÑA	54 465	59 653	74 384	46 931	95 985	331 418
CEUTA	2 086	2 283	1 980	1 501	934	8 784
VALENCIA	65 196	61 554	50 240	45 369	55 588	277 947
EXTREMADURA	19 536	13 439	11 899	8 649	8 866	62 389
GALICIA	64 457	77 624	62 611	73 213	66 221	344 126
BALEARES	8 126	15 377	19 668	11 618	5 351	60 140
RIOJA	3 336	3 501	2 213	2 560	4 376	15 986
MADRID	74 205	69 943	54 643	65 899	62 408	327 098
MELILLA	2 688	974	1 904	1 395	2 874	9 835
NAVARRA	347	448	309	313	289	1 706
P. VASCO	13 425	12 490	15 319	14 925	16 116	72 275
MURCIA	18 668	14 150	10 236	12 062	11 712	66 828
INTER REGIONS	82 934	141 942	111 044	218 595	279 157	833 672
TOTAL	**82 934**	**141 942**	**111 044**	**218 595**	**279 157**	**833 672**

During recent years, in global terms, the EU contribution has been always over 20 per cent, with a maximum of 32.4 per cent in 1995. It is evident, on the other hand that the investment effort of our different levels of government has not increased in a systematic way, and has even been reduced in some years. We shall return to this aspect at the end of this document.

7. THE OUTLOOK FOR TRANSPORT NETWORKS IN SPAIN WITHIN THE COMMUNITY FRAMEWORK

When we speak of the outlook, this inevitably depends to a large extent on the financial contributions of the European Union in future years, and these is turn depend on compromises and tradeoffs by the Community institutions. On the one hand, there is the political will on the part of Member States to endow the Union with the necessary economic resources to advance the integration process, but on the other hand, since the total amount of resources is limited and susceptible of alternative uses, the decisions regarding the order of priorities for the various projects are of great importance.

In this regard it is logical to assume that the Member States that contribute most to the Community budget will be reluctant to increase their contributions. On the other hand however, the enlargement of the Europe of the 15 without at the same time a considerable increase in the contributions of existing members is difficult to imagine.

The enlargement of the European Union will necessarily bring additional costs, since the imbalances here are of a greater magnitude than any recorded in the case of previous accessions, as shown in Table 6.

Table 6. **Central and Eastern European countries: Statistical data**

	Area (1 000 km²)	Population (millions)	Density (Inhab./km²)	Per capita income (% EU average)
HUNGARY	93	10.2	110	37
POLAND	313	38.6	123	31
ROMANIA	238	22.7	95	23
SLOVAKIA	49	5.4	110	41
LATVIA	65	2.5	38	18
ESTONIA	45	1.5	33	23
LITHUANIA	65	3.7	57	24
BULGARIA	111	8.4	76	24
CZECH REP.	79	10.3	130	55
SLOVENIA	20	2.0	100	59
EU 15	3 236	371.6	115	100

As we stated above, the financial policy guidelines for the period of 2000-2006 were outlined in Agenda 2000, made public in 1997. Over the past two years there has been serious controversy within the Union in trying to reach agreement on this proposal. There is a clear confrontation between the group of countries (the majority) inclined to slow down the process of European construction, and the other group (the minority) whose desire is to maintain and even accelerate the process.

The debate has been closely followed by the Central and Eastern European countries, which in all probability will join the Union within the next few years and hope above all for a show of solidarity by their future Community associates.

The initial position of the countries that were less in favour of the launching of the cohesion policy could be described for the purposes of this document as being in favour of:

- Freezing expenditure;
- Reducing the sums allocated to Structural Funds;
- Supporting the less favoured regions of the richest countries, even though their level of development is not below the community average;
- Loss of special benefits by ultraperipheral regions;
- Disappearance of Cohesion Fund aid for the countries participating in the single currency.

As far as Spain is concerned, it can be seen that this set of proposals would have meant the disappearance of aid from the Cohesion Fund and, at the same time, several Autonomous Communities would have ceased to be beneficiaries of the Structural Fund aid corresponding to Objective 1.

Going back to the situation at the time these notes where written (May 1999), once we had seen the initial results of the Extraordinary European Council of Berlin, held at the end of March this year, we were assured that the final form adopted for Agenda 2000, already approved, guarantees the maintenance of the principles that inspired the European construction model, and particularly the maintenance of all the solidarity policies.

The cohesion policy in particular has been consolidated as far as the Structural Funds and the Cohesion Fund are concerned.

To improve the efficiency of the Structural Funds the number of Objectives has been reduced according to the following criteria:

- Objective 1: This now concerns the structural adjustment, development and promotion of the regions that satisfy any of the following conditions:
  - Regions whose per capita GDP does not reach 75 per cent of the Community average;
  - Ultraperipheral Regions;
  - Regions that were part of Objective 6 during the period 1995-1999;
  - Regions currently included in Objective 1 which exceed the threshold of 75 per cent, and for which a progressive reduction of aid is envisaged. This will probably be the case for the Spanish Communities of Valencia and Cantabria.
- Objective 2: The goal is the economic and social conversion of regions suffering from structural problems, in particular rural areas in decline, industrial areas in crisis, and urban areas with difficulties.
- Objective 3: This is focused on providing support for education, training and employment. Its priorities will be the adaptation to economic and social change, the development of education and continuous training systems, active policies to combat unemployment and the fight against social exclusion.

The total amount expected to be allocated to the Structural Funds should reach 195 billion Euros. Almost 70 per cent of this, some 136 billion Euros, will be allocated to Objective 1, and slightly over 46 billion Euros to Objectives 2 and 3.

With respect to the Cohesion Fund, the outcome of the Berlin Summit confirmed the desire of Member States that this Fund should continue helping to improve the economic and social balance in Europe, concentrating its application in the environmental field and, of special interest to us, in transport infrastructure and the Trans-European Networks in particular.

The idea of the Heads of Government, meeting in Berlin, was that those EU States whose per capita GDP was less than 90 per cent of the Community average, could benefit from the Cohesion Fund so long as their economies are moving towards satisfying the criteria for economic convergence.

The global amount allocated by the EU through the Cohesion Fund for the period 1999-2000 will probably be about 18 billion Euros. This figure, as well as that for the Structural Funds, is the outcome of the final agreement, and is slightly lower than the initial proposal which would have allocated to economic and social cohesion policy a percentage of European Union GDP equal to that decided by the Edinburgh Council for the period 1993-99, 0.43 per cent. If this had been the case, then the corresponding figures would have been 2.1 billion and 20 billion Euros, respectively.

In the case of Spain, if the forecasts of the “Ministerio de Hacienda” are confirmed, about 58,500 million Euros or 26 per cent of the amount allocated to the 15 countries of the Union, will be allocated from the Community Treasury as aid for the construction of transport infrastructure.

The Structural Funds contribution will be 47,200 million Euros for this period which will mean slightly less than 23 per cent of the total allocated to the group of 15, while the estimated share from the Cohesion Fund will be slightly over 11,200, or 62 per cent of the total of 18 billion Euros, meaning that the overall level of aid will remain practically as at present.

8. A FIRST APPROXIMATION TO THE RESULTS ACHIEVED: GDP GROWTH

Analysis of the benefits obtained by the more peripheral Spanish regions as a result of the Community cohesion policy, turns out to be rather difficult for several reasons.

In the first place, the study of the improvement in the provision of transport infrastructure can no longer be based on the conventional criterion of the increase in network length. In the case of Spain, the length of the networks is now virtually stabilised, and the determinant factor to be considered should be the improvement in quality. Unfortunately, studies of this sort do not exist for each separate region, and in any event the data are not sufficiently up to date.

We find a similar situation with respect to the macroeconomic parameters and in particular GDP growth, or more precisely per capita GDP growth. In these circumstances, the use of time series only permits us to make comparisons within the period 1993-96, i.e. from the introduction of the Cohesion Fund until the last available data corresponding to all European regions.

However, we have macroeconomic data for the Spanish regions going up to 1998 and shall comment on these later, but in any event their analysis offers very limited possibilities since our objective is to detect the relative situation of certain Spanish regions with respect to Europe and not with respect to one another.

Nevertheless, even though it will be some years before this type of analysis will be able to provide really meaningful results, it seems worthwhile to present some particularly significant findings. They correspond to the period 1992-96 and come from data provided by Eurostat. These data are presented in Table 7, which shows the percentage increase in Purchasing Power Parities (PPP) of the different regions over that period.

Table 7. **Spanish regions' PPP growth**

	1996	1992	1996/1992 (%)
Baleares	17569	16649	106%
Madrid	18208	15845	115%
Cataluña	17942	15506	116%
Navarra	17755	15502	115%
Pais Vasco	16702	14662	114%
La Rioja	16116	14419	112%
Aragón	16094	13902	116%
Valencia	13362	12632	106%
Cantabria	13913	12363	113%
Canarias	13455	12178	110%
Murcia	12159	11573	105%
Asturias	13326	11492	116%
Castilla y León	13748	10972	125%
Castilla-La Mancha	11933	10424	114%
Galicia	11396	9602	119%
Andalucia	10356	9457	110%
Extremadura	9883	8369	118%

The region with the lowest economic level is Extremadura, with a PPP value that barely reached 8 369 units in 1992. This region, together with Andalusia and Galicia, formed then and still are the "trailing group" of Spanish regions in terms of economic development.

As can be seen, among the regions included in Objective 1 in 1992, only the Comunidad Valenciana exceeded the average for Spain as a whole, and this only very slightly.

The percentage growth over the period 1992-96 varies greatly between regions, ranging between a maximum of 25 per cent for Castilla-León, and a minimum of 5 per cent for Murcia. It is interesting to note that four out of the ten least favoured communities that form this group grew at a lower rate than the national average. The average growth for Spain as a whole practically coincided with that of the EU (14 per cent and 13 per cent respectively).

The rest of the Autonomous Communities, those which do not benefit from Objective 1 funds, improved their per capita PPP in a more homogeneous way than the poorer regions and at a rate close to or a little higher than the European Community average.

The Balearic Islands, already mentioned several times in this report, constitute a striking exception, and as Table 7 shows, due to the limited growth over the period, scarcely 6 per cent, this Community went from being the one with the highest standard of living in all Spain, to occupy the fourth place after the Communities of Madrid, Catalonia and Navarra.

Figures 4 and 5 show the relative situation of the Spanish regions with respect to all European regions (we again point out that our data correspond just to the period 1992-96, the latest complete figures available from Eurostat). Figure 4 covers the 10 Communities that benefit from Objective 1, while Figure 5 covers the other seven.

Figure 4. **"Objective 1" regions: Variations in the ranking of European regions (positions gained or lost)**

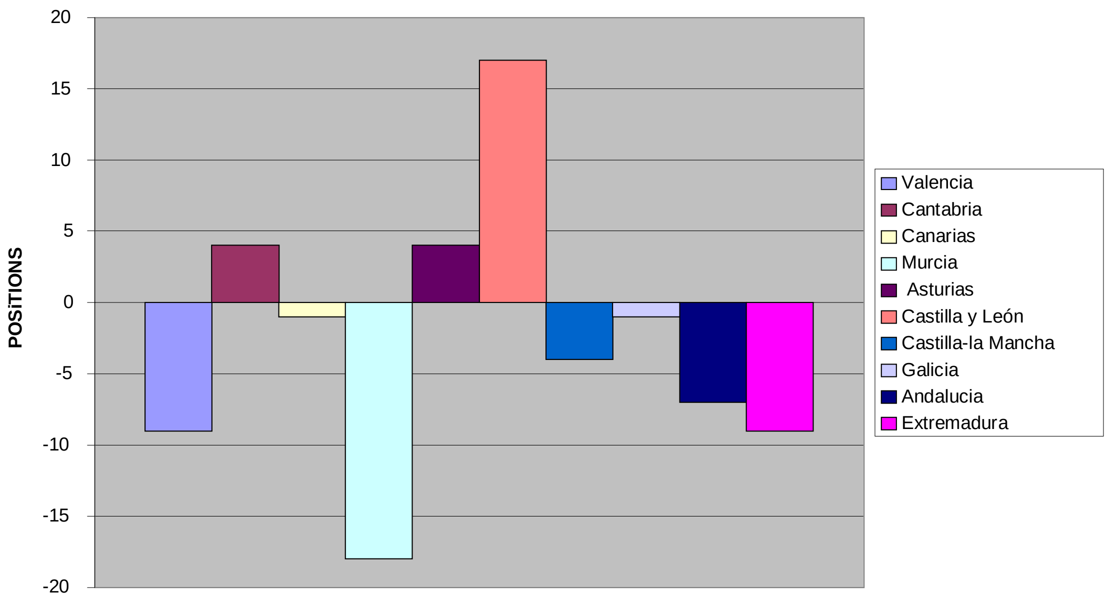
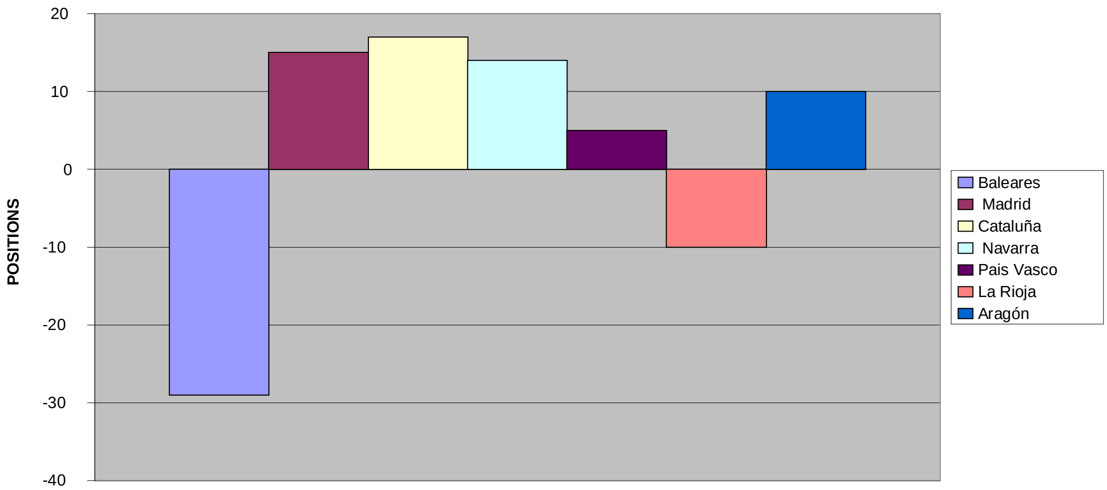


Figure 5. **Richest regions: Variations in the ranking of European regions (Positions gained or lost)**



They are easy to interpret: each figure shows the change in relative position (places lost or gained in the ranking of European regions) between 1992 and 1996. The results certainly do not seem very encouraging since there is no evidence of any improvement in the relative positions of the least favoured regions.

In fact, seven of the ten Communities in the first group lost positions with respect to the other European regions. Murcia lost 18 positions; Extremadura, the most disadvantaged of all in terms of standard of living, lost nine, occupying the fifth place from the bottom of the table at the end of 1996. It is significant that, with the exception of the Portuguese region of Alentejo, the other eight positions lost by this Community were filled by German regions.

Leaving aside Asturias and Cantabria, which gained four positions each, there is only one case of significant growth, that is Castilla-León which improved by 18 positions in the ranking with, as we have already mentioned, a 25 per cent increase in per capita PPP.

Regarding the Spanish regions with higher standards of living, the situation is reversed since five out of the seven gained positions, some very significantly (Madrid gained 15 positions, Catalonia 17, and Navarra 14), and only two of them -- Rioja and Baleares -- lost positions, quite significantly in the case of Baleares as we have seen.

We have already stated that due to the unavailability of data it is impossible to try to establish correlations between the improvement or otherwise of economic indicators and the investment effort by the European Funds intended to improve economic and social cohesion. It is nevertheless worthwhile noting that an analysis of the data available at present leads to no meaningful conclusions.

Thus, for instance, the region with the lowest relative growth in economic wellbeing, Murcia, received a significant amount of per capita investment from Structural Funds during the review period, the fourth highest. Much the same could be said of Galicia, the region with the highest per capita

Structural Funds investment, and the third if we take into account the Cohesion Fund, which did not succeed in improving its relative level with respect to the rest of the European regions during this period.

By contrast, Castilla-León enjoyed a considerable improvement in economic wellbeing despite the fact that it only occupied the seventh place in total per capita aid from the Structural and Cohesion Fund.

9. THE OTHER QUANTITATIVE ASPECT TO BE CONSIDERED: EMPLOYMENT

As is well known, the unemployment percentages for our country are the highest in the European Union, and can be qualified as catastrophic. It is also true that in recent years the different Spanish governments, as well as the Community authorities, have developed specific policies to try to narrow the gap between the Spanish situation and the rest of Europe. In any event, since economic theory always suggests the existence of links between infrastructure investment and the reduction of unemployment, we considered it appropriate to complete the information presented in this report by discussing the unemployment trend in Spain during the period 1994-98.

This time we have not taken into account the trend in each of the regions in the rest of Europe, since, as we have just said, the Spanish Autonomous Communities constitute what may be called a *group apart*.

The data we would like to comment on are summarised in Table 8, and we would like to discuss the trend in the relative situation of the regions with respect to the national average, with special emphasis on the group of less favoured regions.

In global terms, even though the absolute values are still very high, the reduction in unemployment in Spain during the period 1994-98 was considerable, with the number of unemployed falling from 3 724 000 to 3 053 000, or by about 18 per cent.

The percentage reduction in unemployed varies greatly between the different Autonomous Communities and it is again very difficult to establish any correlations. If we consider, in the first place, the group of Objective 1 regions, we see that three of them (Castilla-La Mancha, Extremadura and Andalusia) are among the four with the lowest reduction in the unemployment index for the period, in all cases less than ten percentage points, which corresponds to less than 1.5 per cent, cumulative annual rate or substantially less than the GDP growth rate.

Castilla-Leon, Asturias, Galicia and Cantabria range between 14 per cent and 18 per cent reduction, figures which without reaching the national average are at least close to the growth indices, though it is difficult to establish any link with the infrastructure investment effort.

Only Valencia, Murcia and Canarias show a reduction in unemployment rates significantly greater than the Spanish average, and it is also only here that the expected correlation with the investment effort can clearly be seen.

Table 8. **Spanish regions: Unemployment, 1994-98 (thousands)**

	1994	1995	1996	1997	1998	Reduction. 98/94
ANDALUCIA	894	888	875	874	818	9%
ARAGÓN	86	75	72	68	55	36%
ASTURIAS	89	79	84	84	74	17%
BALEARES	52	44	42	38	36	31%
CANARIAS	163	146	139	131	125	23%
CANTABRIA	46	45	47	42	38	17%
CASTILLA LEON	205	194	193	188	178	13%
CASTILLA MANCHA	117	116	120	118	112	4%
CATALUÑA	552	528	504	460	388	30%
VALENCIA	394	367	360	335	277	30%
EXTREMADURA	125	118	119	117	118	6%
GALICIA	220	196	208	203	182	17%
MADRID	408	429	441	393	389	5%
MURCIA	106	98	100	86	77	27%
NAVARRA	30	27	24	22	23	23%
PAIS VASCO	220	199	181	168	152	31%
RIOJA	17	16	15	12	11	35%
TOTAL	3724	3565	3524	3339	3053	18%

However, as Table 8 shows, the group of regions that do not benefit from ERDF aid, with the exception of Madrid Community, occupy the top places in the reduction in the number of unemployed, way above the national average. The cases of Aragón, with a 34 per cent reduction and La Rioja, with over 33 per cent, stand out.

It thus seems clear that if improving the level of employment is one of the collateral objectives of the cohesion policy, the results are very positive for Spain, but the geographical distribution of this improvement tends to amplify the interregional differences and, therefore, the degree of peripherality of the poorest regions.

10. SUMMARY AND CONCLUSIONS

The concept of peripherality seeks to combine two features of a very different nature, but nevertheless closely related: on one hand, the physical distance from centres of economic activity and political decision, and on the other, the relative position with respect to the population as a whole as regards what we may call in very general terms the "standard of living".

There are many studies that demonstrate the close correlation between geographical and socioeconomic peripherality. The reasons for this are probably of a structural nature, and the strongest evidence that supports what we are saying is the location on the map of Europe of those countries that benefit from the Cohesion Fund.

In this paper we have focused on the socioeconomic aspect of the problem rather than on the geographical aspect. The elements presented try to show the effects of the application of the European Union's economic and social cohesion policy in Spain during recent years.

Cohesion policy, as we understand it, is a major Community tool for the reduction of those inequalities that make a good many European regions and in particular most of the Spanish regions, peripheral regions.

The instruments for the application of this policy are, on one hand, the Structural Funds, and, on the other, the Cohesion Fund. The Structural Funds were created in the mid-70s, but their broad application to transport infrastructure appeared only at the end of the following decade, while the Cohesion Fund is relatively new, the first phase of its application ending this year.

The contributions received by the Spanish regions for medium-sized projects benefiting small areas, as well as for large-scale projects generally included in the Trans-European transport Networks, have been very substantial. The outlook for the future is even better: if the estimates are confirmed, in the period 2000-2007, 62 per cent of the funds allocated to the Cohesion Policy and 23 per cent of those allocated to Regional Policy will be applied to Spain

The benefits obtained as a result of these actions, in terms of the quality improvement of our infrastructure networks are obvious: we have only to consider the significant growth of our motorway system, or the ambitious projects to enlarge our high-speed railway network, just to mention the most outstanding operations. These endeavours have been accomplished either directly thanks to Community Funds, or as a result of the release of our own resources allowed by Community aid.

The conclusions of the Berlin Summit held in March 1999 confirmed the need to consolidate the cohesion policy as well as solidarity policy, with the prospect of the incorporation of new countries into the Union. This guarantees the continuity, for the period of 2000-2006, of the funds to promote balance between regions and cohesion among member states from which Spain has been benefiting.

If we apply the indicators generally used to evaluate improvements in living standards (in our case we have used purchasing power parity and the trend in the unemployment rate) there is no doubt that the Spanish regions have advanced over the past five years in both respects. This improvement has not been the same everywhere, but it has been very significant in certain regions.

However, in general terms, and with the limited data available for making comparisons between the European regions (the last available data for the whole of the Union being for 1996) there are a number of points worthy of note:

- Regarding the improvement in purchasing power, there is no clear direct relationship between the investment effort made thanks to the cohesion policy and the increase in per capita incomes in the regions analysed.
- The group of regions included in Objective 1 for the application of Structural Funds grew on an average by a smaller percentage than regions that did not benefit from this Objective.

- The relative situation of the Spanish regions within Europe evolved in a less favourable way in the case of the poorest regions. In fact, seven out of the ten Communities that benefited from Structural Funds (Objective 1) fell to lower positions in the ranking and some, such as Murcia and Extremadura, very significantly.
- It is obvious that in some cases this criterion is hardly convincing, since positions in the ranking could be lost in a situation of generalised improvement. This could be the case for Extremadura, which, in spite of losing nine positions, has a per capita purchasing power close to the European average. However, this is not the case for regions such as Andalucia, Murcia, Canarias, Cantabria or Valencia (half of those which benefit form the Objective 1) which registered more or less significant losses with respect to the Community average.
- Regarding the trends in unemployment rates we cannot draw any significant conclusions. In fact while total unemployment fell substantially, the less favoured regions of Spain were not those that benefited most from this improvement, rather the contrary. Neither does infrastructure investment seem to be a determining factor, at least in the short period of time that we are analysing here with respect to this aspect of the improvement of the standard of living.

We must stress that the comments presented here are simply suggestions based on the incomplete information available to date concerning the subject of our analysis. A systematic study aimed at interrelating the parameters discussed here cannot be made until information on investments and socioeconomic effects is made available for the period which ended with the conclusions of the Berlin Summit.

In any event, since the forum where we are gathered today includes a good representation of countries with excellent prospects of soon being incorporated into the European Union, it seems appropriate to conclude these lines with some observations that are at present the subject of constant discussion in my country. These are:

- For the richest countries to show solidarity towards the peripheral countries (present members, as well as those which will shortly join the Union) is a moral obligation for the former and a fair aspiration for the latter. An economically and, above all, socially unbalanced Europe is not compatible with the *philosophy* of the Community Treaties.
- However, the call for solidarity must not be understood in a passive sense, but must come accompanied by serious commitments on the part of the recipient countries.
- In the first place, there is a need for management capacity, that is to say, the existence of specialised teams, trained by top-level technical personnel, able to design the regional action programmes needed for the application of Funds. In this respect we can assure you that our country has improved considerably in recent years, and this enables us to apply the allotted Funds with maximum efficiency and yield.
- Second, specific attention must be paid to the so-called “additionality principle”. This means that the financial aid allocated to investment in infrastructures must not substitute for national investment, but rather both should be pooled to achieve a collective result. For this the European Union has established certain controls to try to avoid “substitution”, but obviously it must be the Member States themselves who ensure compliance with these commitments.

With respect to the Spanish case, we are very much afraid that the poor results commented on here are connected with this second aspect.

BIBLIOGRAPHY

Banco Europeo de Inversiones (1999), *Informaciones*, No. 100.

Banco Europeo de Inversiones, *Informe Anual*, 1995, 1996, 1997.

Cuadrado, J. (1990), El crecimiento regional español ante la integración europea. Instituto de Estudios de Perspectiva, Ministerio de Economía y Hacienda, Madrid.

De La Dehesa, G. (1992), Las consecuencias regionales de la Unión Económica y Monetaria. *Información Comercial Española*, No. 710.

Dolado, J., J. Malo De Molina, L. Zabalza (1986), a. Spanish industrial unemployment, some explanatory facts, *Economica*, No. 53.

European Centre for Infrastructure Studies (1996), *The State of European Infrastructure,* Rotterdam.

European Communities (1998), *Integrated Strategic Infrastructure Networks in Europe*. COST Action 328, Final Report, Luxembourg.

Izquierdo, R., A. Monzón (1992), La accesibilidad a las redes de transporte como instrumento de la cohesión económica y social, *TTC*, No. 56.

Keeble, D., J. Offord, S. Walker (1988), *Peripheral Regions in a Community of Twelve Member States*, Commission of the European Communities, Luxembourg.

Lopez Corral, A. (1999), "La Agenda 2000 y las acciones estructurales: resultados de la Cumbre de Berlín", *ROP*, No. 3792.

Ministerio de Economía y Hacienda, "La Programación Regional y sus Instrumentos", *Informe Anual* 1994, 1995, 1996, 1997.

Ministerio de Fomento (1998), "Los transportes y la Comunicaciones", *Informe Anual* 1997, Madrid.

Ministerio de Fomento (1999), Secretaría General Técnica. Avance del *Informe Anual* 1998, Madrid.

Ministerio de O.P. Transporte y Medio Ambiente (1994), *Plan Director de Infraestructuras 1993-2007*, Madrid.

OPOCE (1997), COM(97) 2000 Final Vol 1. Agenda 2000, por una Unión mas fuerte y mas amplia.

OPOCE (1997), COM(97) 2000 Final Vol 2. Agenda 2000, el desafío de la ampliación.

Orellana-Pizarro, H (1994), Evaluación de las infraestructuras de transporte y sus efectos sobre cel desarrollo regional mediante la aplicación de indicadores de accesibilidad. Doctoral Thesis.

Piñero, J. (1998), Los fondos europeos y su aplicación a las Obras Públicas en España", *ROP*, No 3377.

Villaverde, J. (1996), "Desigualdades provinciales en España, 1955-91", *Revista de Estudios Regionales*, No. 45.

Villaverde, J. (1999), *Diferencias regionales en España y Unión Monetaria Europea*, Ed. Pirámide, Madrid.

Villaverde, J. (1996), "Impacto de la producción y la productividad sobre el empleo. Una aplicación del Análisis shift-share a las regiones españolas", *Papeles de la Economía Española*, No. 67.

EUROPEAN INTEGRATION: THE SITUATION OF EU CANDIDATE COUNTRIES

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SUMMARY

Vienna, December 1999

INTRODUCTION – OVERVIEW OF THE REPORT

In recent years, major events in Europe – the break-up of the Soviet Union and the end of the Cold War – have profoundly altered the existing geopolitical order and meant the end of the old models for the international balance of power.

This new situation offers Europe the possibility of playing a significant role. Continent-wide application of the EU model for peaceful integration is a token of European stability. The process of European integration has gathered pace sharply over the last decade. Against this new backdrop, enlargement to include Central and Eastern Europe, Cyprus, Malta and Turkey represents an historical undertaking for the European Union.

It offers opportunities as well. An enlarged Union with, in its initial phase, over 100 million new citizens, will promote trade and economic activity and give fresh impetus to the growth and integration of the European economy as a whole. The accession of new Member States will enhance the Union's weight and influence internationally.

Whatever happens, the issue of enlargement will dominate EU policy in the coming years. The countries of Central and Eastern Europe and of the Mediterranean are, in principle, starting out on equal terms. However, economic and political realities in these countries are often very different. This presents the Union with unprecedented institutional and political challenges.

Although the population of the EU could rise by over 25% to 500 million with the first wave of accessions, its total GDP will not grow by more than 5%. Notwithstanding the enormous efforts undertaken by the countries that are candidates for this first wave of accession, their integration into existing programmes and structures will be a very delicate task.

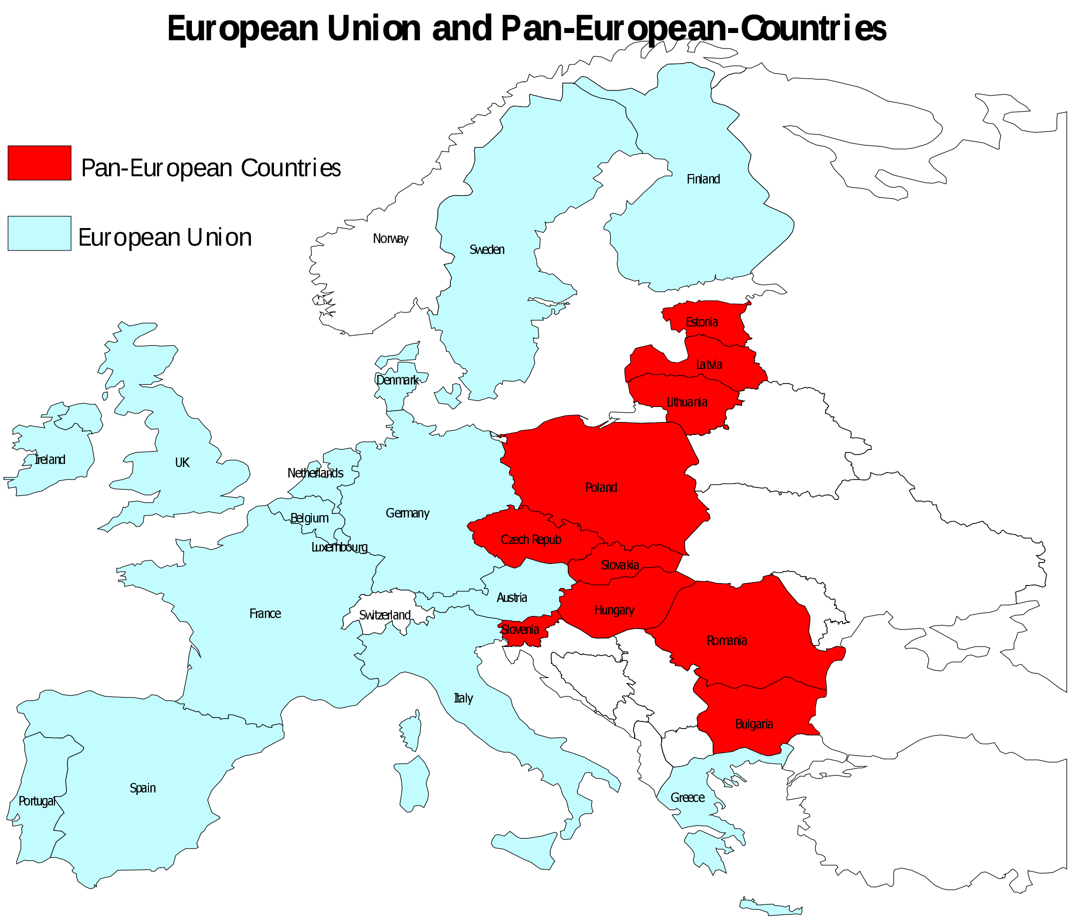
The Copenhagen European Council in 1993 confirmed the legitimacy of Central and Eastern European applications for membership. This marked the start of one of the EU's most ambitious projects in its history. In 1997, the Amsterdam European Council called for accession negotiations to begin in 1998. The Luxembourg European Council received applications from ten countries and negotiations began in 1998 with the first wave of six: Cyprus, the Czech Republic, Estonia, Hungary, Poland and Slovenia. These will be followed by a second wave of five: Bulgaria, Latvia, Lithuania, Romania and Slovakia. In September 1998, Malta reactivated its application and the Cardiff European Council launched the EU strategy to prepare Turkey for accession.

This report deals with the theme “Peripherality and Pan-European Integration: Experience and Prospects”.

Section 1 analyses the recent past, especially in terms of the key socio-economic figures. followed by Section 2 deals with the inventory of pan-European integration. Sections 3 and 4 examine the barriers and obstacles to be addressed. Section 5 addresses future developments in terms of key socio-economic and transport figures. Finally, in Section 6 draws conclusions.

The chapter examines the ten Central and Eastern European countries (excluding Albania and the successor states of the former Yugoslavia, with the exception of Slovenia): Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

Map 1. EU and PECO candidates for accession



1. PRESENTATION OF CANDIDATE COUNTRIES

1.1. Key socio-economic figures

1.1.1 General remarks

The following tables present the key socio-economic figures for 1997 for the ten Central and Eastern European countries under consideration .

Table 1. **Key socio-economic figures for the ten Central and Eastern European countries**

Key socio-economic figures for the ten Central and Eastern European countries - 1997										
	Bulgaria	Czech R.	Hungary	Poland	Romania	Slovak R.	Slovenia	Lthuania	Estonia	Latvia
Area in 1000 km^2	110,994	78,866	93,030	312,683	238,391	49,036	20,256	65,200	45,227	64,589
Population, 1000 persons, avera	8312,1	10303,7	10154,7	38649,5	22545,9	5383,2	1986,8	3715,0	1476,3	2479,9
Population per km^2	74,9	130,6	109,2	123,6	94,6	109,8	98,1	57,0	32,6	38,4
GDP, USD mn, nominal	10202	52018	44813	135561	34843	19449	18202	9580	4500	5400
GDP/capita (USD at exchange ra	1227	5049	4415	3507	1545	3613	9162	2579	3048	2178
Unemployment rate, %	13,7	5,2	10,4	10,5	8,8	12,5	14,8	6,7	10,5	7,0
Exports, total, USD mn	4914	22785	19100	25751	8431	8792	8372	3712	2800	1600
Imports, total, USD mn	4886	27177	21211	42307	11279	10263	9358	5797	4300	2600
Exports/capita, USD	591	2211	1881	666	374	1633	4214	999	1897	645
Imports/caoita, USD	588	2638	2089	1095	500	1907	4710	1560	2913	1048
Vehicle Stock in mn	1,75	3,55	2,43	8,53	2,60	1,14	0,77	0,88	0,43	0,43
Cars per 1000 inhabitants	211	345	239	221	115	212	388	237	291	173

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The smallest country in the group is Slovenia, and the largest is Poland, which is 15 times larger than Slovenia.

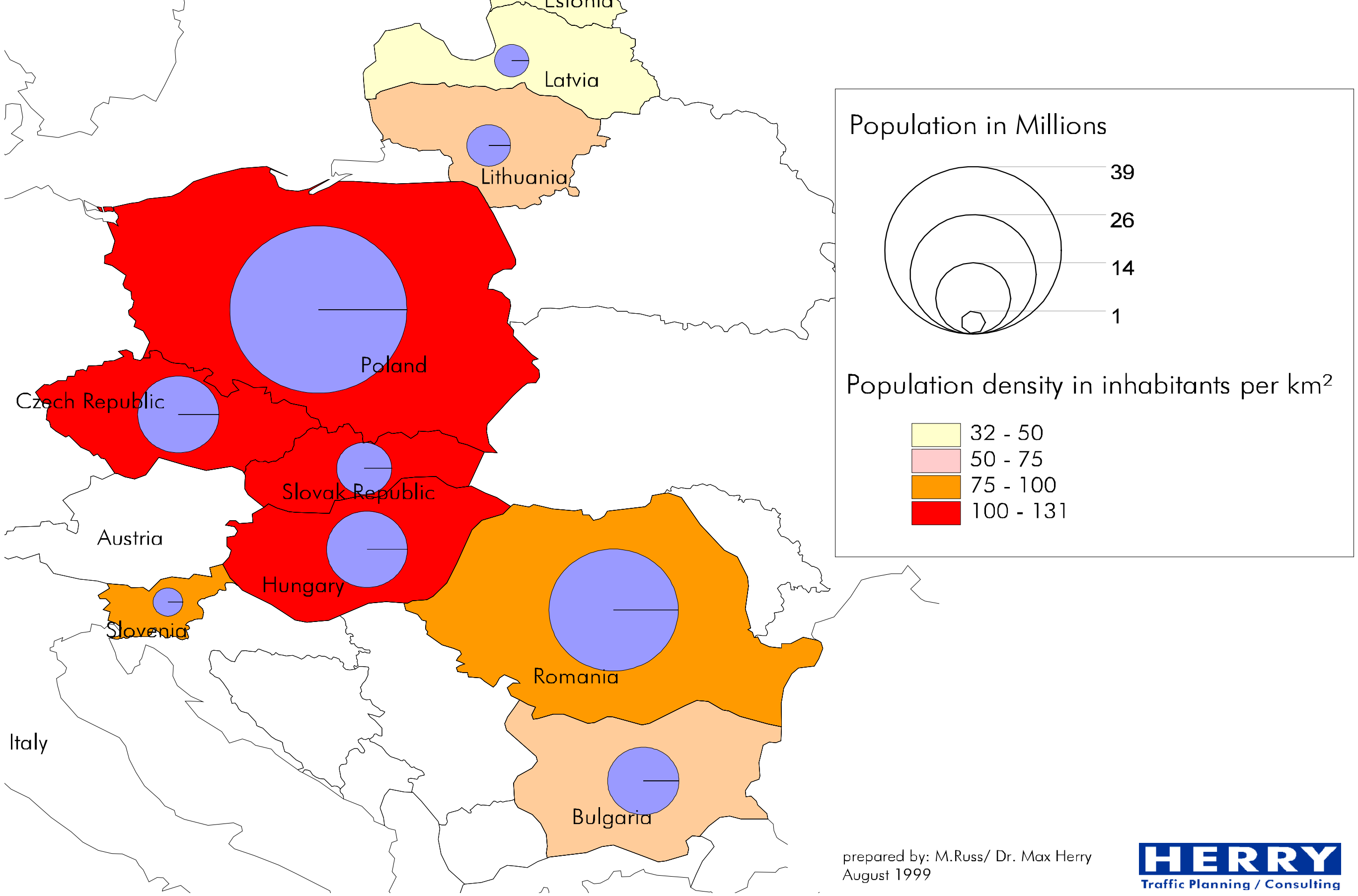
In terms of population, Estonia is the smallest, about 1.5 million inhabitants, and Poland again is the largest with a population of 38.6 million, *i.e.* 25 times that of Estonia.

However, population density is highest in the Czech Republic, with 130 inhabitants per km^2, and the lowest in Estonia with 33 inhabitants per km^2.

In terms of GDP per capita, Slovenia has the highest (USD 9 200 at the exchange rate). The “middle field” consists of the Czech Republic, Hungary, Slovakia and Estonia.

Pan-European-Countries

Population & Population density 1997



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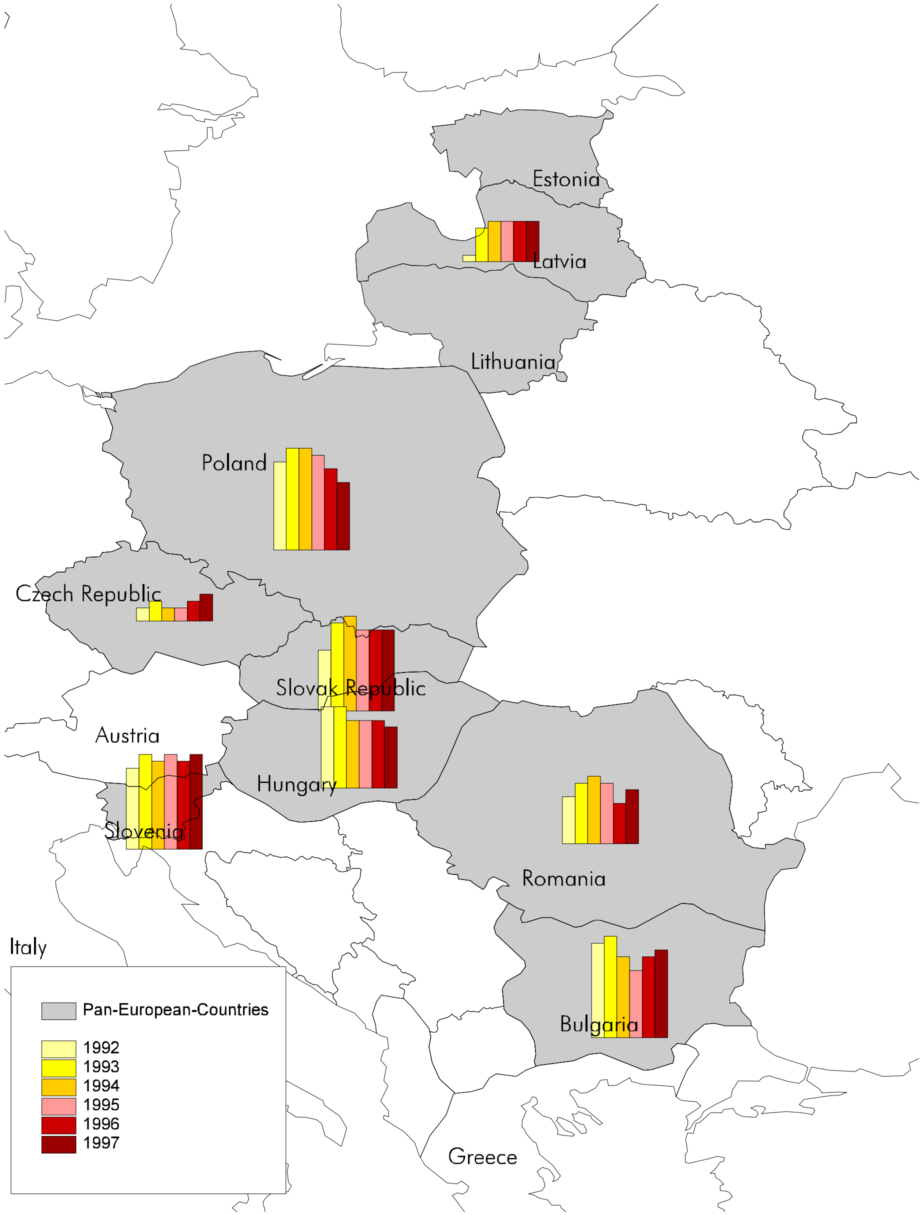

Pan-European-Countries

Unemployment Rate in %

Developement 1992 to 1997

Unemployment Rate (%)						
Country	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Bulgaria	15,2	16,4	12,8	11,1	12,5	13,7
Czech Republic	2,6	3,5	3,2	2,9	3,5	5,2
Estland		6,5	7,6	9,7	10,0	10,5
Hungary	13,2	13,3	11,4	11,1	10,7	10,4
Letland	2,3	5,8	6,5	6,6	7,2	7,0
Litauen	1,3	4,4	3,8	6,2	7,1	6,7
Poland	13,6	16,4	16,0	14,9	13,2	10,5
Romania	8,2	10,4	10,9	9,5	6,6	8,8
Slovak Republic	10,4	14,4	14,8	13,1	12,8	12,5
Slovenia	13,4	15,4	14,2	14,5	14,4	14,8

Source: WIIW - Handbook of Statistics, Countries in Transition 1998
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1.1.2 Trends in GDP

Table 2 traces trends in GDP for the ten Central and Eastern European countries.

Table 2. **Trends in total GDP in the ten Central and Eastern European countries**

GDP in Million US$ - nominal								
Country	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Bulgaria		8.137	8.605	10.812	10.148	13.106	9.946	10.202
Czech Republic	32.273	25.427	29.966	34.440	39.912	50.799	56.460	52.018
Estonia		600	1.000	1.700	2.300	3.600	4.400	4.500
Hungary	33.059	33.395	37.249	38.552	41.518	44.665	45.185	44.813
Latvia		1.000	1.500	2.200	3.600	4.400	5.000	5.400
Lithuania				2.700	4.200	5.900	7.900	9.580
Poland	58.976	76.430	84.324	85.851	92.580	119.082	134.550	135.561
Romania	38.246	28.851	19.578	26.361	30.073	35.478	35.162	34.843
Slovak Republic	15.462	10.841	11.745	11.988	13.749	17.379	18.781	19.449
Slovenia	17.381	12.673	12.523	12.673	14.386	18.744	18.858	18.202

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Source: WIIW - Handbook of Statistics, Countries in Transition 1998

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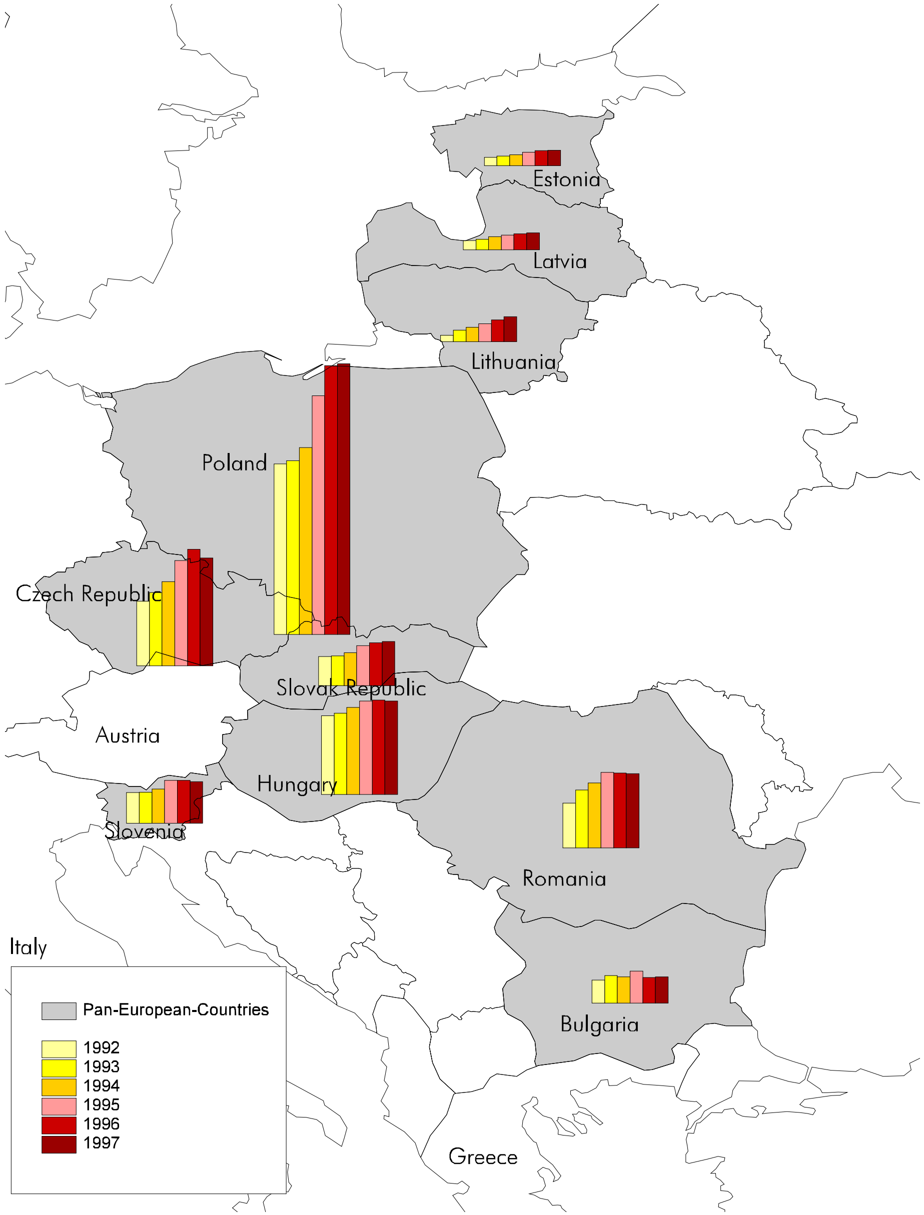
All countries except Bulgaria show an increase in total GDP up to 1996. From 1996 to 1997, GDP decreases slightly on average. Estonia, Latvia and Lithuania have the highest growth rates of GDP of the ten Central and Eastern European countries from 1991 to 1997. Romania is the only country with a decline in total GDP. From 1991 to 1993, it fell by about 30%, then increased until 1995, after which it once again decreased.



Pan-European-Countries

GDP in Million US$ (nominal)

Developement 1992 to 1997

GDP in Million US$ - nominal						
Country	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Bulgaria	8.605	10.812	10.148	13.106	9.946	10.202
Czech Republic	29.966	34.440	39.912	50.799	56.460	52.018
Estland	1.000	1.700	2.300	3.600	4.400	4.500
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Slovenia	12.523	12.673	14.386	18.744	18.858	18.202

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Table 3 traces trends in GDP per capita for the ten Central and Eastern European countries.

Table 3. **Trends in GDP per capita in the ten Central and Eastern European countries**

GDP in US$ per Capita								
Country	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Bulgaria		940	1.008	1.276	1.147	1.559	1.189	1.227
Czech Republic	3.114	2.467	2.904	3.334	3.861	4.917	5.473	5.049
Estonia		375	667	1.133	1.533	2.400	2.933	3.048
Hungary	3.189	3.228	3.608	3.745	4.046	4.367	4.441	4.415
Latvia		370	577	846	1.440	1.760	2.000	2.178
Lithuania				730	1.135	1.595	2.135	2.579
Poland	1.547	1.999	2.198	2.232	2.402	3.086	3.484	3.507
Romania	1.648	1.244	859	1.159	1.323	1.564	1.555	1.545
Slovak Republic	2.919	2.052	2.213	2.251	2.571	3.240	3.495	3.613
Slovenia	8.699	6.331	6.275	6.366	7.233	9.431	9.471	9.162

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Source: WIIW - Handbook of Statistics, Countries in Transition 1998

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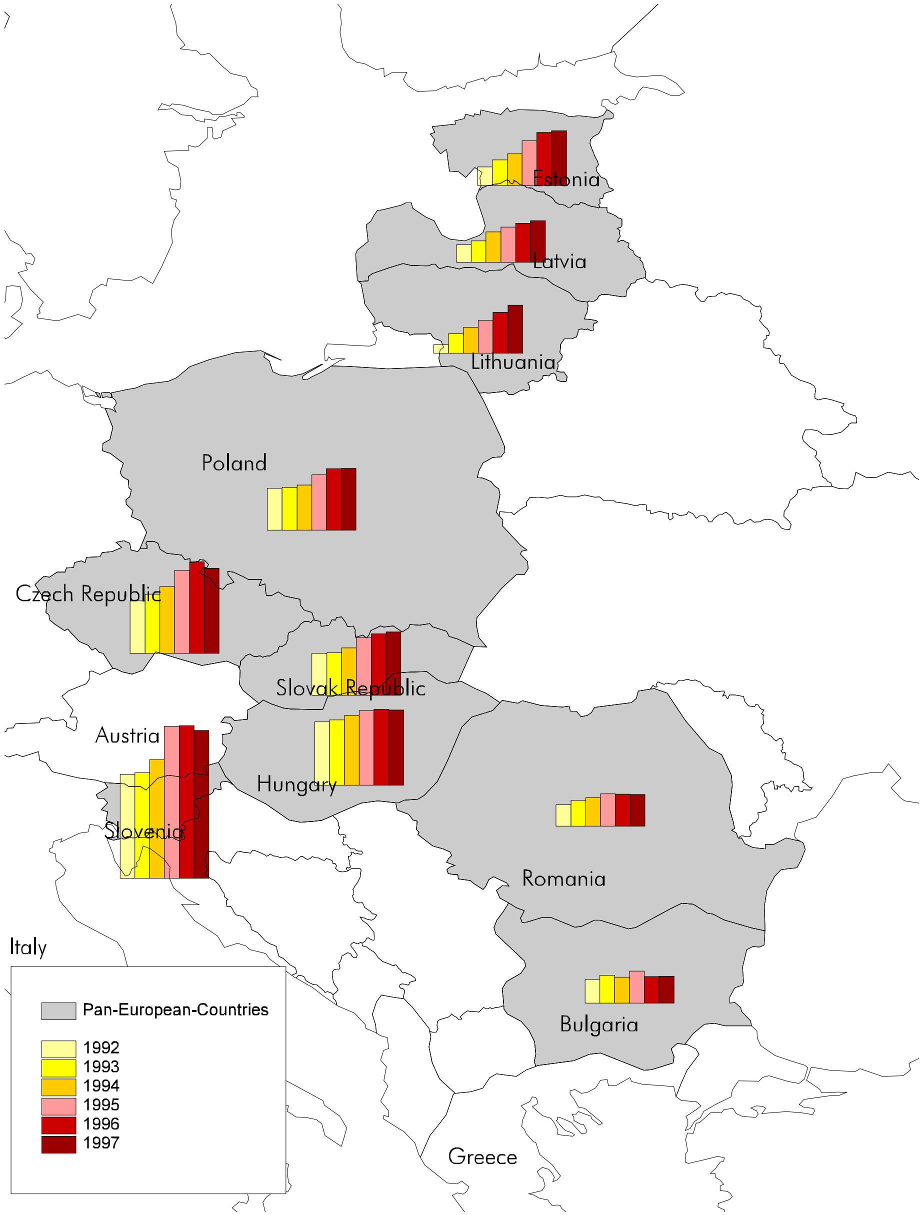
The evolution of GDP per capita in the ten Central and Eastern European countries follows the same path as overall GDP. In 1997, Bulgaria had the lowest GDP per capita, followed by Romania. Slovenia had the highest, at 7.5 times that of Bulgaria. Hungary had the second highest GDP per capita in 1997, but this was only a little higher than half of the GDP per capita of Slovenia.

Pan-European-Countries

GDP in US$ per Capita

Developement 1992 to 1997



GDP in US$ per Capita						
Country	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Bulgaria	1.008	1.276	1.147	1.559	1.189	1.227
Czech Republic	2.904	3.334	3.861	4.917	5.473	5.049
Estland	667	1.133	1.533	2.400	2.933	3.048
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Slovenia	6.275	6.366	7.233	9.431	9.471	9.162

Source: WIIW - Handbook of Statistics, Countries in Transition 1998
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1.1.3 *Trends in trade (export/ import)*

Tables 4 and 5 present trends in trade for the ten Central and Eastern European countries.

Table 4. **Trends in exports (in USD) in the ten Central and Eastern European countries**

Export in Million US$								
Country	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Bulgaria		3.440	3.922	3.721	3.985	5.355	4.890	4.914
Czech Republic	9.052	7.924	8.779	13.205	14.255	21.647	21.906	22.785
Estonia			500	800	1.300	1.900	1.800	2.800
Hungary	9.551	10.216	10.678	8.908	10.736	12.905	13.120	19.100
Latvia			800	1.100	1.000	1.400	1.500	1.600
Lithuania			1.100	2.000	2.000	2.700	3.400	3.712
Poland	14.322	14.903	13.187	14.143	17.240	22.895	24.440	25.751
Romania	5.775	4.266	4.363	4.892	6.151	7.910	8.085	8.431
Slovak Republic	2.894	3.282	3.709	5.447	6.691	8.579	8.829	8.792
Slovenia	4.118	3.874	5.173	6.083	6.828	8.316	8.310	8.372

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Source: WIIW - Handbook of Statistics, Countries in Transition 1998

Business Central Europe - Key Data 1990-1998, http://www.bcemag.com/_bcedb/history.idc

Already in 1990, Poland ranked highest in terms of exports, followed by Hungary and the Czech Republic. With short breaks in the early 1990s, the exports of these three countries increase and are much higher than those of the other countries. Estonia, Lithuania and Latvia had the lowest amounts of exports, but these more than doubled by 1997.

Table 5. **Trends in imports (in USD) in the ten Central and Eastern European countries**

Import in Million US$								
Country	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Bulgaria		2.706	4.468	4.757	4.185	5.658	5.074	4.886
Czech Republic	9.815	7.082	10.382	12.859	14.971	25.252	27.716	27.177
Estonia			600	1.000	1.700	2.500	2.800	4.300
Hungary	8.622	11.438	11.120	12.630	14.620	15.406	16.177	21.211
Latvia			1.000	1.100	1.300	1.900	2.300	2.600
Lithuania			1.000	2.200	2.200	3.400	4.300	5.797
Poland	9.528	15.522	15.913	18.834	21.569	29.049	37.136	42.307
Romania	9.203	5.793	6.260	6.522	7.109	10.278	11.435	11.279
Slovak Republic	3.212	3.607	3.833	6.334	6.611	8.771	11.121	10.263
Slovenia	4.727	4.131	4.923	6.501	7.304	9.492	9.421	9.358

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Source: WIIW - Handbook of Statistics, Countries in Transition 1998

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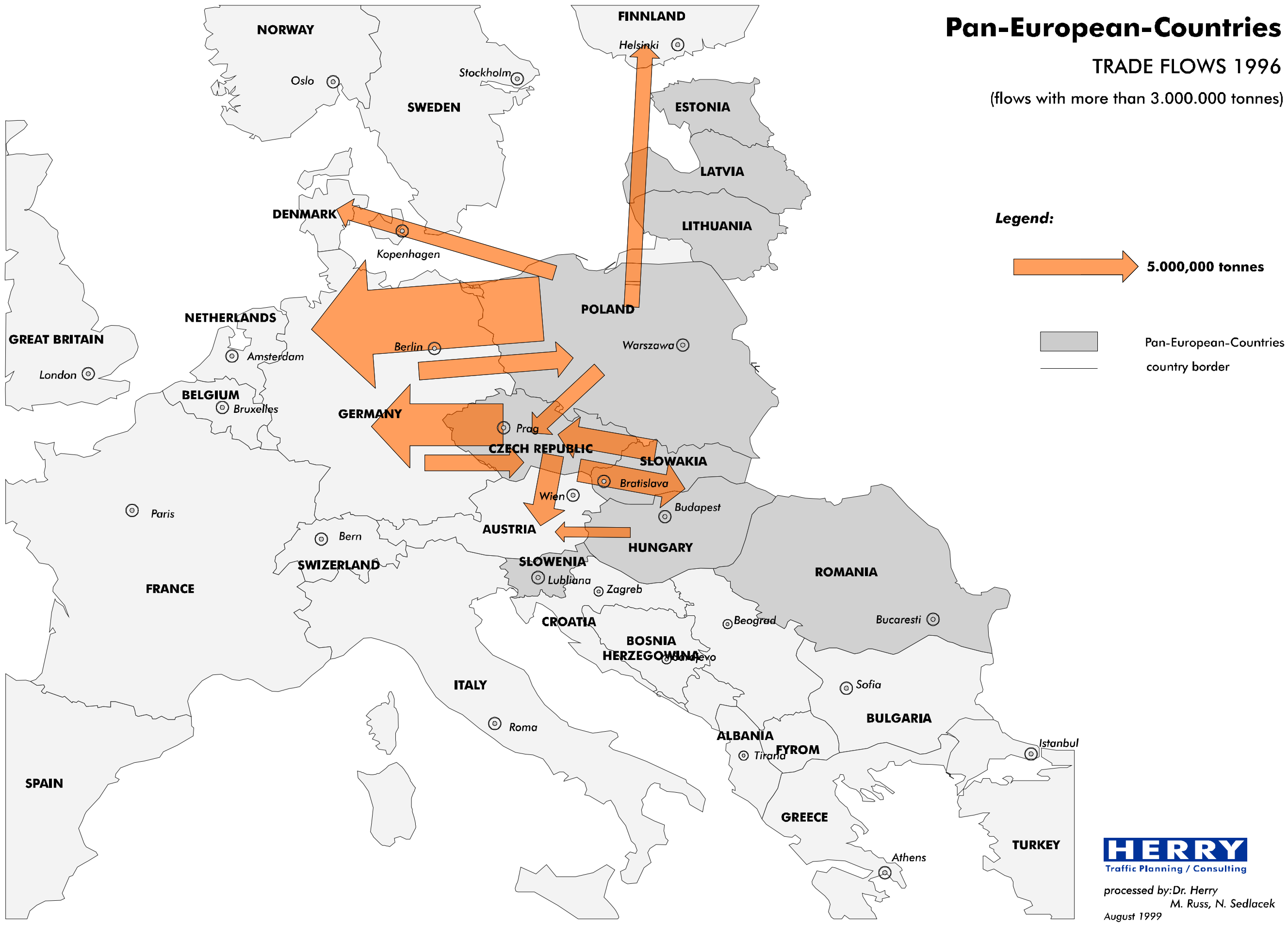
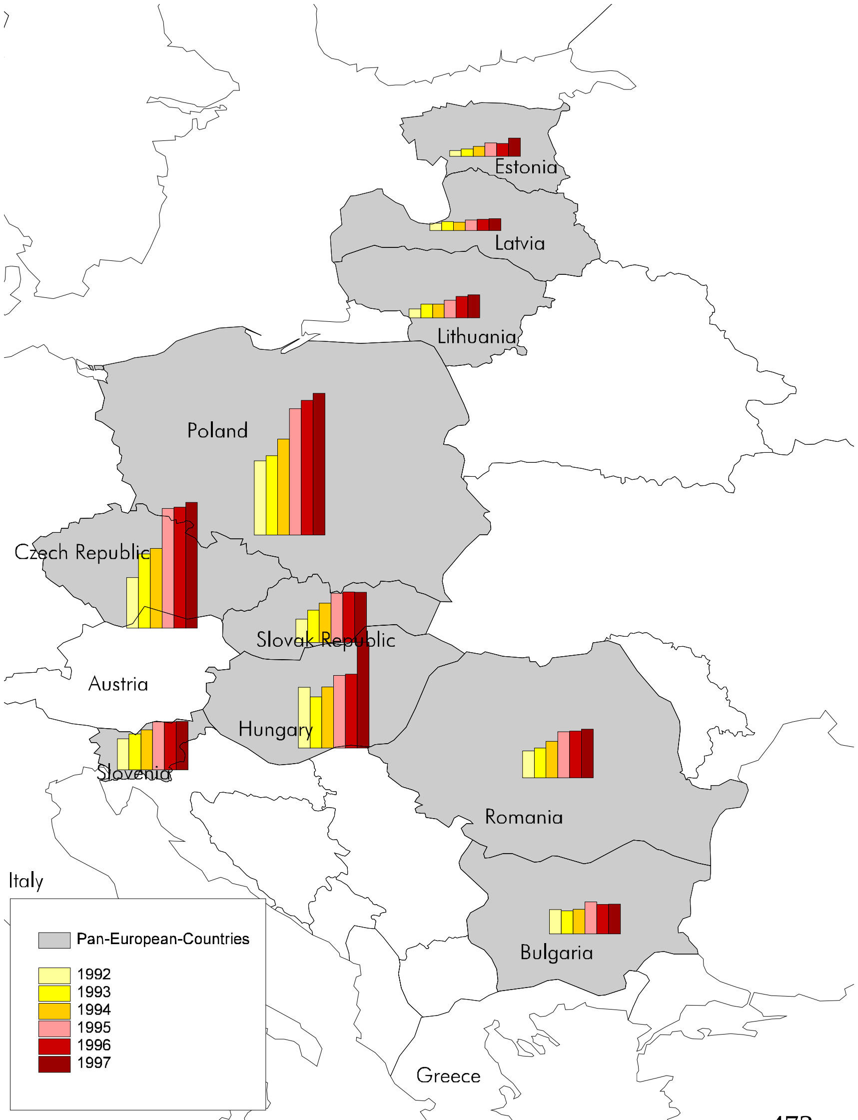
Trends in imports of the ten Central and Eastern European countries are similar to those for exports. Poland saw a remarkable increase in imports. Within eight years, its imports rose from USD 9.53 million to USD 42.31 million. Imports of the Czech Republic and Hungary also increased, but at a lesser rate. As in the case of exports, the smallest amounts of imports were in Latvia, Lithuania and Estonia, but the figures were rising. In 1997, Lithuania’s imports exceeded those of Bulgaria, which experienced a decrease in imports since 1995.

Map 2: **Trade flows of the ten Central and Eastern European countries**





Pan-European-Countries

Export in Million US$

Developement 1992 to 1997

Export in Million US$						
Country	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Bulgaria	3.922	3.721	3.985	5.355	4.890	4.914
Czech Republic	8.779	13.205	14.255	21.647	21.906	22.785
Estland	500	800	1.300	1.900	1.800	2.800
Hungary	10.678	8.908	10.736	12.905	13.120	19.100
Letland	800	1.100	1.000	1.400	1.500	1.600
Litauen	1.100	2.000	2.000	2.700	3.400	3.712
Poland	13.187	14.143	17.240	22.895	24.440	25.751
Romania	4.363	4.892	6.151	7.910	8.085	8.431
Slovak Republic	3.709	5.447	6.691	8.579	8.829	8.792
Slovenia	5.173	6.083	6.828	8.316	8.310	8.372

Source: WIIW - Handbook of Statistics, Countries in Transition 1998
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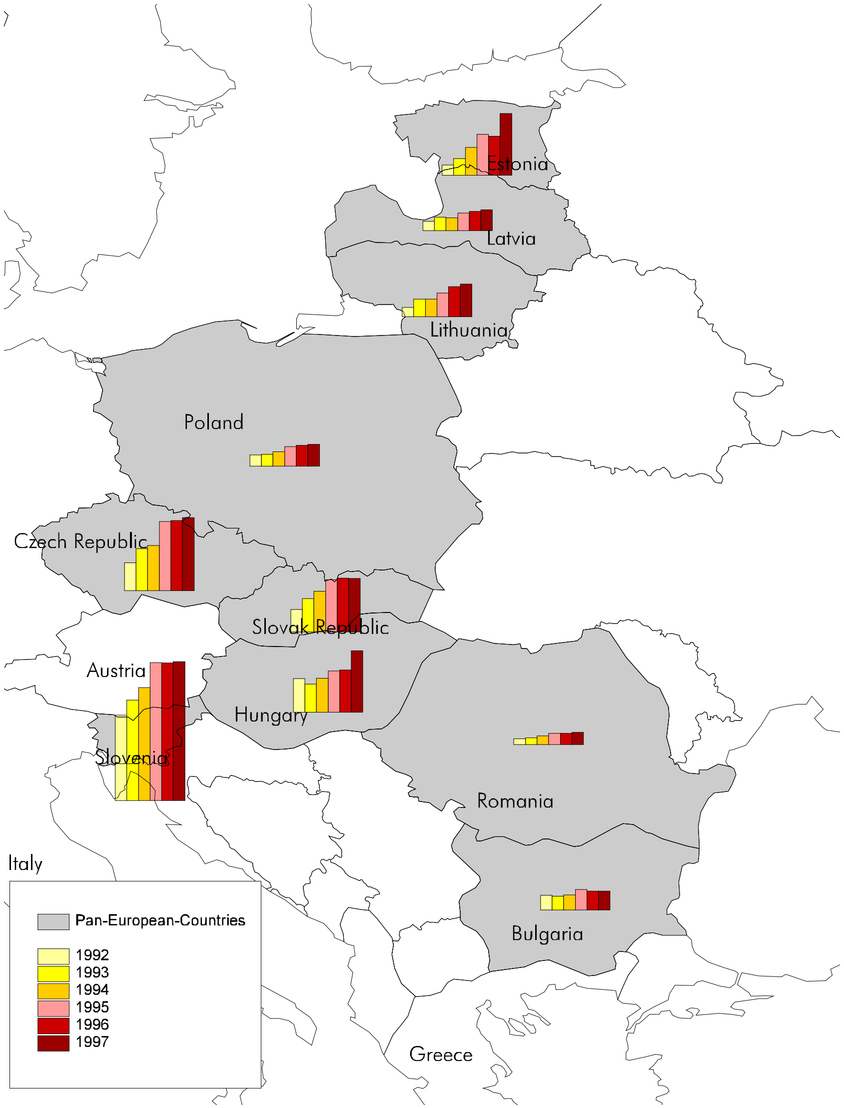

Pan-European-Countries

Export in US$ per Capita

Developement 1992 to 1997

Export in US$ per Capita						
Country	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Bulgaria	459	439	472	637	585	591
Czech Republic	851	1.278	1.379	2.095	2.124	2.211
Estland	333	533	867	1.267	1.200	1.897
Hungary	1.034	865	1.046	1.262	1.287	1.881
Letland	308	423	400	560	600	645
Litauen	297	541	541	730	919	999
Poland	344	368	447	593	633	666
Romania	191	215	271	349	358	374
Slovak Republic	699	1.023	1.251	1.599	1.643	1.633
Slovenia	2.592	3.056	3.433	4.184	4.173	4.214

Source: WIIW - Handbook of Statistics, Countries in Transition 1998
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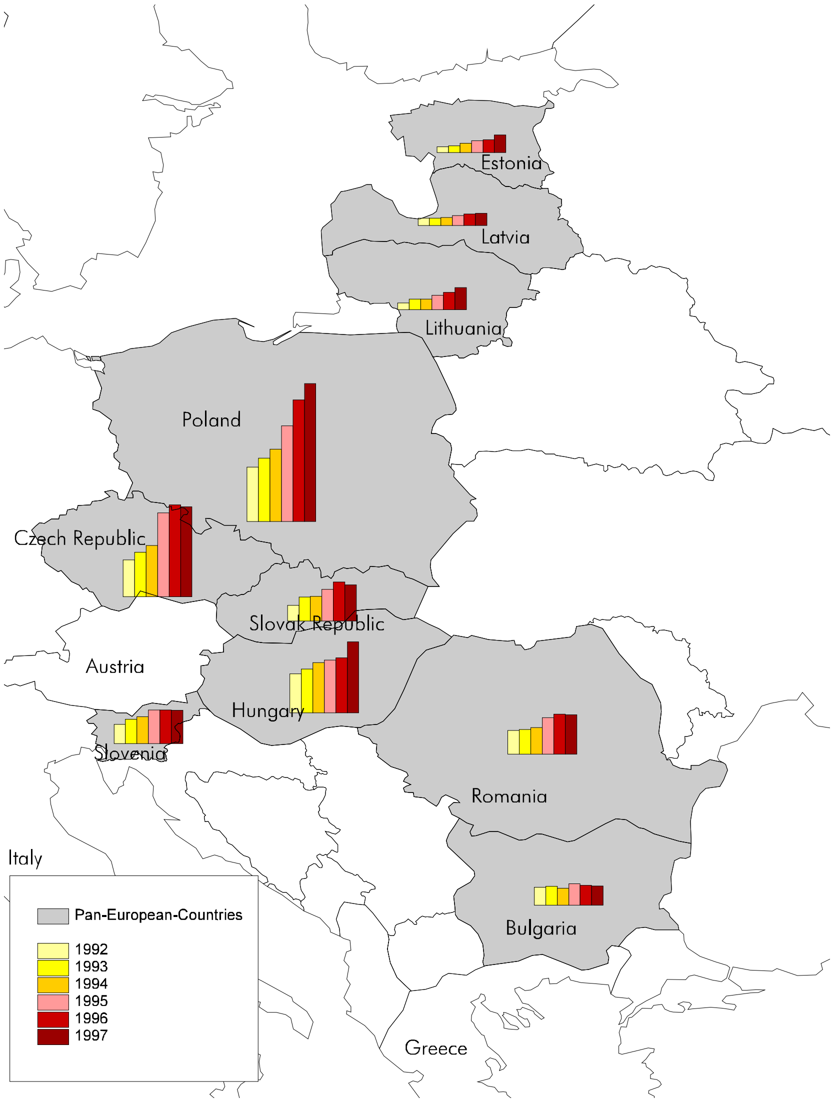

Pan-European-Countries

Import in Million US$

Developement 1992 to 1997

Import in Million US$						
Country	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Bulgaria	4.468	4.757	4.185	5.658	5.074	4.886
Czech Republic	10.382	12.859	14.971	25.252	27.716	27.177
Estland	600	1.000	1.700	2.500	2.800	4.300
Hungary	11.120	12.630	14.620	15.406	16.177	21.211
Letland	1.000	1.100	1.300	1.900	2.300	2.600
Litauen	1.000	2.200	2.200	3.400	4.300	5.797
Poland	15.913	18.834	21.569	29.049	37.136	42.307
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Slovenia	4.923	6.501	7.304	9.492	9.421	9.358

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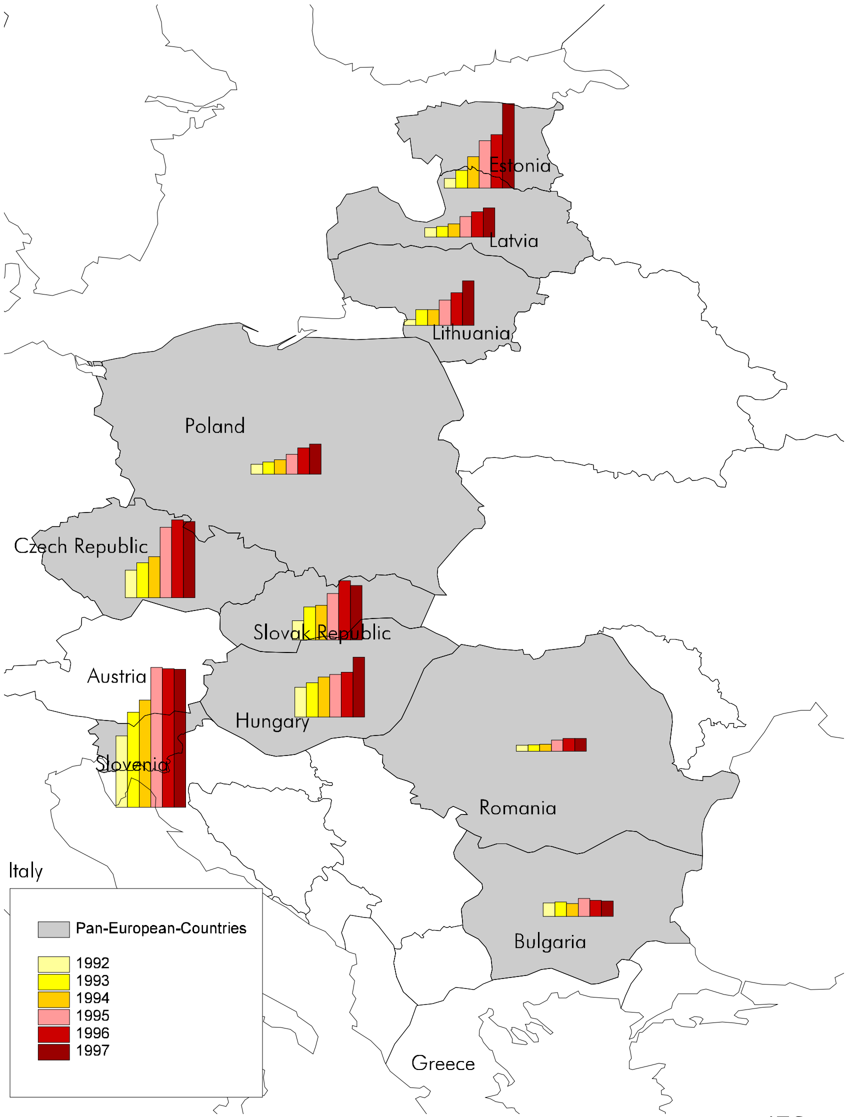

Pan-European-Countries

Import in US$ per Capita

Developement 1992 to 1997

Import in US$ per Capita						
Country	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Bulgaria	523	561	496	673	607	588
Czech Republic	1.006	1.245	1.448	2.444	2.687	2.638
Estland	400	667	1.133	1.667	1.867	2.913
Hungary	1.077	1.227	1.425	1.506	1.587	2.089
Letland	385	423	520	760	920	1.048
Litauen	270	595	595	919	1.162	1.560
Poland	415	490	560	753	961	1.095
Romania	275	287	313	453	506	500
Slovak Republic	722	1.190	1.236	1.635	2.069	1.907
Slovenia	2.467	3.266	3.672	4.776	4.732	4.710

Source: WIIW - Handbook of Statistics, Countries in Transition 1998
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1.2. Transport figures

1.2.1 Transport infrastructure

General figures for the network infrastructure of the ten Central and Eastern European countries under consideration are shown in the following table.

Table 6. **Transport infrastructure**

8.10

Transport Infrastructure

km

1996	BG	CZ	SK	EST	H	LT	LV	PL	RO	SLO	CEC
Motorways	314	423	215	65	365	404	0	258	113	310	2 467
State roads	3030	55088	3073	15303	6487	20717	7037	45376	14570	1370	172 051
Provincial/local roads	33943	66449	3921	58800	23197	39161	44618	329315	58477	13189	671 070
All Roads	37287	121960	17867	44168	30049	60282	51655	374949	73160	14869	826 246
Railway lines	4293	9435	3673	1020	7715	1997	2413	23420	11385	1201	66 652
of which electrified	2710	2859	1516	132	2353	122	271	11626	3960	499	26 048
Inland waterways	470	630	172	320	1373	369	347	3812	1613	0	9 106
Oil pipelines	578	736	0	0	2071	399	766	2278	3546	0	10 374
Area (1000 km2)	110.9	78.9	49.0	45.2	93.0	65.3	64.6	312.7	238.6	20.3	1 079
Railway lines density (length of lines/area) m/km²	39	120	75	23	83	31	37	75	48	59	62

Source: *UN-ECE*

Note : The railways of Estonia, Latvia and Lithuania are broad gauge (1524 mm)

Source: EU Transport in Figures, Statistical Pocket Book, July 1999**.**

The average line density of the railways is 62 m/km². Hungary's line density stands out, as it is nearly double the average. Estonia has the smallest line density, followed by Latvia and Lithuania. In terms of roads in the ten Central and Eastern European countries, Latvia has a noteworthy lack of motorways. In comparison to the remaining countries, Estonia has only a few motorways, but Lithuania, the third Baltic country, possesses the second highest length of motorways of the ten countries, after the Czech Republic.

1.2.2 Passenger cars - total stock and per capita

Table 7 shows the stock of passenger cars for the ten Central and Eastern European countries.

Table 7. **Passenger cars – vehicle stock**

Passenger Cars 8.9

Vehicle stock million

	BG	CS	CZ	SK	EST	H	LT	LV (1)	PL	RO	SLO	CEC	index 1985 =100
1970	0.16	1.00			0.03	0.24	0.05	0.04	0.48	0.04	0.18	2.2	20
1980	0.82	2.12			0.13	1.11	0.25	0.17	2.63	0.24	0.42	7.9	71
1985	1.06	2.73			0.18	1.44	0.34	0.22	3.67	0.95	0.50	11.1	100
1989	1.27	3.12			0.23	1.73	0.45	0.27	4.85	1.22	0.55	13.7	123
1990	1.32	3.24			0.24	1.94	0.49	0.28	5.26	1.29	0.58	14.6	132
1992	1.36	3.48			0.28	2.06	0.57	0.35	6.51	1.59	0.61	16.8	152
1993	1.40		2.69	1.00	0.32	2.09	0.60	0.39	6.77	1.79	0.63	17.7	159
1994	1.59		2.97	0.99	0.34	2.18	0.65	0.42	7.15	2.02	0.66	19.0	171
1995	1.65		3.24	1.02	0.38	2.28	0.72	0.33	7.51	2.20	0.70	20.0	181
1996	1.71		3.32	1.06	0.41	2.43	0.79	0.38	8.05	2.39	0.73	21.3	192
1997	*1.75*		3.56	1.14	0.43	2.43	0.88	0.43	8.53	2.60	0.77	22.5	203
Cars per 1000 inhabitants :													
1997	209		348	211	293	241	238	175	221	115	390	215	

Source: Eurostat, ECMT, IRF, national statistics *estimates in italic* underlined: change in time series

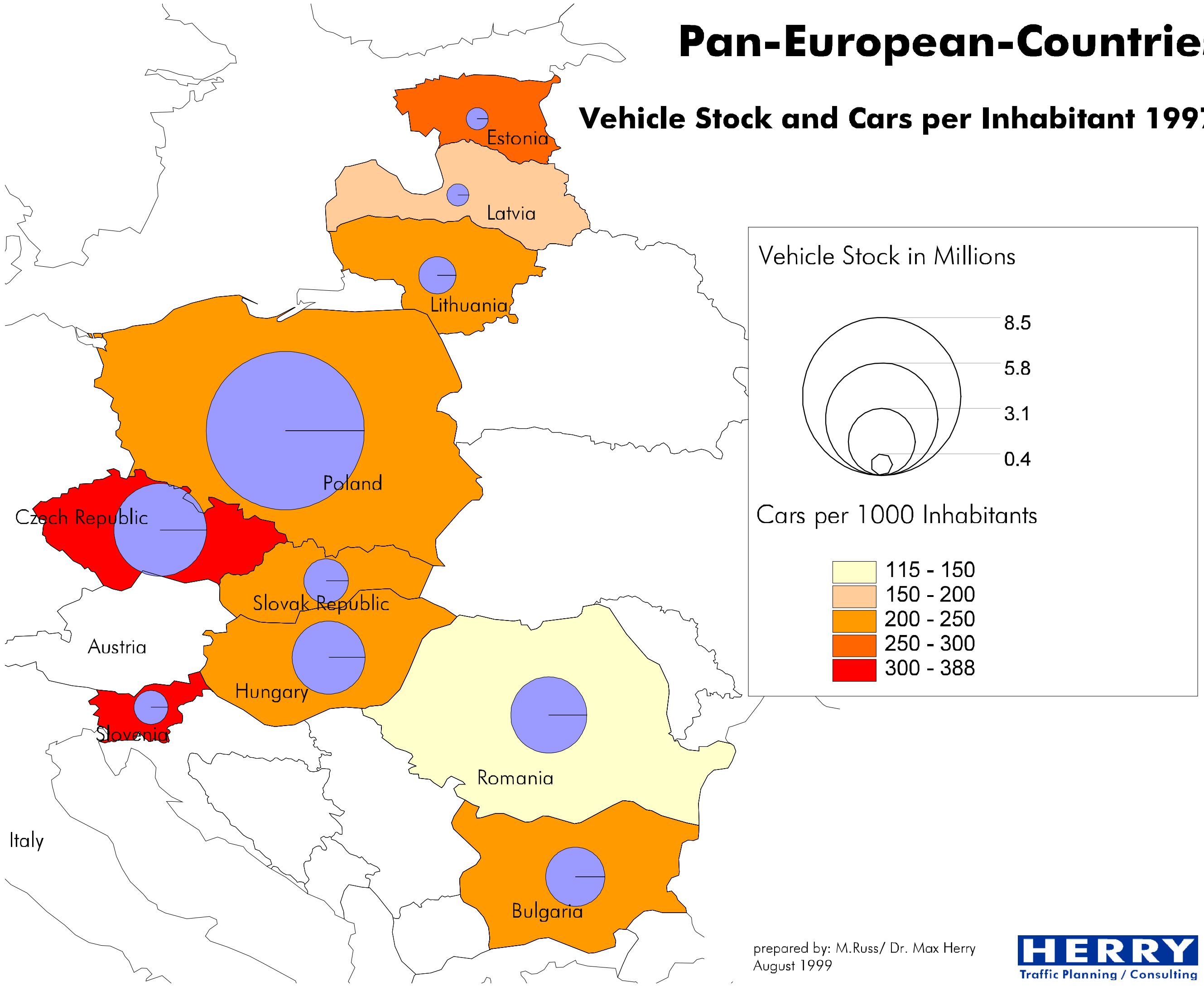
(1) change in vehicle register, vehicle stock overestimated before 1994 CEC passenger car traffic in 1997: ca. 400 bio pkm

Source: EU Transport in Figures, Statistical Pocket Book, July 1999.

In 1997, the ten Central and Eastern European countries had an average of 215 cars per 1 000 inhabitants. Slovenia has the highest number of cars per inhabitant, followed by the Czech Republic. Romania has the lowest number of cars per inhabitant. The “middle field” consists of Bulgaria, the Slovak Republic, Lithuania and Poland.

Pan-European-Countries

Vehicle Stock and Cars per Inhabitant 1997



prepared by: M.Russ/ Dr. Max Herry
August 1999

HERRY Traffic Planning / Consulting

1.2.3 Passenger transport

Table 8 presents volume of traffic figures for the ten Central and Eastern European countries.

Table 8. **Passenger traffic of the ten Central and Eastern European countries, 1995**

Total passenger traffic 1995 billion passenger trips		
domestic	**international**	**Total**
2.32	**0.40**	**2.72**

Selected countries: Poland, Czech Republic, Slovak Republic, Hungary, Romania, Bulgaria, Albania, Estonia, Latvia, Lithuania, FYROM, BIH, Slovenia.
Source: NEA, INRETS, IWW: Traffic Forecast on the Ten Pan-European Transport Corridors of Helsinki, 1999.

Table 9 shows trends in rail traffic in the ten Central and Eastern European countries.

Table 9. **Passenger transport – railways**
(1 000 million pkm)

Passenger Transport — 8.7

Railways

1000 mio pkm

	BG	CS	CZ	SK	EST	H	LT	LV	PL	RO	SLO	CEC	index 1985 =100
1970	6.2	20.5			1.2	15.2	2.1	3.8	36.9	17.8	1.5	**106.2**	80
1980	7.1	18.0			1.6	13.7	3.3	4.8	46.3	23.2	1.4	**119.4**	90
1985	7.8	19.8			1.6	9.6	3.4	5.2	52.0	31.1	1.7	**132.2**	100
1989	7.6	19.7			1.6	9.6	3.5	5.6	55.9	35.5	1.4	**140.3**	106
1990	7.8	19.4			1.5	9.2	3.6	5.4	50.4	30.6	1.4	**129.3**	98
1992	5.4	16.9			1.0	6.9	2.7	3.7	32.6	24.3	0.5	**94.0**	71
1994	5.1		8.5	4.5	0.5	6.4	1.6	1.8	21.8	18.3	0.6	**69.1**	52
1995	4.7		8.0	4.2	0.4	6.2	1.1	1.4	21.0	18.9	0.6	**66.5**	50
1996	5.1		8.1	3.8	0.3	6.4	0.9	1.2	19.8	18.4	0.6	**64.5**	49
1997	5.9		7.7	3.1	0.3	6.5	0.8	1.1	19.9	15.8	0.6	**61.7**	47
1998	4.7		7.0	3.1	0.2	6.8	0.7	1.1	20.6	13.4	0.6	**60.2**	44
passenger-km per person per year													
1997	704		756	575	179	645	206	464	516	699	314	**589**	

Source: UIC, ECMT (1970-1980 results), 1998 results are provisional

Source: EU Transport in Figures, Statistical Pocket Book, July 1999.

In 1997 the average distance travelled by one person by train was 589 km. Average kilometres travelled per person and per year were much above the average in the Czech Republic, Bulgaria and Romania, while Estonia and Lithuania ranked last.

Table 10. **Passenger transport – buses and coaches**
(1 000 million pkm)

Passenger Transport 8.8

Buses and Coaches
1000 mio pkm

	BG	CS	CZ	SK	EST	H	LT	LV	PL	RO	SLO	CEC	index 1985 =100
1970	12.2	21.4			2.6	13.6	4.9	3.3	29.1	7.9	2.6	97.7	52
1980	21.6	33.8			3.7	26.4	6.7	4.6	49.2	24.0	4.9	174.8	94
1985	24.7	36.6			4.3	28.0	7.4	5.0	52.1	21.7	6.5	186.3	100
1990	25.9	43.4			4.5	24.1	6.7	5.9	46.3	24.0	6.6	187.2	100
1991	18.9	43.1			3.8	22.3	6.5	4.5	41.7	20.6	4.4	166.8	89
1992	16.8	35.0			3.0	19.4	5.2	2.6	39.0	25.3	3.4	149.7	80
1993	14.0		21.9	11.5	2.5	19.2	3.7	1.7	37.8	19.8	2.8	134.9	72
1994	12.1		16.0	10.9	2.4	18.6	3.8	1.8	34.3	25.0	2.6	127.4	68
1995	11.5		11.0	11.2	2.1	19.1	3.3	1.8	34.0	22.9	2.5	119.5	64
1996	9.2		9.7	11.1	2.1	19.0	2.9	1.6	32.0	12.8	2.4	102.9	55
1997	8.4		8.8	10.6	2.2	18.8	2.6	1.7	33.1	13.5	2.4	102.2	55
passenger-km per person per year													
1997	1 005		863	1 968	1 534	1 863	701	696	857	599	1 224	976	

Source: ECMT
Note : other modes, billion pkm 1997: air 17.8, ship: 0.55, tram/metro: 15, private car: ca. 400(estimat

Source: EU Transport in Figures, Statistical Pocket Book, July 1999.

In 1997, the average distance travelled by one person by bus and coach was 976 km. Average kilometres per person and per year were much above the average in Slovakia, followed by Hungary and Estonia, while Latvia and Lithuania ranked last.

1.2.4 Goods transport

Trends in goods transport by road in the ten Central and Eastern European countries is shown in Table 11 and the following figure.

Table 11. **Goods transport by road (1 000 million tkm)**

Goods Transport — 8.3

Road

Transport on the territory — 1000 mio tkm

	BG	CS	CZ	SK	EST	H	LT	LV	PL	RO	SLO	CEC	index 1985 = 100	% of all tkm
1970	7.0	10.1			2.4	5.8	3.4	2.9	15.8	5.2	2.1	54.6	41	15.4
1980	13.1	21.3			4.2	11.4	6.9	5.1	44.6	11.8	3.9	122.3	91	22.8
1985	13.5	21.5			4.4	12.7	7.4	5.9	36.6	27.9	4.7	134.6	100	25.6
1989	15.1	23.2			4.8	14.5	8.1	6.0	38.4	30.0	4.6	144.8	108	27.1
1990	13.8	23.3			4.5	15.2	7.3	5.9	40.3	29.0	4.9	144.1	107	31.5
1991	8.0	17.4			3.8	14.0	7.0	4.9	39.6	20.7	4.3	119.8	89	33.1
1992	7.0	14.0			1.5	12.8	5.0	2.5	42.0	15.7	2.8	103.3	77	33.7
1993	8.5		13.0	5.5	1.1	13.4	6.9	1.3	40.7	15.4	2.8	108.6	81	36.1
1994	10.0		22.7	4.9	1.4	13.0	4.6	1.4	45.4	18.3	2.4	124.1	92	39.6
1995	11.0		20.8	5.2	1.6	13.0	5.2	1.8	51.2	19.7	2.4	131.8	98	39.7
1996	11.5		30.1	5.2	1.9	13.1	4.2	2.2	56.5	19.8	2.3	146.7	109	42.0
National and international traffic by vehicles registered in the country														
1997	6.3		40.6	7.3	2.2	18.5	4.7	3.4	63.5	9.2	5.0	160.7	n.a.	44.3

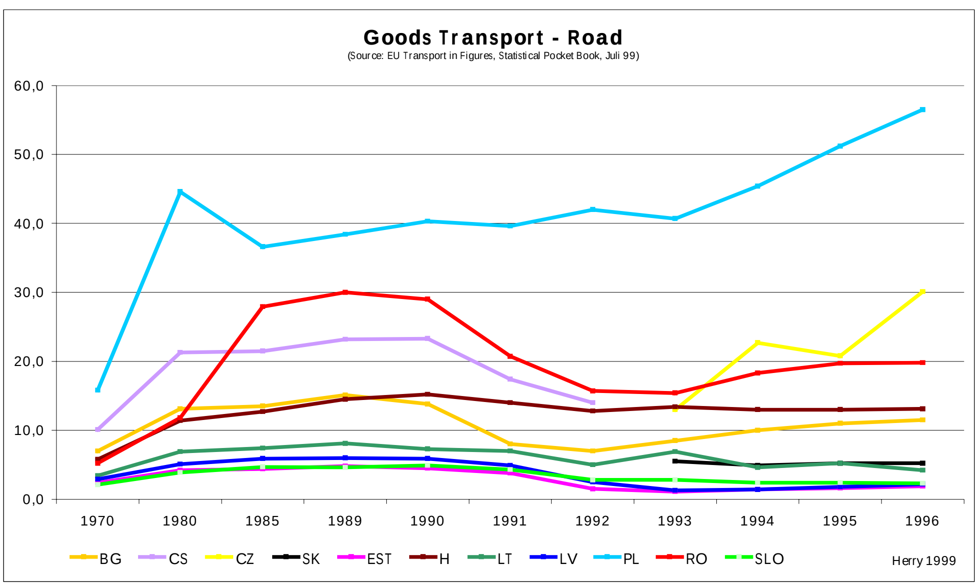
Source: ECMT, national statistics, Eurostat

Note : 1997 data : results of the 1997 Eurostat pilot surveys

underlined: break in time series.

Source: EU Transport in Figures, Statistical Pocket Book, July 1999.

Figure 1. **Goods transport - Road (1 000 million tkm)**



Poland has by far the highest level of goods transport by road. Goods transport by road increased strongly in Romania in the late 1980s, decreased by about 50% until 1993, and has since increased again. The growth rate in the Czech Republic is noteworthy.

Table 12 and the following figure show trends in goods transport by rail in the ten Central and Eastern European countries.

Table 12. **Goods transport - Rail (1 000 million tkm)**

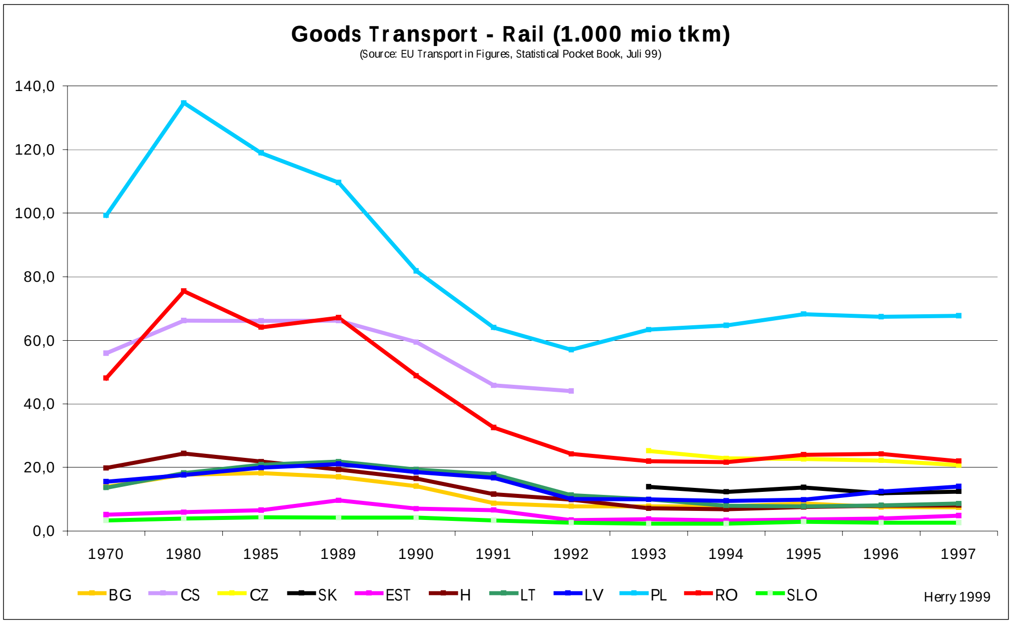
Goods Transport — **Railways** — 1000 mio tkm — **8.4**

	BG	CS	CZ	SK	EST	H	LT	LV	PL	RO	SLO	CEC	index 1985 =100	% of all tkm
1970	13.9	55.9			5.1	19.8	13.6	15.5	99.3	48.1	3.3	**274.3**	81	77.3
1980	17.7	66.2			5.9	24.4	18.2	17.6	134.7	75.5	3.9	**364.2**	107	67.8
1985	18.2	66.1			6.5	21.8	20.9	19.9	118.9	64.1	4.3	**340.6**	100	64.9
1989	17.0	66.2			9.6	19.3	21.8	21.1	109.6	67.1	4.2	**335.9**	99	62.9
1990	14.1	59.4			7.0	16.5	19.3	18.5	81.8	48.8	4.2	**269.5**	79	58.9
1991	8.7	45.8			6.6	11.6	17.8	16.7	64.0	32.5	3.3	**207.0**	61	57.2
1992	7.8	44.0			3.4	9.8	11.3	10.1	57.0	24.2	2.6	**170.2**	50	55.5
1993	7.7		25.2	13.9	3.7	7.1	9.9	9.9	63.3	21.9	2.3	**164.8**	48	54.8
1994	7.8		22.8	12.3	3.3	6.8	8.0	9.5	64.7	21.6	2.3	**159.1**	47	50.8
1995	8.6		22.6	13.7	3.6	7.5	7.7	9.8	68.2	24.0	2.9	**168.5**	49	50.7
1996	7.5		22.2	11.9	3.9	8.0	8.1	12.4	67.4	24.2	2.6	**168.2**	49	48.1
1997	7.4		20.7	12.4	4.8	8.1	8.6	14.0	67.7	22.0	2.6	**168.3**	49	46.4

Source: UIC, ECMT — 1998: (provisional): 153.4 (-8.8 %)

Source: EU Transport in Figures, Statistical Pocket Book, July 1999

Figure 2. **Goods transport - Rail (1 000 million tkm)**



As for goods transport by road, Poland leads in level of goods transport by rail. In Romania, the level of goods transport has decreased markedly since the late 1980s. Since 1993, there has been a minimal increase in goods transport by rail in all ten countries.

Table 13 and the following figure show trends in goods transport by inland waterway in the ten Central and Eastern European countries.

Table 13. **Goods transport - Inland waterways (1 000 million tkm)**

Goods Transport 8.5

Inland Waterways

1000 mio tkm

	BG	CS	CZ	SK	EST	H	LT	LV	PL	RO	SLO	CEC	index 1985 =100	% of all tkm
1970	1.83	2.43			0.01	1.76	0.12	0.05	2.30	1.35		9.9	77	2.8
1980	2.61	3.59			0.01	2.15	0.15	0.09	2.33	2.35		13.3	104	2.5
1985	2.00	4.36			0.01	2.14	0.17	0.30	1.41	2.35		12.7	100	2.4
1989	1.95	5.10			0.01	2.11	0.17	0.30	1.19	3.70		14.8	114	2.7
1990	1.61	4.42			0.00	2.04	0.16	0.29	1.03	2.09		11.6	91	2.5
1991	1.02	3.89			0.00	1.72	0.14	0.34	0.74	2.03		9.9	78	2.7
1992	0.84	2.98			0.00	1.60	0.05	0.40	0.75	1.89		8.6	67	2.8
1993	0.46		1.26	0.84	0.00	1.62	0.05	0.00	0.66	1.59		6.5	51	2.2
1994	0.36		1.19	0.85	0.00	1.35	0.03	0.00	0.79	1.90		6.5	51	2.1
1995	0.73		1.32	1.23	0.00	1.26	0.02	0.00	0.88	3.11		8.6	67	2.6
1996	0.63		1.10	1.60	0.00	1.34	0.01	0.00	0.85	3.77		9.3	73	2.7
1997	0.68		0.74	1.52	0.00	1.64	0.01	0.00	0.93	4.33		9.9	77	2.7

Source: ECMT, national statistics *Estimates in italic*

Source: EU Transport in Figures, Statistical Pocket Book, July 1999.

From 1970 to 1997, goods transport by inland waterway decreased in all countries under review except Romania, where the level of goods transported by inland waterway increased continuously, with a break in the early 1990s. In 1997, Romania has by far the highest level of goods transport by inland waterway.

2. INVENTORY OF PAN-EUROPEAN INTEGRATION

2.1. Former and existing programmes and actions

2.1.1 PHARE

General remarks

The PHARE Programme is a European Community initiative that supports the development of a larger democratic family of nations within a prosperous and stable Europe. Its aim is to help the countries of central Europe rejoin mainstream Europe through future membership in the European Union.

To this end, PHARE provides grant finance to support its partner countries through the process of economic transformation and the strengthening of democracy to the point where they are ready to assume the obligations of EU membership. PHARE provides know-how from a wide range of non-commercial, public and private organisations to its partner countries. It acts as a powerful catalyst by unlocking funds for important projects from other donors through studies, capital grants, guarantee schemes and credit lines. It also invests directly in infrastructure, which should account for more PHARE funds as the integration process progresses.

The main priorities for PHARE funding are common to all countries and include restructuring of state enterprises, including agriculture, private sector development, reform of institutions, legislation and public administration, reform of social services, employment, education and health, development of energy, transport and telecommunications infrastructure and environmental and nuclear safety. For countries that have signed Europe Agreements, PHARE is the financial instrument of the European Union's pre-accession strategy for leading them to full membership.

The PHARE programme is the world's largest grant assistance effort for Central and Eastern Europe.

The partner countries

PHARE partner countries fall into two basic groups:

- Those that have applied to become members of the European Union (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia).
- Those that have not done so [Albania, Bosnia and Herzegovina, and the former Yugoslav Republic of Macedonia (FYROM)].

(Croatia was suspended from the PHARE Programme in 1995.)

Expansion of the PHARE programme to the partner countries					
1989	**1990**	**1991**	**1992**	**1993**	**1996**
Poland	Bulgaria	Albania	Estonia	Czech Republic	Bosnia
Hungary	CSFR	Romania	Latvia	Slovakia	FYROM
	Yugoslavia		Lithuania		
	E. Germany		Slovenia		

East Germany was included in the PHARE programme until reunification.

Aid to Yugoslavia was suspended in 1991.

The Czech Slovak Federal Republic (CFSR) was replaced by the Czech Republic and Slovakia.

Programme types

– Multi-annual indicative programmes

Each year an overall sum is made available to PHARE from the general budget of the European Union. It is divided up between the various countries, taking into account, among other things, the country-specific orientations agreed in the PHARE Management Committee. The partner country determines its priorities for support and makes an agreement with the European Commission. A Multi-annual Indicative Programme (MIP), covering a period of several years, is drawn up and signed by both sides. The MIP outlines the objectives and priorities of the programme, the proposed time scale, the actions foreseen for each sector of activity and the approximate budget to be allocated to each.

– National programmes

Most programmes are national programmes, agreed bilaterally with each partner country. National programmes account for around 78% of total commitments over the 1990-96 period. PHARE support within these national programmes has traditionally focused on a number of key priority sectors in which reform and changes are needed to move from a centrally planned to a market-oriented system.

For each country a Country Operational Programme (COP) is agreed annually; it describes the components for which funds are to be committed in a specific financial year. The COP is accompanied by Sector Operational Programmes (SOPs), which detail for each sector the components to be implemented, including activities, timetables and budget breakdowns.

The COP and SOPs are submitted for an opinion to the PHARE Management Committee. Upon formal approval by the European Commission, a Financing Memorandum is signed with the partner country for its respective COP. The Financing Memorandum contains the formal commitment of the EU to finance the measures described therein.

– Financing Memoranda (after 1997)

In its original form, the traditional programming described above holds good for programmes agreed under the 1995, 1996 and 1997 COPs. Projects agreed under these programmes are still being contracted and will therefore follow the traditional cycle, as will programmes agreed with the three non-candidate countries.

However, a new approach was adopted in early 1998 based on the Accession Partnerships; it will be followed in parallel with the traditional system for some time to come. The priorities identified in the Accession Partnerships form the basis of an annual Financing Memorandum, which includes details of the projects and programmes to be financed from that year’s budget. The measures included in each Financing Memorandum are submitted to the PHARE Management Committee for opinion and are subsequently submitted for a formal Commission Decision before the Financing Memorandum is signed with the partner country.

– Cross-border co-operation programmes

Recognising the key importance of the border regions between the Member States and the Central and Eastern European countries, the European Union has, since 1992, financed several measures aimed at enhancing cross-border co-operation, primarily to improve border crossings.

Following the success of the EU’s INTERREG programme, a new budget was made available in 1994 specifically to support co-operation between the PHARE countries and adjoining EU border regions. In 1994, ECU 150 million were budgeted for the PHARE Cross-border Co-operation (CBC) programme, in the overall framework of the PHARE Programme. This programme fosters co-operation among states, regions and interest groups along borders of the EU and the Central and Eastern European countries as a key element of the pre-accession strategy. The programme initially focused on regions with development problems or on areas where border conflicts had taken place. Complementary financing in EU border areas is provided under the INTERREG programme. Financed from Community funds, the INTERREG programme supports co-operation between border regions in EU Member States.

Priorities for cross-border co-operation have primarily been investment in infrastructure and the environment. Support has also focused on the exchange of information and experience across border regions, as well as joint measures in fields such as transport, energy, telecommunications, health, business, technology and tourism.

– Multi-beneficiary programmes

Although most programmes are national programmes, agreed bilaterally with each partner country, many problems facing the countries affect more than one country. PHARE has dealt with these through a range of multi-beneficiary programmes that involve several partner countries at a time. Multi-beneficiary programmes have focused on the environment, telecommunications, energy, transport, nuclear safety, customs and the fight against drugs.

– Horizontal programmes

As a result of the pre-accession strategy, there has also been the need for actions that the European Commission considers essential to the strategy's success, but which have not been requested by the partner countries. Such programmes are collectively known as horizontal programmes and have traditionally accounted for about 5% of the PHARE budget. Horizontal programmes are initiated by the Commission and the partner countries are invited to participate. They primarily concern areas of common interest to the EU and the Central and Eastern European countries, which justify the use of a common or coherent delivery mechanism.

Since 1994, a number of former multi-country programmes have become horizontal programmes. This resulted from changes in the priorities of the partner countries and the Commission's belief that certain programmes were nevertheless still worth pursuing. They include:

- ACE (Action for Co-operation in the Field of Economics)

  Programme designed to promote the exchange of knowledge and expertise in economics between academic and professional economists in the Central European Countries (CEC) and in the European Union (EU).

- The Democracy Programme

  Programme which encourages non-governmental organisations that boost civic society and democracy in their countries by offering grants to projects that fulfil certain conditions.

- JOP (Joint Venture Support Scheme)

  Programme providing grants, equity or equivalent funding, medium- and long-term loans, financial guarantees to promote joint ventures, direct investments in CECs and private investments in productive sectors.

- The LIEN Programme

  Programme providing co-financing grants for projects initiated by non-governmental organisations (NGOs) that wish to stimulate citizens' initiatives and to strengthen the capacity of NGOs based in Central and Eastern Europe, in the Baltic states, in the New Independent States (NIS) and in Mongolia.

- The Partnership Programme

  Programme providing co-financing grants for local development projects initiated by non-profit organisations (NPOs) that wish to build a sustainable partnership with a view to exchange of skills, knowledge and experience.

- Tempus

  Trans-European mobility programme for university studies to help with the modernisation of higher education and the improvement of vocational training in the associated countries.

2.1.2 TACIS[1]

The European Union's TACIS Programme provides grant finance for the transfer of know-how to 12 countries of the former Soviet Union and Mongolia. In so doing, it fosters the development of market economies and democratic societies. It is the largest programme of its kind operating in the region, and has launched more than 3 000 projects worth over ECU 3 290 million since its inception in 1991.

The TACIS Programme is one of the instruments developed by the EU to forge closer economic and political links with the NIS.[2] It operates within the wider context of a deepening and evolving relationship between the EU and the NIS, enshrined in Partnership and Co-operation Agreements that commit both sides to a new level of political, economic and cultural dialogue.

The Programme is managed by the European Commission's DG1A (Directorate General for External Relations: Europe and the New Independent States, Common Foreign and Security Policy and External Service).

2.1.3 Others

OBNOVA

The OBNOVA Programme is a European Community initiative for the rehabilitation and reconstruction of Bosnia and Herzegovina, Croatia, the Federal Republic of Yugoslavia and the Former Yugoslav Republic of Macedonia (FYROM).

The OBNOVA Programme was created in July 1996. It aims to reinforce the Dayton Accord and the peace agreements signed in Paris on 14 December 1995.

The main priorities for OBNOVA funding are:

- Regional co-operation and good neighbourliness projects, as well as transborder projects.
- Rebuilding of infrastructure and other individual or collective facilities damaged in the fighting.

- Consolidation of democracy and civil society.
- Return of refugees.
- Integration or reintegration of refugees, displaced persons and former soldiers into working life.

2.2. Accession process[3]

2.2.1 General remarks

The Copenhagen European Council in 1993 confirmed the legitimacy of Central and Eastern European applications for membership. This marked the start of one of the EU's most ambitious projects in its history. In 1997 the Amsterdam European Council called for accession negotiations to begin in 1998.

The accession process started on 30 March 1998 with a meeting of the foreign ministers of the Member States, the countries of Central and Eastern Europe and Cyprus.

2.2.2 Luxembourg European Council (December 1997)

The Luxembourg Council approved the Commission's analysis in Agenda 2000 and decided that negotiations should commence with five Central and Eastern European countries (the Czech Republic, Estonia, Hungary, Poland and Slovenia) plus Cyprus, and then with the other five countries of Central and Eastern Europe once they had made the necessary progress under the accession partnerships. Its approach was two-pronged:

- Negotiations would proceed on the principle that the Community *acquis* would be applied on accession.
- An enhanced pre-accession strategy would be introduced to help all applicant countries align their laws as quickly as possible on the Community *acquis*, preferably before accession.

ECU 100 million were also allocated to the second wave of countries (Bulgaria, Latvia, Lithuania, Romania and Slovakia) to finance projects to help them in their economic reforms.

2.2.3 Accession negotiations for the first six applicants

The negotiations focus on applicants' ability to take on all the obligations of a Member State of the European Union and to apply the Community *acquis* once they join; they focus, more particularly, on immediate measures to extend the single market. They also cover the pre-accession aid that the Union is to provide to help the applicants adopt the Community *acquis*. Negotiations may be concluded even if the *acquis* have not been fully adopted, as transitional measures may be introduced after accession. Any transitional periods must be as short as possible and cover as few sectors as possible.

2.2.4 *The enhanced pre-accession strategy*

The enhanced pre-accession strategy was welcomed by the Dublin European Council in December 1996. It covers all applicant countries in Central and Eastern Europe and makes use both of existing instruments (the Europe Agreements, the White Paper on the internal market and the PHARE programme) and a new instrument that forms the keystone of the strategy, the accession partnerships.

2.2.5 *Accession partnerships*

The accession partnerships launched on 15 March 1998 provide a single framework with three basic components:

- Priority areas for adoption of the Community *acquis*.
- Programming for EU financial assistance.
- The terms applicable to this aid: compliance with the obligations under the Europe Agreements and progress in meeting the Copenhagen criteria.

The assistance given by these partnerships to the countries preparing for accession include:

- A national programme for adopting the Community *acquis* in which each applicant specifies the laws and regulations, institutional and administrative reforms and human and budgetary resources they intend to deploy in each priority area identified in the accession partnership.
- A joint evaluation of economic policy priorities.
- A pact to fight organised crime.
- The "road maps" introduced in 1997 by the Commissioner responsible for the internal market to help applicant countries integrate the Community *acquis*.

2.2.6 *Pre-accession aid to Central and Eastern European countries*

Central and Eastern European countries will receive ECU 21 billion in pre-accession aid for the period 2000-2006. It will take three forms:

- PHARE programme: ECU 10.5 billion (ECU 1.5 billion a year). Since 1997 this has focused on the two main priorities for adoption of the Community *acquis*: institution building in the applicant countries (30% of the budget) and investment financing (70%) in areas where post-accession transitional periods are to be avoided as far as possible.
- Aid for agricultural development totalling ECU 3.5 billion (ECU 500 million a year).
- Structural aid amounting to ECU 7 billion (ECU 1 billion a year) to be used primarily to help applicant countries comply with Community infrastructure standards in the transport and environmental sectors. It will also be used to familiarise these countries with structural project procedures.

2.2.7 *Pre-accession aid to Cyprus*

Cyprus is not covered by the PHARE programme but, under the Association Agreement signed with this country, it receives ECU 72 million in grants from the Community budget and other assistance under the Fourth Financial Protocol which came into force in 1996 and runs for four years.

In December 1997, the Luxembourg European Council adopted a special pre-accession strategy for Cyprus based on:

- Its participation in certain targeted projects, primarily in institution building and justice and home affairs.
- Its participation in a number of programmes and Community agencies (following the approach used for other applicant countries).
- Use of technical assistance provided by TAIEX (Technical Assistance Information Exchange Office).

2.2.8 Cardiff European Council (June 1998)

Following the opening of accession negotiations with Cyprus, Hungary, Poland, Estonia, the Czech Republic and Slovenia, the European Council noted that the screening exercises for seven chapters of the *acquis* had been completed for these six countries. Analytical examination of the *acquis* had also started for Bulgaria, Latvia, Lithuania, Romania and Slovakia.

The Commission confirmed that, at the end of 1998, it would present an initial evaluation of progress made by each of the applicants towards membership. At the request of the European Council, the reports will include Cyprus and Turkey. The Commission adopted the 12 reports on 4 November 1998.

In compiling the reports for the Central and Eastern European applicants, the Commission set out to analyse whether, in the light of the Copenhagen criteria, the reforms that had been announced had in fact been carried out. The Commission also analysed progress made by each candidate in implementing the *acquis* and adapting the relevant administrative structures.

On the whole, the Commission confirms the analysis set out in Agenda 2000 and believes that all of the applicant countries will be able to meet the obligations of the *acquis* in the medium term only if they pursue their preparatory efforts with determination. On the basis of that analysis, the Commission does not feel it necessary to make new recommendations on the conduct or extension of ongoing negotiations.

The Associated Countries and the European Union

Country	Association Agreement signed on	Accession application submitted on
Bulgaria	01-03-1993	14-12-1995
Czech Republic	06-10-1993	17-01-1996
Cyprus	19-12-1972	03-07-1990
Estonia	12-06-1995	24-11-1995
Hungary	16-12-1991	31-03-1994
Latvia	12-06-1995	13-10-1995
Lithuania	12-06-1995	08-12-1995
Malta	01-04-1971	03-07-1990
Poland	16-12-1991	05-04-1994
Romania	08-02-1993	22-06-1995
Slovakia	06-10-1993	27-06-1995
Slovenia	10-06-1996 (*)	10-06-1996
Turkey	12-09-1973	14-04-1987

(*) Date of entry into force: 1 February 1999.

3. EXISTING BARRIERS – EVALUATION AND PRIORITIES IN THE TRANSPORT AREA

3.1. General remarks

Particularly in most of the countries of the former Yugoslavia, market conditions are very unstable and differ among transport modes as well as between privately and state-owned companies within the same transport mode.

The most important reasons for the situation are:

- Low transport infrastructure standards, characterised by differences in the intensity of post-war rehabilitation and operational efforts that put rail transport at a disadvantage.
- Geopolitical relations in the region that hinder international railway operations.
- Confused relations between various entities in Bosnia and Herzegovina that affect specific transport modes in different ways.
- Erratic performance of customs offices and other border-crossing services.
- Weaknesses in the legal and fiscal systems, which allow widespread "black market" operations.
- Unequal conditions for purchase and operation of transport equipment.

This situation led to an uncontrolled and unnatural development of traffic in the post-war period, which has resulted in particular in:

- Excessive rise in motorisation.
- A merely symbolic share of railway traffic in total traffic.

In the more developed Eastern countries, deficiencies in the rail system have led to strategies for:

- Development of high-speed lines along the main arteries.
- Intensification of night-train traffic, in particular for freight.
- Higher speed for freight trains.
- Improvement of combined transport.
- Development of logistics and informatics.
- Market-oriented prices.
- Environmental protection.

Road transport operations focus on the movement of heavy goods vehicles. This economic sector is highly regulated by national legislation and international agreements. Efforts by the UN/ECE, ECMT and the European Union over many decades have led to many improvements and increased the efficiency of road freight transport. There is nevertheless still much room for further improvements, but these do not relate specifically to Corridor V. By implementing the *acquis communautaire*, EU accession candidates are resolving a number of remaining problems. The main operational barriers that continue to plague international transport between Central and Eastern European countries as long as they are not members of the European Union are:

- The poor quality of infrastructure networks on some sections.
- Delays and waiting times at border crossings.
- Difficulties in simplifying customs procedures.
- Difficulties in transit customs regimes.
- Unofficial levies at border posts or en route.

To remove these obstacles, it would be necessary to:

- Improve network links to meet international and domestic traffic demand.
- Provide road infrastructure that would relieve non-uniformity among different areas of the countries and facilitate uniform regional development.
- Improve traffic conditions (to reduce accident numbers, time in transport, operating costs of transport).
- Reduce unfavourable impacts on the environment and nature.
- Increase efficiency of transport.

For international road traffic, in particular, there exist some serious bottlenecks:

- Legal barriers:
  - Standards and rules on vehicle dimensions and equipment.
  - Access to the profession of road transport company.
  - Inability to obtain a general licence to operate a business.
  - Marked differences in environmental standards.
- Commercial barriers due to the disparity of the economic and financial conditions between EU trucking companies and those of the Central and Eastern European countries.
- Financial barriers, especially difficulties for financing the equipment.

Means of reducing these deficiencies include:

- Redefining development priorities.
- Upgrading existing roads.
- Phased implementation of planned development.
- Elimination of local danger spots.
- Response to the need for local economic or other development.
- Adoption of legal, commercial and financial measures.

3.2. Remarks for individual countries

(Source: EU - *SCADPlus*: Enlargement: Preparing for Accession)

3.2.1. Bulgaria

In its Opinion of July 1997, the European Commission considered that Bulgaria had made progress in implementing Community legislation on transport but that it was still necessary to align itself rapidly on the Community *acquis*. The maritime, air and road haulage sectors were considered to pose the most potential problems, particularly as regards safety. It was also necessary to place greater emphasis on the practical application of the *acquis* in the other transport sectors. The November 1998 report notes the progress made since 1997 in some transport modes, but also calls for additional efforts to improve administrative structures.

Community transport policy is defined in two fundamental texts. The Europe Agreement provides for harmonisation of Bulgarian legislation with Community law, co-operation aimed at restructuring and modernising transport, improvement of access to the transport market, facilitation of transit and achievement of operating standards comparable with those in the Community. The White Paper focuses on measures for meeting internal market conditions in the transport sector, including such aspects as competition, legislative harmonisation and standards.

Bulgaria is on the traditional route from the Middle East to Central and Western Europe. Three pan-European transport corridors, identified at the Pan-European Conference in Crete, cross Bulgarian territory, a fourth being the Danube. The war in former Yugoslavia led to a rise in transit traffic, causing congestion on Bulgaria's main roads.

As regards completion of the internal market, Bulgaria has made great efforts to implement Community legislation. It already applies rules similar to the Community requirements, particularly on inland waterways and combined transport. This harmonisation process has been speeded up since 1997.

A Civil Aviation Law has been adopted to transpose the main Community provisions on air transport into national law. Other measures on licensing and certification are being prepared.

The National Assembly has adopted a Road Transport Law setting out the conditions applicable to transport of passengers and goods, which is deemed to be in conformity with Community legislation on market access and admission to the occupation.

The main Community provisions on transport of goods by road and on occasional international carriage of passengers by bus are expected to be adopted in the medium term.

Bulgaria is currently implementing its road infrastructure programme. It has also set the priorities for the main rail and road networks, in keeping with the criteria for developing the trans-European network. In addition, it has strengthened regional co-operation.

Medium-term priorities:

- To continue alignment efforts with respect to Community legislation, particularly in the road, air and sea transport of goods (safety regulations).
- To mobilise the investment needed in transport infrastructure (particularly for the extension of trans-European networks).

3.2.2 Estonia

In its Opinion of July 1997, the Commission expressed the view that Estonia had made significant progress in adopting the Community transport *acquis*. Transport was not expected to pose major difficulties with regard to the adoption of the internal market *acquis*, provided that efforts were made in road haulage (weights and dimensions, access to the sector), the maritime sector (safety) and, to a lesser extent, air transport, and provided also that financial procedures were clarified in the rail sector, However, steps should be taken to ensure that the necessary means are provided to lay the basis for extending the future trans-European transport network to include the acceding countries. The Commission also urged Estonia to strengthen its administrative structures, including supervisory bodies.

The November 1998 report confirms that considerable progress has been made in implementing the transport *acquis*. However, the country must still adopt a specific transport infrastructure and financing strategy to be financed by the national budget. Further progress must also be made to increase safety standards in ships.

Community transport policy is defined in two fundamental texts. The Europe Agreement provides for harmonisation of Estonian legislation with Community law, co-operation aimed at restructuring and modernising transport, improvement of access to the transport market, facilitation of transit and achievement of operating standards comparable to those in the Community. The White Paper focuses on measures for meeting internal market conditions in the transport sector, including such aspects as competition, legislative harmonisation and standards.

In the course of 1997, Estonia stepped up its efforts to establish a regulatory framework for transport in accordance with EC legislation.

In road transport, the government has adopted all the necessary legislation as regards weights and dimensions, access to the profession and roadworthiness tests for motor vehicles. This legislation has already entered into force.

In the railway sector, the restructuring of the railways has progressed in accordance with the Community *acquis*. The Railways Act has been amended to ensure financial transparency in this sector. The state-run railway company has been converted into a joint-stock company.

In the field of maritime transport, the Port and Maritime Safety Acts and the Ship's Property, Ship's Flag and Ship's Register Acts entered into force in 1998. The Port and Maritime Safety Acts define owners' obligations with regard to safety requirements and establish state surveillance in ports. They are intended to transpose most of the Community *acquis* relating to maritime safety. The safety of ships remains a concern, however. The Ship's Flag and Ship's Register Acts provide for the registration of ships and also contain provisions concerning flag documents.

In the air transport sector, the Estonian government has adopted several regulations that meet EU requirements on rules for the investigation of civil aviation accidents and incidents and establish common rules for a denied-boarding compensation system in scheduled air transport. The draft of a new Aviation Act has been drawn up and covers a substantial part of the *acquis*.

With regard to the development of transport infrastructure, Estonia plays an active part in the Transport International Needs Assessment (TINA), with a view to linking to the trans-European networks. The national priority is to improve east-to-west and south-east-to-west links, in particular by rail.

Medium-term priorities:

- To continue alignment efforts with respect to Community legislation, particularly in road (market access, safety regulations), sea (safety regulations) and rail transport.
- To mobilise the investment needed for transport infrastructure (particularly for the extension of trans-European networks).

3.2.3 Latvia

In its Opinion of July 1997, the Commission expressed the view that Latvia had made notable progress in assimilating the *acquis* in the transport field, particularly as regards air transport. The transport industry was unlikely to pose any major difficulties for assimilation of the *acquis* with regard to the internal market, provided that efforts were made in the road haulage (access to profession, weights and dimensions, road tax), shipping (safety) and rail (public service and standardisation of accounting procedures) sectors. However, Latvia would be advised to improve its administrative structures, including inspection bodies (for example, those responsible for safety) as soon as possible.

The November 1998 report states that Latvia has continued its ambitious programme of transposing and implementing the transport *acquis* and has also set clear targets for the next few years. The administration is starting to develop satisfactory enforcement capacities.

Community transport policy is defined in two fundamental texts. The Europe Agreement provides for harmonisation of Latvian legislation with Community law, co-operation aimed at restructuring and modernising transport, improvement of access to the transport market, facilitation of transit and achievement of operating standards comparable to those in the Community. The White Paper focuses on measures for meeting internal market conditions in the transport sector, including such aspects as competition and legislative harmonisation.

Latvia has made considerable progress in approximating its transport legislation on the basis of the National Programme for Transport Development, which has been adjusted to cover the priorities of the Accession Partnership.

With regard to road transport, about 90% of the road transport *acquis* had been transposed into national legislation by the end of 1998, including directives on the weights and dimensions of vehicles and access to the profession. Laws relating to market access, driving licences, technical inspections and safety belts have already been implemented. Additional efforts are still needed to improve road safety, however.

In the rail transport sector, a new Railway Code was adopted in April 1998, aimed at implementing the railway *acquis*. According to the new Code, a Railway Administration and a Railway Technical Inspectorate were to be established in 1999.

With regard to maritime transport, Latvia is continuing to harmonise requirements regarding state control of ports and has joined the basic international conventions on maritime safety and pollution prevention. The privatisation of the largest Latvian shipping company began in 1998. The maritime and port administrations have strengthened their activities and are helping to improve maritime safety.

In the aviation sector, Latvia has already aligned substantial parts of its legislation on the *acquis*, including the technical rules based on the Joint Aviation Regulations.

Latvia is improving its transport infrastructure, in particular its east-west transit links, in line with the priorities of the Accession Partnership and the national programme for the adoption of the *acquis*, and in close co-operation with the EU through the Transport Infrastructure Needs Assessment programme (TINA). It is also continuing to modernise its railway links.

Medium-term priorities:

- To continue its alignment efforts with respect to Community legislation, particularly in the transport of goods by road (technical regulations and taxation), transport by sea (safety) and by rail.
- To mobilise the investment needed for the transport infrastructure (particularly for the extension of trans-European networks).

3.2.4 Lithuania

In its July 1997 Opinion, the Commission considered that Lithuania would probably be able to comply with most of the Community transport *acquis* in the medium term. Accession should therefore not pose significant problems for Lithuania in this sector, provided that adequate attention is paid, in the pre-accession period, to safety improvements (especially maritime safety), harmonisation of environmental standards in transport (air pollution, noise) and implementation of the *acquis* in the road haulage and railway sectors. The Commission also called for Lithuania's administrative structures, including the bodies supervising such areas as safety, to be rapidly reinforced.

The November 1998 Report concludes that progress has been made in this sector, particularly in adopting and implementing the *acquis*, but stresses the need to improve maritime and aviation safety.

Community transport policy is defined in two fundamental texts. The Europe Agreement provides for harmonisation of Lithuanian legislation with Community law, co-operation aimed at restructuring and modernising transport, improvement of access to the transport market, facilitation of transit and achievement of operating standards comparable to those in the Community. The White Paper focuses on measures for meeting internal market conditions in the transport sector, including such aspects as competition, legislative harmonisation and standards.

Lithuania has continued to align and implement its legislation, particularly in the areas of sea, inland waterway and air transport.

In the road transport sector, new driver qualification requirements and rules for access to the profession complying with the *acquis* entered into force in 1997.

Rules on licensing of economic activities in the rail transport sector were amended in 1998 in line with EC requirements.

Efforts have been made in the air transport sector to improve safety by regulating the use of air space. The Civil Aviation Administration was reorganised in 1998. However, particular attention needs to be devoted to implementing the *acquis*. Airport concession charges are gradually being decreased.

Concessions on seaport charges for Lithuanian shipping were abolished on 31 March 1998.

Lithuania is also carrying out an ambitious programme to improve maritime safety. The bodies responsible for monitoring maritime safety have been strengthened and the number of inspectors increased.

Measures to protect the environment were carried out in the transport sector in the period 1997-98, particularly in the field of transport of dangerous goods by road. In June 1998, Lithuania became a party to the Convention on the Transport of Dangerous Goods, which is part of the Community *acquis*.

With regard to infrastructure, one of Lithuania's key priorities is its integration into the trans-European networks. Funding stands at 1.2% of GDP, a satisfactory level. A national inspectorate of inland waterways navigation was set up at the end of 1997.

Medium-term priorities:

- To continue alignment efforts with respect to Community legislation, particularly in road, rail and sea transport (safety).
- To mobilise the investment needed for transport infrastructure (particularly for the extension of trans-European networks).

3.2.5 Poland

In its Opinion of July 1997, the European Commission felt that Poland had made good progress in adopting the transport *acquis*. The transport sector should not pose major problems as regards adoption of the internal market *acquis*, provided that Poland moves swiftly and decisively on the operation of its domestic road haulage market. Conversely, special attention should be given to providing the means to lay the foundations for the future trans-European network, which has been extended to include the acceding countries, and to improving and strengthening administrative structures. The 1998 report seems to confirm this assessment, while stressing the need to make further efforts, particularly in terms of the laws on the free movement of goods.

Community transport policy is defined in two fundamental texts. The Europe Agreement provides for harmonisation of Hungarian legislation with Community law, co-operation aimed at restructuring and modernising transport, improvement of access to the transport market, facilitation of transit and achievement of operating standards comparable to those in the Community. The White Paper focuses on measures for meeting internal market conditions in the transport sector, including such aspects as competition and legislative harmonisation.

In the area of transport, Poland has speeded up its harmonisation of existing legislation with Community standards. Progress has also been made in developing infrastructure and in the operation of transport businesses. Efforts must be made to incorporate the *acquis* in the road and rail transport sectors. It will also be necessary to step up investment in transport infrastructure and more particularly in the trans-European networks.

A new law concerning excise duty and VAT applying to road and combined transport entered into force in January 1998, thereby repealing the flat-rate duty on European carriers. The sticker system for road transport introduced in December 1997 was altered in April 1998 in order to reduce rates for daily and weekly journey cards. However, major efforts are needed, given that the EU has required the maximum load capacity of road-transport vehicles to be increased, and also to deal with the greater numbers of heavy lorries on the road following accession. To do so, Poland will have to speed up the modernisation of its inadequate road infrastructures, while taking the assessment of transport infrastructure needs into account.

A new law on the railways was adopted in November 1997. It separates infrastructure from train operation and introduces a system of licences.

Medium-term priorities:

- To make extra efforts with respect to alignment with Community legislation, particularly in road transport (market access, safety regulations and taxation) and rail transport.
- To mobilise the requisite investment in the transport infrastructure (particularly for the extension of trans-European networks).

3.2.6 Romania

In its Opinion of July 1997, the Commission expressed the view that Romania had made progress in adopting the Community's transport *acquis*. However, its entry into the internal transport market should remain subject to rapid alignment on the *acquis*. Shipping and road haulage were the sectors most likely to pose problems, especially with regard to safety, though efforts were also required in the rail sector. Steps had to be taken to ensure that the basis was laid for extending the future trans-European transport network to include the acceding countries, and the present shortcomings of the road network had to be rapidly overcome. Romania's administrative structures, including the bodies supervising such areas as safety, also had to be rapidly and substantially reinforced.

The November 1998 report confirms that, although Romania has made progress in transport harmonisation, major efforts still have to be made, particularly on road and maritime safety. No specific improvements have yet been made to administrative structures. Romania should prepare a detailed programme for establishing competent bodies to manage the *acquis*, including the identification of training needs where appropriate.

Community transport policy is defined in two fundamental texts. The Europe Agreement provides for harmonisation of Romanian legislation with Community law, co-operation aimed at restructuring and modernising transport, improvement of access to the transport market, facilitation of transit and achievement of operating standards comparable to those in the Community. The White Paper focuses on measures for meeting internal market conditions in the transport sector, including such aspects as competition, legislative harmonisation and standards.

Since 1997, Romania has made good progress in harmonising legislation. The government has adopted a large number of ordinances aimed at bringing the national legislation into conformity with Community requirements in all modes of transport, subject to more detailed confirmation of their conformity.

With regard to road transport, a series of ordinances adopted by the government transposes the conditions of market access for transport services, competition and certain technical requirements linked to upgrading the infrastructure. Negotiations are currently taking place on conditions for the carriage of goods and on occasional international carriage of passengers (INTERBUS). The negotiations should offer an opportunity to establish reasonable medium-term deadlines for meeting the remaining priorities identified in this field.

With regard to rail transport, new governmental decrees regulate access to infrastructure and provide for a comprehensive restructuring of the railway company (SNCFR).

In the field of air transport, the updated government programme for restructuring TAROM is under way. Other organisations, such as airport administrations, have been transferred to local administrations. Negotiations are also taking place on market access with a view to creating a framework for identifying specific measures to be taken to transpose and apply the *acquis* fully.

With regard to maritime and inland waterway transport, government decisions have been taken on the use of the International Code for Safety Management (ISM), the free market, training of crew and certificates. Autonomous administrations in this sector are being restructured.

Romania is implementing its road infrastructure programme. The privatisation of state-owned transport companies is being prepared. The assessment of transport infrastructure needs (TINA) has identified priorities, in particular for the main rail and road networks, in accordance with the criteria established in the "Guidelines for Developing the Trans-European Transport Network". Romania is actively participating in regional initiatives.

The current infrastructure programmes will place a strain on domestic resources, even with EU support. It would therefore be useful to establish a general strategy for infrastructure financing involving the EU, the EIB, international financial institutions and the private sector.

Medium-term priorities:

- To make extra efforts with respect to alignment on Community legislation, particularly in the road and sea transport of goods (safety regulations).
- To mobilise the investment needed in the transport infrastructure (particularly for the extension of trans-European networks).

3.2.7 Slovakia

In its Opinion of July 1997, the Commission expressed the view that Slovakia had made progress in adopting the Community transport *acquis*, but that considerable progress was still required with regard to road haulage (market access, safety standards and taxation) and railways, where the effective implementation of the *acquis* would have to be monitored. The Commission did not consider that the transport sector should pose serious problems as regards adoption of the internal market *acquis*, provided that the situation improved in those two sectors. The Slovak Republic needed to take steps to ensure that the basis was laid for extending the future trans-European transport network to include the acceding countries, and to reinforce administrative structures at all levels, including supervisory bodies.

The November 1998 report emphasises that Slovakia must make further efforts to harmonise legislation in the fields of air, road and rail transport and with regard to the safety of road transport and combined transport.

Community transport policy is defined in two fundamental texts. The Europe Agreement provides for harmonisation of Slovak legislation with Community law, co-operation aimed at restructuring and modernising transport, improvement of access to the transport market, facilitation of transit and achievement of operating standards comparable to those in the Community. The White Paper focuses on measures for meeting internal market conditions in the transport sector, including such aspects as competition and legislative harmonisation.

In May 1997 the Ministry of Transport adopted regulations on vehicle traffic. Further efforts are required with regard to access to the domestic road haulage market, particularly in light of the financial capacity of national carriers. Efforts must also be made to achieve satisfactory levels of road safety.

A new law on civil aviation entered into force in July 1998, integrating Community standards into Slovak legislation. Additional implementing legislation is required, however, particularly with regard to air transport safety and slot allocation.

In the field of rail transport, the government approved a long-term programme of railway development at the beginning of October 1997. The investments planned in this field will be reduced and spread over a longer period (to 2010) owing to the critical financial situation of the state-run railways. No plans have been made for restructuring the railways, or for preparing legislation to implement Council Directive 91/440 .

As regards transport infrastructure, one of the main priorities is to develop the four pan-European corridors that cross Slovak territory. In August 1997, budgetary constraints led the government to approve a new means of financing highway construction through bank loans with government guarantees. Slovakia is actively participating in the Transport Infrastructure Needs Assessment (TINA).

Medium-term priorities:

- To make extra efforts with respect to alignment with Community legislation, particularly in road and rail transport (market access, safety regulations and taxation).
- To mobilise the investment needed in the transport infrastructure (particularly for the extension of trans-European networks).

3.2.8 Slovenia

In its Opinion of July 1997, the European Commission expressed the view that Slovenia had made notable and rapid progress in adopting the Community's transport *acquis*. The transport sector was unlikely to pose major problems as regards adoption of the internal market *acquis*, provided that it made further efforts on road haulage (especially market access and taxation) and clarified financial procedures in the rail sector, measures that were readily achievable. However, steps should be taken to ensure that the necessary means are provided to lay the basis for the future trans-European transport network. The November 1998 report confirms that harmonisation is continuing at a satisfactory pace, but that more competition is required in all transport sectors as well as effective application of the legislation. Administrative structures will also have to be created or reinforced.

Community transport policy is defined in two fundamental texts. The Europe Agreement provides for harmonisation of Slovene legislation with Community law, co-operation aimed at restructuring and modernising transport, improvement of access to the transport market, facilitation of transit and achievement of operating standards comparable to those in the Community. The White Paper focuses on measures for meeting internal market conditions in the transport sector, including such aspects as competition and legislative harmonisation.

The harmonisation of transport legislation is proceeding, and Slovenia has already reached a significant level of legislative harmonisation and integration with the EU. With regard to road transport, a law on road transport was adopted in June 1997 and amended a year later to better define free haulage in road transport. Other measures were adopted in June 1998 on charges for road users. The government has also adopted a resolution on Slovenia's transport policy concerning the management of traffic flows and increased traffic safety.

In the rail transport sector, a new law was adopted on the operation and financing of transport on the railway network and the reorganisation and ownership restructuring of Slovene Railways. The Law transposes Directive 91/440/EC on the development of the Community's railways. Other financing/accounting measures have been taken in accordance with EC standards. However, supplementary efforts are necessary to upgrade existing legislation and complete the restructuring of Slovene Railways.

With regard to maritime transport, Slovenia has already harmonised much of its legislation with EU rules on maritime safety and the protection of the maritime environment. However, with regard to legislation regulating free access to the maritime services market, Slovenia is under-regulated, so that significant efforts will be needed to adopt all the necessary legislation. The International Safety Management Code (ISMC) concerning the quality of vessels under the Slovene flag has been implemented, together with state port control procedures. A new Maritime Code is currently under discussion in Parliament.

In air transport, further efforts are required to harmonise legislation and strengthen aviation administration to ensure its effective implementation.

Slovenia has invested heavily in infrastructure in recent years and now has a well-developed motorway building programme and upgraded road, railway and port infrastructure. Other investments have been in border-crossing infrastructure along new borders. Slovenia is an active participant in the Transport Infrastructure Needs Assessment (TINA) programme.

Medium-term priorities:

- To make further efforts with respect to alignment on the *acquis*, particularly in road and rail transport (market access, safety regulations and taxation).

- To mobilise the investment needed in the transport infrastructure (particularly for the extension of trans-European networks).

3.2.9 Czech Republic

In its July 1997 Opinion, the Commission considered that the Czech Republic had made notable progress in adopting the Community transport *acquis* and that the transport sector was unlikely to pose any major problems as regards adoption of the Community single market *acquis*. However, steps should be taken to ensure that the necessary means were provided to lay the foundations for the future trans-European transport network, as extended to include the acceding countries. It also noted that the Czech Republic's administrative structures, including its supervisory bodies, needed to be reinforced. The November 1998 report stresses the need to make efforts in the field of road transport and civil aviation. In addition, major investment is needed to improve transport infrastructure.

Community transport policy is defined in two fundamental texts. The Europe Agreement provides for harmonisation of Hungarian legislation with Community law, co-operation aimed at restructuring and modernising transport, improvement of access to the transport market, facilitation of transit and achievement of operating standards comparable to those in the Community. The White Paper focuses on measures for meeting internal market conditions in the transport sector, including such aspects as competition and legislative harmonisation.

In June 1998, a resolution on an action programme for a new national transport policy was adopted. This resolution stipulates the conditions, goals and instruments relating to the transport sector, including infrastructure and social and environmental aspects.

The 1994 Road Transport Act was amended in 1998. The amendment introduces, as of January 2000, the concept of "financial fitness" for hauliers operating in international road transport. There are shortcomings as regards the inspection of vehicles. There has been no progress in civil aviation. In the railways sector, adoption of the *acquis* has not been completed. With regard to the restructuring of the state-owned railways, the government adopted, on 22 April 1998, a resolution outlining the measures that should accompany the restructuring programme adopted in 1997.

As regards infrastructure, the Czech Republic seeks to improve its links with neighbouring countries by completing road and railway projects in Corridors IV and VI. The construction of the D5 motorway, which links Prague to the German border, was completed in 1997. The construction of railway corridors I and II is advancing. The Czech Republic participates actively in the Transport Infrastructure Needs Assessment (TINA) programme.

Medium-term priorities:

- To continue alignment efforts with respect to Community legislation (particularly on market access, safety regulations and taxation in road and rail transport).
- To mobilise the investment needed in the transport infrastructure (particularly for the extension of trans-European networks).

3.2.10 Hungary

In its July 1997 Opinion, the Commission considered that Hungary had made significant progress in adopting the Community transport *acquis*. The transport sector was considered to be unlikely to pose any major problems as regards adoption of the internal market *acquis*, provided that it improved the operation of its domestic road haulage market (access to the market, social rules and safety), made progress on technical checks on passenger vehicles and clarified financial procedures and access rights in the rail sector.

However, the Commission stated that it would be necessary to ensure that the resources needed to lay the foundations for the future trans-European transport network, extended to include the acceding countries, were actually made available. It also felt it would be advisable for Hungary's administrative structures, including bodies supervising areas such as safety, to be reinforced rapidly.

The November 1998 report notes that Hungary is continuing its efforts to align its legislation on the *acquis* and to adapt its institutions to Community requirements. Further efforts are nevertheless needed to harmonise rules on technical requirements for road vehicles, improvement of road safety, access to the national road haulage market and the development of infrastructure in inland waterways. Extra efforts should be made to harmonise legislation on civil aviation (particularly safety), rail (rights of access to the rail network) and combined transport.

Community transport policy is defined in two fundamental texts. The Europe Agreement provides for harmonisation of Hungarian legislation with Community law, co-operation aimed at restructuring and modernising transport, improvement of access to the transport market, facilitation of transit and achievement of operating standards comparable to those in the Community. The White Paper focuses on measures for meeting internal market conditions in the transport sector, including such aspects as competition and legislative harmonisation.

In the area of road transport, new legislation has been adopted on testing of motor vehicles for roadworthiness, requirements for driving licences, the content of driver training and the requirement for access to the profession of domestic road haulage operator. However, the legislation on driving licences is not yet fully in line with the *acquis*.

In maritime transport, a new law was adopted in 1998. In addition, Hungary has signed the MARPOL (International Convention of the Prevention of Maritime Pollution) and SOLAS (International Convention on the Safety of Life at Sea) Conventions and has joined the International STCW (Convention on the Standards of Training, Certification and Watchkeeping) in line with the *acquis*. Hungary has also transposed the standards on piloting on the high seas into its legislation.

Rules on the transport of dangerous goods (by road and rail) have been brought into line with Community and international legislation. As regards air transport, progress has been made concerning noise pollution around airports and the limitation of noise emissions from subsonic aircraft.

Hungary is actively participating in the Transport Infrastructure Needs Assessment (TINA). Projects for road and railway links are under way and a number of major road projects, such as the M5 (southern link) and the M3 (eastern link) have been started. Some of these projects have been funded by the private sector.

Medium-term priorities:

- To continue alignment efforts with respect to Community legislation, particularly in road transport (technical control).
- To mobilise the investment needed in the transport infrastructure (particularly for the extension of trans-European networks).

4. EXISTING BARRIERS – EVALUATION AND PRIORITIES IN SECTORS OTHER THAN TRANSPORT

The European Commission published Agenda 2000 on 16 July 1997. This three-part policy document looks at:

- The future of the main areas of Community policy.
- The European Union's financial perspectives for the period 2000-2006.
- The Union's enlargement.

Attached to it are the Commission's Opinions, prepared on the basis of the Copenhagen accession criteria, on membership applications from Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. The Commission proposed that membership be extended to a first wave of five countries and that negotiations be launched initially with the Czech Republic, Estonia, Hungary, Poland and Slovenia. The negotiations with Cyprus would open six months after the end of the Intergovernmental Conference. The situation in the other countries would be reviewed annually.

- The first accession criterion (political criterion) concerns, notably, respect for democracy and human rights and appears to have been met by all countries except Slovakia where, in the Commission's view, the rule of law and democracy is not sufficiently rooted in political life and there is insufficient protection of minorities. Consequently, it was excluded from the first wave of applicants.

- The economic criterion has probably been the key factor. The five countries chosen are considered to have viable market economies and Slovakia is very close to this goal. As regards the second requirement under this criterion – capacity to cope with competitive pressure and market forces within the Union – the Czech Republic and Slovenia are considered to have made the greatest progress and Hungary and Poland appear to be proceeding apace with restructuring, with Estonia trailing. The Commission noted that the four countries which had not been chosen for the first wave of negotiations on economic grounds had recently made substantial progress and could catch up to the other applicant countries within the next ten years.

- The third criterion (ability to adopt the Community *acquis*) highlights the differences between:

  - Bulgaria and Romania, which were considered unable to take on the obligations of membership in the medium term.
  - The three Baltic States and Slovenia, which were unlikely to be able to adopt the body of the Community *acquis* in the medium term unless they made substantial efforts.
  - Hungary, Poland, the Czech Republic and Slovakia, which should be able to take on the main part of the Community *acquis* in the medium term, provided progress is made in specific sectors.

4.1. Political criteria

(*Source:* EU - *SCADPlus*: Enlargement: Preparing for Accession)

4.1.1 Bulgaria

Short-term priorities:

- To adopt measures to facilitate naturalisation procedures and improve the integration of those without Bulgarian nationality, particularly stateless children.
- To improve access to Bulgarian language training for non-Bulgarian speakers.

Evaluation (end of 1998)

The Bulgarian parliament still has to adopt amendments to the Citizenship Act to facilitate the naturalisation of stateless children.

Medium-term priorities:

- To continue to integrate non-nationals by strengthening training in Bulgarian in primary and secondary schools and organising courses for adults.
- To adopt additional measures to speed up the naturalisation process.

4.1.2 Estonia

Short-term priorities:

- To adopt measures to facilitate naturalisation procedures and improve the integration of those without Estonian nationality, particularly stateless children.
- To improve access to Estonian language training for non-Estonian speakers.

Evaluation (end of 1998)

The Estonian parliament still has to adopt amendments to the Citizenship Act to facilitate the naturalisation of stateless children.

Medium-term priorities:

- To continue to integrate non-nationals by strengthening training in Estonian for Russian speakers in primary and secondary schools and organising courses for adults.
- To adopt additional measures to speed up the naturalisation process.

4.1.3 Latvia

Short-term priorities:

- To take measures to relax naturalisation procedures to integrate more effectively those without nationality (particularly stateless children).
- To strengthen the training of allophones in Latvian.

Evaluation (late 1998)

Progress has been made. The success of the referendum of 3 October 1998 on the amendment of the Nationality Act has speeded up the naturalisation process, in particular by abolishing the system of age brackets (which gave priority to younger age groups) and granting citizenship to stateless children. The first stage of the Latvian-teaching programme has been completed: 2 700 teachers working in the minorities' schools and about 12 000 allophones have received training.

Medium-term priorities:

- To integrate non-citizens faster by relaxing naturalisation procedures for stateless children.
- To revise the naturalisation mechanism and adopt additional measures for speeding up the process.

4.1.4 Poland

Medium-term priorities:

- To concentrate on guaranteeing freedom of the press and equal access to public services.

4.1.5 Slovakia

Short-term priorities:

- To ensure free and fair presidential, national and local elections in 1998.
- To ensure the opposition's effective participation in inspection committees and parliamentary supervisory authorities.
- To adopt legislative provisions on minority language use and related implementing measures.

Evaluation (end of 1998)

Free and fair national elections took place in September 1998. A law on municipal elections was adopted recently but raises some concerns, in particular as to the consequences it might have for free and fair elections. The participation of the opposition in inspection committees and parliamentary supervisory authorities has not been completely satisfactory. Legislation on minority languages remains to be adopted.

Medium-term priorities:

- To take further steps to ensure respect for the Constitution and the rights of the opposition.
- To guarantee the independence of the judiciary.
- To foster and strengthen the functioning of democratic institutions, NGOs, an independent media and policies and institutions that protect the rights of minorities.

4.1.6 Slovenia

Medium-term priorities:

- To continue efforts to improve the working of the judicial system and speed up the restitution of assets.

4.1.7 Czech Republic

Medium-term priorities:

- To continue work on integrating the Romanies.
- To strengthen legislation guaranteeing freedom of the press.

4.1.8 Hungary

Medium-term priorities:

- To continue efforts to integrate the Romanies.

4.2. Economic reform

(*Source*: EU - *SCADPlus*: Enlargement: Preparing for Accession)

4.2.1 Bulgaria

Short-term priorities:

- To set economic policy priorities in the medium term and those for joint assessment under the Europe Agreement.
- To continue the programme of privatising state enterprises and banks.
- To adopt restructuring measures in industry, finance and agriculture.
- To adopt measures to encourage foreign direct investment.

Evaluation

A new medium-term strategy has been developed. In general terms, Bulgaria has achieved overall economic stability, thus creating the right conditions for economic growth and has attracted foreign investment. More work must be done, notably in the privatisation of state enterprises and in the banking sector. Further efforts are needed in the agricultural sector.

Medium-term priorities:

- To complete the privatisation process.
- To strengthen the institutions needed to operate a market economy.

4.2.2 Estonia

Short-term priorities:

- To set medium-term economic policy priorities and those for joint assessment under the Europe Agreement.
- To maintain strong growth, reduce inflation and increase the level of savings.
- To speed up property reform with a view to extending private ownership.
- To introduce basic legislation linked to the reform of the pensions system.

Evaluation (end of 1998)

Estonia has developed a medium-term economic strategy and joint assessment with the Commission is being prepared. The process of privatising SMEs is almost complete, though the privatisation of the big utilities companies has yet to be carried out. Further efforts in enterprise restructuring will be needed for several years. The government has adopted new measures to increase monitoring in the financial sector. Legislation on pension reform has also been introduced. However, Estonia must make further efforts on property reform and the establishment of an agricultural census.

4.2.3 Latvia

Short-term priorities:

- To set economic policy priorities in the medium term under the Europe Agreement.
- To speed up the market-oriented restructuring of enterprises, particularly by completing the privatisation process.
- To continue to strengthen the banking sector.
- To modernise the agricultural sector.
- To set up a land and property register.

Evaluation (end of 1998)

A medium-term economic strategy has been drawn up and a joint review conducted with the Commission. Though the privatisation of SMEs is practically complete, the privatisation of some larger companies, in particular the utilities, is in abeyance. Restructuring efforts must continue over a number of years. The banking sector has been strengthened considerably by tighter supervision. Agriculture is being modernised and a land and property register introduced.

Medium-term priorities:

- To consolidate the privatisation process.
- To strengthen the market-oriented restructuring of the enterprise, finance and banking sectors.
- To introduce a statutory framework for public services and financial services.
- To strengthen competition policy.

4.2.4 Lithuania

Short-term priorities:

- To define economic policy priorities in the medium term and those for joint assessment under the Europe Agreement.
- To speed up large-scale privatisation.
- To restructure the banking, energy and agricultural processing sectors.
- To apply financial discipline to enterprises.

Evaluation (end of 1998)

Lithuania has still to draw up a medium-term economic strategy. Progress has been made with large-scale privatisation, restructuring the banking sector and applying financial discipline to firms. Major efforts are still needed to restructure the energy and agricultural processing sectors.

Medium-term priorities:

- To complete the privatisation process and the restructuring of the banking, energy and agricultural processing sectors.
- To improve the system of recording property ownership.
- To align the legislative framework (legislation on bankruptcy and competition, simplifying the regulations which apply to enterprises, particularly for patents).

4.2.5 Poland

Short-term priorities:

- To set economic policy priorities in the medium term and those for joint assessment under the Europe Agreement.
- To adopt measures for dealing with the foreign deficit.
- To speed up the privatisation of state-owned enterprises.
- To contribute to the development of the financial sector.

4.2.6 Romania

Short-term priorities:

- To identify economic policy priorities in the medium term and those for joint assessment under the Europe Agreement.
- To continue the government's economic reform programme, in particular the privatisation of two banks, converting most of the independent public corporations to commercial companies and efficient implementation of the foreign investment system.
- To restructure/privatise some of the major industrial and agricultural enterprises (particularly by reducing their losses and financial arrears).
- To continue to implement agreements with international financial institutions.

Evaluation (end of 1998)

Romania has made progress in developing an economic policy for the short to medium term. However, there were problems in implementing this policy in 1998 owing to worldwide economic difficulties and the lack of a genuine commitment to introduce strict budgetary constraints and speed up structural reforms. It was announced that two banks would be privatised by the end of 1998. Although the general rules governing investment were once again changed, the legal framework did not become simpler or more transparent. The process of restructuring/privatising large industrial state companies in the steel and coal sector is under way, as is the restructuring/privatisation of agricultural companies. However, measures remain to be taken concerning large loss-making enterprises. Since summer 1998, most independent administrations have been privatised, but it is still too early to assess this process fully.

Medium-term priorities:

- To create favourable conditions for a lasting increase in productivity.
- To continue to restructure/privatise enterprises, particularly banks.

4.2.7 Slovakia

Short-term priorities:

- To establish economic policy priorities in the medium term and those for joint assessment under the Europe Agreement.
- To implement policies for combating internal and external instability and support macroeconomic stability.
- To continue structural reforms and market-based restructuring of the enterprise, finance and banking sectors.
- To continue the process of reconverting heavy, high-intensity energy industries.

Evaluation (end of 1998)

Slovakia has made efforts to implement policies for combating internal and external instability, but it still has to develop a medium-term economic policy and a framework for joint assessment. Limited progress has been made in restructuring the banking and finance sector and in continuing to reconvert heavy, highly energy-intensive industries.

4.2.8 Slovenia

Short-term priorities:

- To establish medium-term economic policy priorities and assess them jointly under the interim co-operation agreement.
- To achieve a lasting reduction in the public debt.
- To take measures to help business, finance and banking adjust to the marketplace.
- To prepare pension reform.

Evaluation (late 1998)

The joint assessment figuring among the short-term priorities was approved in November 1998. Relatively little progress has been made towards restructuring and privatising the banking and insurance sectors. Supervisory capacities need to be stepped up, especially in the insurance sector. The new banking law has still to be adopted. Pension reforms are under preparation, with a draft going before the Slovenian parliament in August 1998.

4.2.9 Hungary

Short-term priorities:

- To assess and update economic policy priorities in the medium term under the Europe Agreement.
- To continue to consolidate conditions likely to provide strong growth in investments by systematically implementing sensible macroeconomic policies.
- To continue structural reforms, particularly in the public sector and in health care.

Evaluation (end of 1998)

Progress has been made in this field. The mass privatisation plan was completed and a new pension system was introduced from January 1998. Branches of foreign credit institutions are now allowed to operate in the Hungarian banking sector, subject to a licence from the State Financial and Capital Market Commission. In the field of trade policy, Hungary eliminated all trade-related charges, with the exception of some customs duties which will be phased out before 1 January 2001.

4.3. Environment

(*Source*: EU - *SCADPlus*: Enlargement: Preparing for Accession)

4.3.1 Bulgaria

Short-term priorities:

- To continue to transpose the framework legislation.
- To draw up detailed alignment programmes and strategies linked to various laws.
- To start to implement these programmes and strategies.

Evaluation (end 1998)

Strategic programmes for implementing Community legislation have been drawn up but are not yet operational. Although some progress has been achieved on air and waste, further efforts must be made in sectors such as water and pollution control.

Medium-term priorities:

- To set up control structures and capacities.
- To continue to plan and implement alignment strategies linked to various legislative acts.
- To give particular attention to the water sector, particularly its institutional requirements.

4.3.2 Estonia

Short-term priorities:

- To continue to transpose framework legislation.
- To draw up detailed alignment programmes and strategies linked to various laws.
- To start to implement these programmes and strategies.

Evaluation (end of 1998)

Significant progress has been made in aligning environmental legislation, particularly in the field of waste management and nature conservation. More needs to be done, however, on noise, industrial pollution, genetically modified organisms, chemicals and water quality. Steps must also be taken to improve the licensing and monitoring system, human resource development and the facilities of the Environmental Inspectorate and regional environmental agencies. Capacity at local level needs to be strengthened.

Medium-term priorities:

- To develop monitoring structures and capability.
- To continue to plan and implement alignment programmes linked to various legislative acts.
- To give special attention to the water and waste sectors, particularly radioactive waste.

4.3.3 Latvia

Short-term priorities:

- To continue to transpose the framework legislation.
- To introduce detailed alignment programmes and strategies relating to various forms of legislation.
- To start to implement these programmes and strategies.

Evaluation (end of 1998)

Progress has been made in this area and plans have been drawn up for new activities. Latvia has dealt satisfactorily with most of the short-term priorities laid down in the accession partnership.

Medium-term priorities:

- To develop control and application structures and capacities.
- To continue to plan and implement alignment strategies linked to various legislative acts.
- To give special attention to the quality of drinking water, sewage and the waste sector.

4.3.4 Lithuania

Short-term priorities:

- To continue to transpose the framework legislation.
- To draw up detailed alignment programmes and strategies relating to various forms of legislation.
- To launch these programmes and strategies.

Evaluation (end of 1998)

Lithuania has made considerable progress in this area, especially in transposing legislation.

Medium-term priorities:

- To set up control and implementation structures and capacities.
- To continue to plan and implement alignment strategies linked to various legislative acts.
- To give special attention to the quality of drinking water, waste and nuclear safety.

4.3.5 Poland

Short-term priorities:

- To continue to transpose the framework legislation.
- To draw up detailed alignment programmes and strategies relating to various forms of legislation.
- To launch these programmes and strategies.

Evaluation (end 1998)

Progress has been rather limited. Poland must therefore make substantial efforts to fulfil its obligations in this field.

Medium-term priorities:

- To set up control and implementation structures and capacities.
- To continue to plan alignment strategies linked to various legislative acts.
- To give special attention to the quality of drinking water, sewage and waste as well as to the large combustion plants.

4.3.6 Romania

Short-term priorities:

- To continue to transpose framework legislation.
- To draw up detailed alignment programmes and strategies linked to various laws.
- To launch these programmes and strategies.

Evaluation (end of 1998)

Little progress has been made in this field. The transposition of framework legislation has not been systematic. At present there is no planning at strategic, institutional or technical level.

Medium-term priorities:

- To set up monitoring structures and capability.
- To continue to plan alignment programmes linked to various legislative acts.
- To give special attention to air and water quality.

4.3.7 Slovakia

Short-term priorities:

- To continue to transpose framework legislation.
- To establish detailed alignment programmes and strategies related to various laws.
- To launch these programmes and strategies.

Evaluation (end of 1998)

Limited progress has been made in transposing the *acquis* and there has been no progress at all in developing alignment programmes and implementing detailed strategies.

Medium-term priorities:

- To develop control structures and capacities.
- To continue planning and implementation of alignment programmes related to various legislative acts.
- To place particular emphasis on air and water quality and the waste sector as well as on a general policy for industrial pollution control and risk management.

4.3.8 Slovenia

Short-term priorities:

- To continue to transpose the framework legislation.
- To finalise detailed alignment programmes and strategies relating to various forms of legislation.
- To launch these programmes and strategies.

Evaluation (late 1998)

Slovenia has continued harmonising its legislation and carrying out programmes to improve air quality in urban areas. However, the national environmental action programme has not been adopted.

Medium-term priorities:

- To set up control and application structures and capacities.
- To continue to plan alignment programmes linked to various legislative acts.
- To place particular emphasis on wastewater and a general policy of risk management and fighting industrial pollution.

4.3.9 Czech Republic

Short-term priorities:

- To continue to transpose the framework legislation.
- To draw up detailed alignment programmes and strategies linked to various laws.
- To start to implement these programmes and strategies.

Evaluation (end of 1998)

Progress has been made in the transposition of legislation but efforts need to be stepped up, in particular on water and industrial pollution. The drafting of implementation programmes for the separate directives, particularly as regards investment, is behind schedule.

Medium-term priorities:

- To set up control structures and capacities.
- To continue to plan alignment programmes linked to various legislative acts.
- To give special attention to institutional requirements on the water, air and waste sectors.

4.3.10 Hungary

Short-term priorities:

- To continue to transpose the framework legislation.
- To draw up detailed alignment programmes and strategies linked to various laws.
- To start to implement these programmes and strategies.

Evaluation (end of 1998)

Despite the adoption of a national environmental protection programme and four major laws, legislative harmonisation in this field remains slow.

Medium-term priorities:

- To develop control structures and capacities.
- To continue to plan and implement alignment strategies linked to various legislative acts.
- To give special attention to the management of urban sewage and waste.
- To adopt general measures to fight industrial pollution.

4.4. Summary of existing barriers

Enlargement: Preparation for Accession – Political Criteria (Source: EU - *SCADPlus*: Enlargement: Preparing for Accession)	
Country	**Political criteria – Evaluation**
Bulgaria	Efforts should continue to integrate the Romanies and protect individual freedoms.
Estonia	The Estonian parliament still has to adopt amendments to the Citizenship Act to facilitate the naturalisation of stateless children.
Latvia	Progress has been made. The success of the referendum of 3 October 1998 on the amendment of the nationality act has speeded up the naturalisation process, in particular by abolishing the system of age brackets (which gave priority to younger age groups) and granting citizenship to stateless children. The first stage of the Latvian-teaching programme has been completed: 2 700 teachers working in the minorities' schools and about 12 000 allophones have received training.
Lithuania	-
Poland	Poland is concentrating on guaranteeing freedom of the press and equal access to public services.
Romania	Romania needs to continue child protection reform, efforts to integrate the Romanies and to protect individual freedoms and to improve the functioning of the court system.

Slovakia	Free and fair presidential, national and local elections were held in 1998. The effective participation of the opposition in inspection committees and parliamentary supervisory authorities should be strengthened. Legislative provisions on minority language use and related implementing measures need to be adopted.
Slovenia	Efforts to improve the working of the judicial system and speed up the restitution of assets should continue.
Czech Republic	Work on integrating the Romanies and strengthening legislation guaranteeing freedom of the press should continue.
Hungary	Efforts to integrate the Romanies should continue.

Enlargement: Preparation for Accession – Economic Reform (*Source*: EU - *SCADPlus*: Enlargement: Preparing for Accession)	
Country	**Economic reform – Short-term/medium-term priorities – Evaluation**
Bulgaria	A new medium-term strategy has been developed. In general terms, Bulgaria has achieved overall economic stability and thus created the right conditions for economic growth and attracting foreign investment. More work must be done, notably on the privatisation of state enterprises and in the banking sector. Further efforts are needed in the agricultural sector.
Estonia	Estonia has developed a medium-term economic strategy. Joint assessment with the Commission is being prepared. The process of privatising SMEs is almost complete, although the privatisation of the big utilities companies has yet to be carried out. Further efforts in enterprise restructuring will be needed for several years. The government has adopted new measures to increase monitoring in the financial sector. Legislation on pension reform has also been introduced. However, Estonia must make further efforts on property reform and the establishment of an agricultural census.
Latvia	A medium-term economic strategy has been drawn up and a joint review conducted with the Commission. While the privatisation of SMEs is practically complete, the privatisation of some larger companies, in particular the utilities, is in abeyance. Restructuring efforts must continue over a number of years. The banking sector has been strengthened considerably by tighter supervision. Agriculture is being modernised and a land and property register introduced.
Lithuania	Lithuania has still to draw up a medium-term economic strategy. Progress has been made with large-scale privatisation, restructuring of the banking sector and application of financial discipline to firms. Major efforts are still needed to restructure the energy and agricultural processing sectors.

Poland	Poland has developed a medium-term economic strategy and is currently carrying out a joint evaluation with the Commission. The government has adopted plans to restructure state enterprises, notably in the coal and steel sectors. However, further efforts will be required over several years to complete the restructuring and privatisation programmes already launched. Progress has been made in developing the financial sector following the adoption of framework legislation, but efforts are nevertheless needed in the privatisation of the banking sector in particular.
Romania	Romania has made progress in developing an economic policy in the short to medium term. However, there were problems in implementing this policy in 1998 owing to world economic difficulties and the lack of a genuine commitment to introduce strict budgetary constraints and speed up structural reforms. It was announced that two banks would be privatised by the end of 1998. Although the general rules governing investment were once again changed, the legal framework did not become simpler or more transparent. The process of restructuring/privatising large industrial state companies in the steel and coal sector is under way, as is the restructuring/privatisation of agricultural companies. However, measures remain to be taken for large loss-making enterprises. Since summer 1998 most independent administrations have been privatised, but it is still too early to assess this process fully.
Slovakia	Slovakia has made efforts to implement policies to combat internal and external instability, but still has to develop a medium-term economic policy and a framework for joint assessment. Limited progress has been made in restructuring the banking and finance sector and in continuing to reconvert heavy, highly energy-intensive industries.
Slovenia	The joint assessment figuring among the short-term priorities was approved in November 1998. Relatively little progress has been made towards restructuring and privatising the banking and insurance sectors. Supervisory capacity needs to be strengthened, especially in the insurance sector. The new banking law has still to be adopted. Pension reforms are under preparation, with a draft going before the Slovenian parliament in August 1998.
Czech Republic	In 1997, the government adopted two packages of special economic measures which had a positive impact on the internal and external balance and on structural reform. Progress was made in the accounting and tax sectors. However, the overall economic situation is still difficult, with negative growth figures in 1998. In July 1998 the government approved a medium-term economic strategy and took the necessary steps for a formal assessment of economic policy priorities with the Commission. Measures were also taken for stricter supervision of capital markets and the privatisation of banks. Banking and bankruptcy laws were amended to bring them closer to the *acquis*. Little progress was made on financial control and industrial restructuring.
Hungary	Progress has been made. The mass privatisation plan was completed and a new pension system was introduced from January 1998. Branches of foreign credit institutions are now allowed to operate in the Hungarian banking sector, subject to a licence from the State Financial and Capital Market Commission. In the field of trade policy, all trade-related charges have bee eliminated, with the exception of some customs duties which will be phased out before 1 January 2001.

Enlargement: Preparation for Accession - Transport (*Source*: EU - *SCADPlus*: Enlargement: Preparing for Accession)	
Country	**Transport – Medium-term priorities**
Bulgaria	Efforts to adjust legislation to Community legislation continue, particularly in the road, air and sea transport of goods (safety regulations). The investment needed in transport infrastructure (particularly for the extension of trans-European networks) needs to be mobilised.
Estonia	Efforts to adjust legislation to Community legislation continue, particularly in road (market access, safety regulations), sea (safety regulations) and rail transport. The investment needed in the transport infrastructure (particularly for the extension of trans-European networks) needs to be mobilised.
Latvia	Efforts to adjust legislation to Community legislation continue, particularly in the transport of goods by road (technical regulations and taxation), transport by sea (safety) and by rail. The investment needed in the transport infrastructure (particularly for the extension of trans-European networks) needs to be mobilised.
Lithuania	Efforts to adjust legislation to Community legislation continue, particularly in road, rail and sea transport (safety). The investment needed in the transport infrastructure (particularly for the extension of trans-European networks) needs to be mobilised.
Poland	Efforts to adjust legislation to Community legislation continue, particularly in road transport (market access, safety regulations and taxation) and rail transport. The requisite investment in the transport infrastructure (particularly for the extension of trans-European networks) needs to be mobilised.
Romania	Extra efforts are being made to adjust legislation to Community legislation, particularly in the road and sea transport of goods (safety regulations). The investment needed in the transport infrastructure (particularly for the extension of trans-European networks) needs to be mobilised.
Slovakia	Extra efforts are being made to adjust legislation to Community legislation, particularly in road and rail transport (market access, safety regulations and taxation). The investment needed in the transport infrastructure (particularly for the extension of trans-European networks) needs to be mobilised.
Slovenia	Further efforts are needed to align on the *acquis*, particularly in road and rail transport (market access, safety regulations and taxation). The investment needed in the transport infrastructure (particularly for the extension of trans-European networks) needs to be mobilised.
Czech Republic	Efforts to adjust legislation to Community legislation continue, particularly on market access, safety regulations and taxation in road and rail transport. The investment needed in the transport infrastructure (particularly for the extension of trans-European networks) needs to be mobilised.
Hungary	Efforts to adjust legislation to Community legislation continue, particularly for road transport (technical control). The necessary investment in the transport infrastructure (particularly in the extension of trans-European networks) needs to be mobilised.

Enlargement: Preparation for Accession - Environment (*Source*: EU - *SCADPlus*: Enlargement: Preparing for Accession)	
Country	**Environment – Evaluation**
Bulgaria	Strategic programmes for implementing Community legislation have been drawn up but are not yet operational. Although some progress has been achieved in air and waste, further efforts must be made in sectors such as water and pollution control.
Estonia	Significant progress has been made in aligning environmental legislation, particularly in the field of waste management and nature conservation. More needs to be done, however, on noise, industrial pollution, genetically modified organisms, chemicals and water quality. Steps must also be taken to improve the licensing and monitoring system, human resource development and the facilities of the Environmental Inspectorate and regional environmental agencies. Capacity at local level needs to be strengthened.
Latvia	Progress has been made and plans for new activities have been drawn up. Latvia has dealt satisfactorily with most of the short-term priorities laid down in the accession partnership.
Lithuania	Lithuania has made considerable progress, especially in transposing legislation.
Poland	Progress has been rather limited. Poland must therefore make substantial efforts to fulfil its obligations in this field.
Romania	Little progress has been made. The transposition of framework legislation has not been systematic. At present there is no planning at strategic, institutional or technical level.
Slovakia	Limited progress has been made in transposing the *acquis* and there has been no progress in developing alignment programmes and implementing detailed strategies.
Slovenia	Slovenia has continued harmonising its legislation and carrying out programmes to improve air quality in urban areas. However, the national environmental action programme has not been adopted.
Czech Republic	Progress in transposing legislation has been made but efforts need to be stepped up, in particular on water and industrial pollution. The drafting of implementation programmes for the separate directives, particularly as regards investment, is behind schedule.
Hungary	Despite the adoption of a national environmental protection programme and four major laws, legislative harmonisation in this field remains slow.

5. FUTURE OUTLOOK

5.1. Planned programmes and actions

For the candidate countries, the future holds: implementation at national level of structural fund-type activities, such as ISPA and SAPARD; preparation for the Social Fund; institution building (mainly through twinning, more sectors included); limited numbers of multi-beneficiary programmes (PRAQ, Customs, Statistics, JOP, LIEN, TAIEX, Cross Border, Environment, Justice and Home Affairs); and participation in Community programmes.

5.2. Socio-economic figures

The table below presents an estimate of future socio-economic trends.

Table 14. **Development of GDP in the pan-European countries – Moderate scenario**

GDP growth		
	20 years average p.a. (%) **1996-2015**	Cumulated growth (%) **1996-2015**
ALBANIA	6.47	250.3
BOSNIA-HERZEGOVINA	4.21	128.1
BULGARIA	2.06	50.4
CZECH REPUBLIC	3.33	92.4
ESTONIA	4.08	122.4
FYROMACÉDOINE	4.19	127.3
HUNGARY	3.89	114.6
LATVIA	3.71	107.3
LITHUANIA	4.17	126.2
POLAND	5.17	173.9
ROMANIA	2.79	73.4
SLOVAKIA	4.44	138.2
SLOVÉNIA	4.22	128.7

Figure 3. **Summary GDP per country – MODERATE SCENARIO**

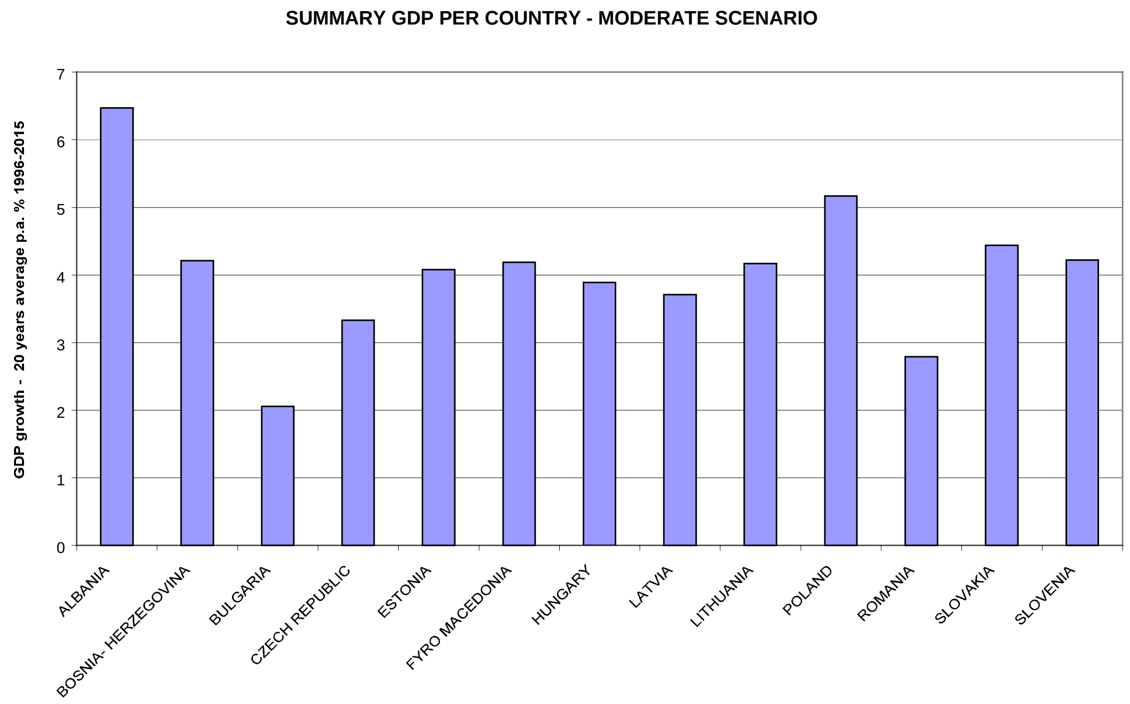
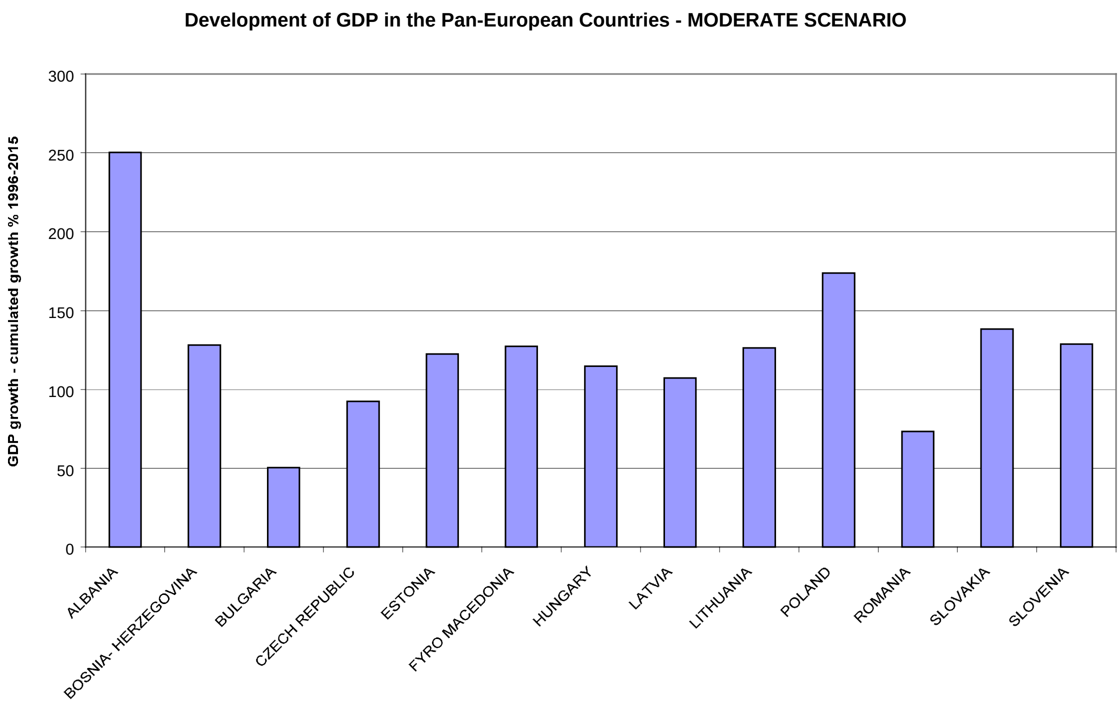


Figure 4**. Development of GDP in the pan-European countries – MODERATE SCENARIO**



According to the above table and figures, Albania will experience the highest increase in GDP, followed by Poland. Bulgaria is expected to have the lowest growth rate for GDP.

6. SUMMARY/CONSEQUENCES

An enlarged Union with over 100 million new citizens, in its initial phase at least, will promote trade and economic activity and give fresh impetus to the growth and integration of the European economy as a whole. The accession of new Member States will enhance the Union's weight and influence internationally.

Whatever happens, the issue of enlargement will dominate EU policy in the coming years. The countries of Central and Eastern Europe and of the Mediterranean are, in principle, starting out on equal terms. However, economic and political realities in these countries are often very different. This presents the Union with unprecedented institutional and political challenges.

Although the population of the EU could rise by over 25% to 500 million with the first wave of accessions, its total GDP will not grow by more than 5%. In spite of the enormous efforts undertaken by the countries that are candidates for adhesion, their integration into existing programmes and structures will be a very delicate task.

This report deals with ten Central and Eastern European countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. It excludes Albania and the successor states of the former Yugoslavia (with the exception of Slovenia).

In terms of population, Estonia is the smallest country covered, with about 1.5 million inhabitants, and Poland is the largest, with 38.6 million, *i.e.* 25 times the population of Estonia.

In terms of GDP per capita, Slovenia is first (USD 9 200 at the exchange rate). The "middle field" consists of the Czech Republic, Hungary, Slovakia and Estonia.

In all countries except Bulgaria, GDP is increasing. Among the ten Central and Eastern European countries, the growth rates are highest in Estonia, Latvia and Lithuania.

The trend for GDP per capita in the ten Central and Eastern European countries parallels that of total GDP.

Already in 1990, Poland led in exports, followed by Hungary and the Czech Republic. For imports, the trends and breakdown are similar to those for exports.

In terms of transport infrastructure, average railway density is 62 m/km². As for the roads in the ten Central and Eastern European countries studied, the lack of motorways in Latvia stands out. Compared to the remaining countries, Estonia has few motorways, but Lithuania, the third Baltic country, has the second highest number of the ten countries after the Czech Republic.

In 1997 on average, the ten Central and Eastern European countries had 215 cars per 1 000 inhabitants. Slovenia had the most cars per number of inhabitant, followed by the Czech Republic.

In 1997, an individual covered an average annual distance of around 590 km by train. In the Czech Republic, Bulgaria and Romania, average kilometres travelled per person and per year were far above the average of all ten countries.

Again in 1997, an individual covered an average distance buses and coaches of about 1 000 km.

Poland has by far the highest level of goods transport by road. In Romania, goods transport by road increased strongly in the late 1980s, then decreased by about 50% to 1993, and then began increasing again. The growth rate for the Czech Republic is also noteworthy.

As for goods transport by road, Poland has by far the highest level of goods transport by rail. In Romania, goods transport by rail has decrease markedly since the late 1980s. Since 1993, there has been essentially no increase in goods transport by rail in the ten countries.

Goods transport on inland waterways is decreasing in all the countries studied except Romania.

In terms of past and present programmes and actions, the PHARE Programme, a European Community initiative, supports the development of a larger democratic family of nations within a prosperous and stable Europe. Its aim is to help the countries of Central Europe to become part of mainstream Europe through future membership in the European Union.

To this end, PHARE provides grant finance to support its partner countries as they transform their economies and strengthen their democratic institutions to the point where they are ready to assume the obligations of membership in the European Union. It provides know-how from a wide range of non-commercial, public and private organisations to its partner countries.

The PHARE programme is the world's largest source of grant aid to Central and Eastern Europe.

The PHARE partner countries fall into two broad groups:

- Those that have applied to become members of the European Union (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia).
- Those that have not [Albania, Bosnia and Herzegovina, and the Former Yugoslav Republic of Macedonia (FYROM)].

(Croatia was suspended from the PHARE Programme in 1995.)

The OBNOVA Programme is another European Community initiative for the rehabilitation and reconstruction of Bosnia and Herzegovina, Croatia, the Federal Republic of Yugoslavia and the Former Yugoslav Republic of Macedonia (FYROM).

The OBNOVA Programme was created in July 1996 and seeks to reinforce the Dayton Accord and the peace agreements signed in Paris on 14 December 1995.

The Copenhagen European Council in 1993 confirmed the legitimacy of Central and Eastern European applications for membership. This marked the start of one of the most ambitious EU projects in its history. In 1997, the Amsterdam European Council called for accession negotiations to begin in 1998.

The accession process started on 30 March 1998 with a meeting of the foreign ministers of the Member States, the countries of Central and Eastern Europe and Cyprus.

The accession partnerships launched on 15 March 1998 provide a single framework for their three basic components:

- Definition of priority areas in which the Community *acquis* is to be adopted.
- Programming the Union's financial assistance.
- Definition of the terms applicable to this aid: compliance with the obligations under the Europe Agreements and progress in meeting the Copenhagen criteria.

ECU 21 billion will be provided in pre-accession aid to Central and Eastern European countries for the period 2000-2006 and will take three forms:

- PHARE programme: ECU 10.5 billion (ECU 1.5 billion a year). Since 1997, the focus has been on the two main priorities for adoption of the Community *acquis*: institution building in the applicant countries (30% of the budget) and investment financing (70%) in areas where post-accession transitional periods are to be avoided as far as possible.
- Aid for agricultural development totalling ECU 3.5 billion (ECU 500 million a year).
- Structural aid amounting to ECU 7 billion (ECU 1 billion a year) to be used primarily to help applicant countries comply with Community infrastructure standards in the transport and environmental sectors. It will also be used to familiarise these countries with structural project procedures.

In terms of the evaluation of existing barriers and priorities in the transport area, especially in the most of the countries of the former Yugoslavia, market conditions are very unsettled and differ both between transport modes and between privately owned and state-owned companies operating in the same mode.

The most important reasons for market disorder are:

- Low standards of transport infrastructure, owing to differences in the intensity of post-war rehabilitation and operational capability, which put railway transport at a disadvantage.
- Geo-political relations in the region, which prevent international railway operations.
- Still unsettled relations between entities in Bosnia and Herzegovina, which affect specific transport modes in different ways.
- Diversity in the performance of custom offices and other border crossing services.
- Weaknesses in the legal and fiscal systems, which allowing widespread black market operations.
- Unequal conditions for the purchase and operation of means of transport.

- An uncontrolled and unnatural development of traffic in the post-war period, which is seen in particular by:
  - Excessive growth in motorisation.
  - The symbolic share of railway traffic in total traffic.

In the more developed Eastern countries, the deficiencies of the railway system have led to strategies to:

- Develop high-speed lines along the main arteries.
- Intensify night train traffic, in particular for freight.
- Raise speeds for freight trains.
- Improve combined transport.
- Develop logistics and informatics services.
- Set market-oriented prices.
- Protect the environment.

For road transport operations, attention has focused on the movement of heavy goods vehicles, an economic sector that is strictly regulated by national legislation and international agreements. Efforts by the UN/ECE, the ECMT and the European Union over many decades have led to much improvement and greater efficiency in road freight transport. Nevertheless, there is still much room for further improvements, but these do not relate specifically to Corridor V. By implementing the *acquis communautaire,* EU accession candidates are resolving a number of remaining problems. The main operational barriers for international transport between the Central and Eastern European countries, as long as they are not members of the European Union, continue to be:

- Poor quality of infrastructure networks on some sections.
- Delays and waiting times at border crossings.
- Difficulties in simplifying customs procedures.
- Problems with transit customs regimes.
- Unofficial levies at border posts or en route.

To remove such obstacles, it would be necessary to:

- Improve international and domestic network links in order to satisfy traffic demand.
- Provide the necessary road infrastructure to remedy the lack of uniformity between areas of the country and to facilitate uniform regional development.
- Improve traffic conditions (to reduce accident numbers, time input, operating costs of transport).
- Reduce negative impacts on the environment and on nature.
- Increase the efficiency of transport.

The following are among the bottlenecks that concern more specifically international road traffic:

- Legal barriers:
  - Standards and rules regarding the dimensions and equipment of vehicles.
  - Conditions of access to the road transport profession.
  - Refusal of a general licence to operate a business.
  - Marked differences in environmental standards.
- Commercial barriers: the disparity of economic and financial conditions between EU trucking companies and those of the Central and Eastern European countries.
- Financial barriers: difficulties for financing the equipment.

Options for addressing these problems include:

- Redefinition of development priorities.
- Upgrading of existing roads.
- Phased implementation of planned development.
- Elimination of local danger spots.
- Satisfaction of needs for local economic or other development.
- Adoption of legal, commercial and financial measures.

The European Commission published Agenda 2000 on 16 July 1997. This three-part policy document looks at:

- The future of the main areas of Community policy.
- The European Union's financial outlook for the period 2000-2006.
- The enlargement of the Union.

Attached to this document are the Commission's Opinions, prepared on the basis of the Copenhagen accession criteria, on membership applications from Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. The Commission proposed that membership be extended to a first wave of five countries and that negotiations be launched initially with the Czech Republic, Estonia, Hungary, Poland and Slovenia. The negotiations with Cyprus would open six months after the end of the Intergovernmental Conference. The situation in the other countries would be reviewed annually.

- The first accession criterion (political criterion), which concerns, notably, respect for democracy and human rights, appears to have been met by all countries except Slovakia, where, in the Commission's view, the rule of law and democracy is not sufficiently rooted in political life and there is insufficient protection of minorities. Consequently, it was excluded from the first wave of applicants.
- The economic criterion: this has probably been the key factor. The five countries chosen are considered to have viable market economies and Slovakia is very close to this goal. As regards the second requirement under this criterion – the capacity to cope with competitive pressure and market forces within the Union – the Czech Republic and Slovenia are considered to have made the greatest progress, Hungary and Poland appear to be proceeding well with restructuring, with Estonia trailing behind. The Commission noted that the four

countries not chosen for the first wave of negotiations on economic grounds had recently made substantial progress and could catch up the other applicant countries within the next ten years.

- The third criterion (ability to adopt the Community *acquis*) highlights the differences between:
  - Bulgaria and Romania, which were considered unable to take on the obligations of membership in the medium term.
  - The three Baltic states and Slovenia, which were unlikely to be able to adopt the body of the Community *acquis* in the medium term unless they made substantial efforts.
  - Hungary, Poland, the Czech Republic and Slovakia which should be able to take on the main part of the Community *acquis* in the medium term, provided progress is made in specific sectors.

This catalogue of existing barriers leads to the following remarks:

6.1. Political issues

- Bulgaria needs to continuation its efforts to integrate the Romanies and protect individual freedoms.
- Estonia’s parliament still has to adopt amendments to the Citizenship Act to facilitate the naturalisation of stateless children.
- Latvia has made progress. The success of the referendum of 3 October 1998 on the amendment of the nationality act has speeded up the naturalisation process, in particular by abolishing the system of age brackets (which gave priority to younger age groups) and granting citizenship to stateless children. The first stage of the Latvian-teaching programme has been completed: 2 700 teachers working in the minorities' schools and about 12 000 allophones have received training.
- Poland needs to concentrate on guaranteeing freedom of the press and equal access to public services.
- Romania must pursue its efforts to reform its system of child protection, to integrate the Romanies, to protect individual freedom and to improve the functioning of the courts.
- Slovakia held free and fair presidential, national and local elections in 1998. The opposition's effective participation in inspection committees and parliamentary supervisory authorities should be reinforced and legislative provisions on minority language use and related implementing measures should be adopted.
- Slovenia should improve the working of the judicial system and speed up the restitution of assets.
- The Czech Republic should continue work on integrating the Romanies and on strengthening legislation guaranteeing freedom of the press.
- Hungary should continuation efforts to integrate the Romanies.

6.2. Economic issues

- Bulgaria has developed a new medium-term strategy. In general terms, Bulgaria has achieved overall economic stability, which has created the right conditions for economic growth and attracting foreign investment. More work must be done, notably for the privatisation of state enterprises and in the banking sector. Further efforts are also needed in the agricultural sector.
- Estonia has developed a medium-term economic strategy. Joint assessment with the Commission is being prepared. The process of privatising SMEs is almost complete, but the privatisation of the big utilities companies has yet to be carried out and further efforts at

enterprise restructuring will be needed for several years. The government has adopted measures to increase monitoring in the financial sector and legislation has also been introduced on pension reform. However, Estonia must make further efforts in terms of property reform and the establishment of an agricultural census.

- Latvia has drawn up a medium-term economic strategy and a joint review has been conducted with the Commission. Though the privatisation of SMEs is practically complete, the privatisation of some larger companies, in particular the utilities, is in abeyance, and restructuring efforts must continue over a number of years. The banking sector has been strengthened considerably by tighter supervision. Agriculture is being modernised and a land and property register has been introduced.
- Lithuania has still to draw up a medium-term economic strategy, although progress has been made in large-scale privatisation, restructuring the banking sector and applying financial discipline to firms. Major efforts are still needed to restructure the energy and agricultural processing sectors.
- Poland has developed a medium-term economic strategy and is currently carrying out a joint evaluation with the Commission. The government has adopted plans to restructure state enterprises, notably in the coal and steel sectors. However, further efforts will be required over several years to complete the restructuring and privatisation programmes already launched. Progress has been made in developing the financial sector following the adoption of framework legislation, but efforts are nevertheless needed in the privatisation of the banking sector in particular.
- Romania has made progress in developing a short- to medium-term economic policy. However, in 1998, there were problems in implementing this policy owing to world economic difficulties and the lack of a genuine commitment to introduce strict budgetary constraints and speed up structural reforms. It was announced that two banks would be privatised by the end of 1998. Although the general rules governing investment were changed again, the legal framework did not become simpler or more transparent. The process of restructuring/privatising large industrial state companies in the steel and coal sector is under way, as is the restructuring/privatisation of agricultural companies. However, measures for large loss-making enterprises remain to be taken. Since summer 1998, most independent administrations have been privatised, but it is still too early to assess this fully.
- Slovakia has made efforts to implement policies to combat internal and external instability but has still to develop a medium-term economic policy and a framework for joint assessment. Limited progress has been made in restructuring the banking and finance sector and in continuing reconverting heavy, highly energy-intensive industries.
- Slovenia approved in November 1998 the joint assessment figuring among the short-term priorities. Relatively little progress has been made towards restructuring and privatising the banking and insurance sectors and supervisory capacities need to be strengthened, especially in the insurance sector. The new banking law has still to be adopted. Pension reforms are being prepared, with a draft going before the Slovenian parliament in August 1998.
- In the Czech Republic, the government adopted in 1997 two packages of special economic measures which had a positive impact on the internal and external balance and on structural reform. Progress was made in the accounting and tax sectors. However, the overall economic situation is still difficult, with negative growth in 1998. In July 1998, the government approved a medium-term economic strategy and took the steps for a formal assessment of economic policy priorities with the Commission. Measures were also taken for stricter supervision of capital markets and the privatisation of banks. Banking and bankruptcy laws were amended to bring them closer to the *acquis*. Little progress was made on financial control and industrial restructuring.
- Hungary has made progress in this area. The mass privatisation plan was completed and a new pension system was introduced as from January 1998. Branches of foreign credit institutions

are now allowed to operate in the Hungarian banking sector, subject to a licence from the State Financial and Capital Market Commission. In the field of trade policy, Hungary has eliminated all trade-related charges, with the exception of some customs duties which will be phased out before 1 January 2001.

6.3. Transport – medium-term priorities:

- Bulgaria needs to continue alignment efforts with respect to Community legislation, particularly in the road, air and sea transport of goods (safety regulations). Mobilising the investment needed in transport infrastructure (particularly in the extension of trans-European networks).
- Estonia needs to continue its efforts to adjust legislation to Community legislation, particularly in road (market access, safety regulations), sea (safety regulations) and rail transport. The investment needed in the transport infrastructure (particularly for the extension of trans-European networks) needs to be mobilised.
- Latvia needs to continue its efforts to adjust legislation to Community legislation, particularly in the transport of goods by road (technical regulations and taxation), transport by sea (safety) and by rail. The investment needed in the transport infrastructure (particularly for the extension of trans-European networks) needs to be mobilised.
- Lithuania needs to continue its efforts to adjust legislation to Community legislation, particularly in road, rail and sea transport (safety). The investment needed in the transport infrastructure (particularly in the extension of trans-European networks) needs to be mobilised.
- Poland should make extra efforts to adjust legislation to Community legislation, particularly in road transport (market access, safety regulations and taxation) and rail transport. The requisite investment in the transport infrastructure (particularly in the extension of trans-European networks) needs to be mobilised.
- Romania should make extra efforts to adjust legislation to Community legislation, particularly in the road and sea transport of goods (safety regulations). The investment needed in the transport infrastructure (particularly in the extension of trans-European networks) needs to be mobilised.
- Slovakia should make extra efforts to adjust legislation to Community legislation, particularly in road and rail transport (market access, safety regulations and taxation). The investment needed in the transport infrastructure (particularly in the extension of trans-European networks) needs to be mobilised.
- Slovenia should make further efforts to align its legislation on the *acquis*, particularly in road and rail transport (market access, safety regulations and taxation). The investment needed in the transport infrastructure (particularly in the extension of trans-European networks) needs to be mobilised.
- The Czech Republic should continue efforts to adjust its legislation to Community legislation (particularly on market access, safety regulations and taxation in road and rail transport). The investment needed in the transport infrastructure (particularly in the extension of trans-European networks) needs to be mobilised.
- Hungary should continue efforts to adjust its legislation to Community legislation, particularly in road transport (technical control). The investment needed in the transport infrastructure (particularly in the extension of trans-European networks) needs to be mobilised.

6.4. Environment

- Bulgaria has drawn up strategic programmes for implementing Community legislation but they are not yet operational. Although some progress has been achieved in the areas of air and waste, further efforts must be made in sectors such as water and pollution control.
- Estonia has made significant progress in adjusting environmental legislation, particularly in the field of waste management and nature conservation. More needs to be done, however, on noise, industrial pollution, genetically modified organisms, chemicals and water quality. Steps must also be taken to improve the licensing and monitoring system, human resource development and the facilities of the Environmental Inspectorate and regional environmental agencies. Capacity at local level needs to be strengthened.
- Latvia has made progress in this area and plans for new activities have been drawn up. It has dealt satisfactorily with most of the short-term priorities laid down in the accession partnership.
- Lithuania has made considerable progress in this area, especially in transposing legislation.
- Poland has made rather limited progress. It must therefore make substantial efforts to fulfil its obligations in this field.
- Romania has made little progress in this field. The transposition of framework legislation has not been systematic and at present there is no planning at strategic, institutional or technical level.
- Slovakia has made limited progress in transposing the *acquis* and there has been no progress at all in developing alignment programmes and implementing detailed strategies.
- Slovenia has continued to harmonise its legislation and carry out programmes to improve air quality in urban areas. However, the national environmental action programme has not been adopted.
- The Czech Republic has made progress in transposing legislation, but efforts need to be stepped up, particularly for water and industrial pollution. The drafting of implementation programmes for the separate directives, particularly as regards investment, is behind schedule.
- Hungary has adopted a national environmental protection programme and four major laws, but legislative harmonisation in this field remains slow.

NOTES

1. *Source*: TACIS-Homepage – The European Commission – DG1A.

2. The NIS comprises the former republics of the Soviet Union, minus the Baltic States, and Mongolia.

3. *Source*: EU - *SCADPlus*: Enlargement: Preparing for Accession.

PERIPHERALITY AND PAN-EUROPEAN INTEGRATION: THE CASE OF THE CEECs

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SUMMARY

Warsaw, January 2000

INTRODUCTION

This paper draws on the experience of the author's team, which participated in various research projects and consulting in the area of transport policies and plans, transport demand modelling and problems relating to the interrelationship of transport, economic development and the environment in Central and Eastern European countries (CEECs). In particular, the results of work on motorway development programmes, co-operation among the Baltic States (e.g. under the auspices of the Conference of Transport Ministers of the Baltic States), the EC DG VII project, POSSUM (Policy Strategies for Sustainable Mobility)[1], problems of mitigating transport impact on global warming and other R&D work are taken into account. While this paper concentrates on the specific problems of Central and Eastern European countries, some findings seem to be universally valid.

The preparation of this chapter benefited greatly from help provided by Mr. Jan Friedberg[2], who offered information and discussed essential points of Poland's transport policy. In some sections, the author refers to data, views and predictions contained in a paper he prepared in 1992 and presented at the ECMT's 95th Round Table on Transport Economics, held in Paris on 18-19 March 1993 [4]. It was interesting to compare these predictions with what has happened in the intervening seven years

The first section discusses the notion of peripherality in the context of pan-European integration and of Central and Eastern Europe. The impact on transport demand of the envisaged development of peripheral countries is then considered, including some environmental impacts. One question asked is what can be done to decouple economic growth and growth in transport demand through means such as "*glocalisation*" (the global/local, i.e. "glocal" economy) and *dematerialisation*. Sections 4-7 deal with policy issues, such as the contradiction between meeting the needs of long-distance international traffic/transport and regional/local transport demand, the impact of European Union policies and international finance institutions on transport investment, and appropriate technologies (appropriate in countries of varying economic potential). Finally, the directions of a new national transport policy in Poland are briefly described.

1. THE NOTION OF PERIPHERALITY AND CENTRAL AND EASTERN EUROPE

The term *peripherality* is used with various meanings. Similarly, the geographic extent of what is called Central and Eastern Europe varies depending on the criteria used.

Table 1. **Population density and GNP per capita in selected countries in Europe (1998)**

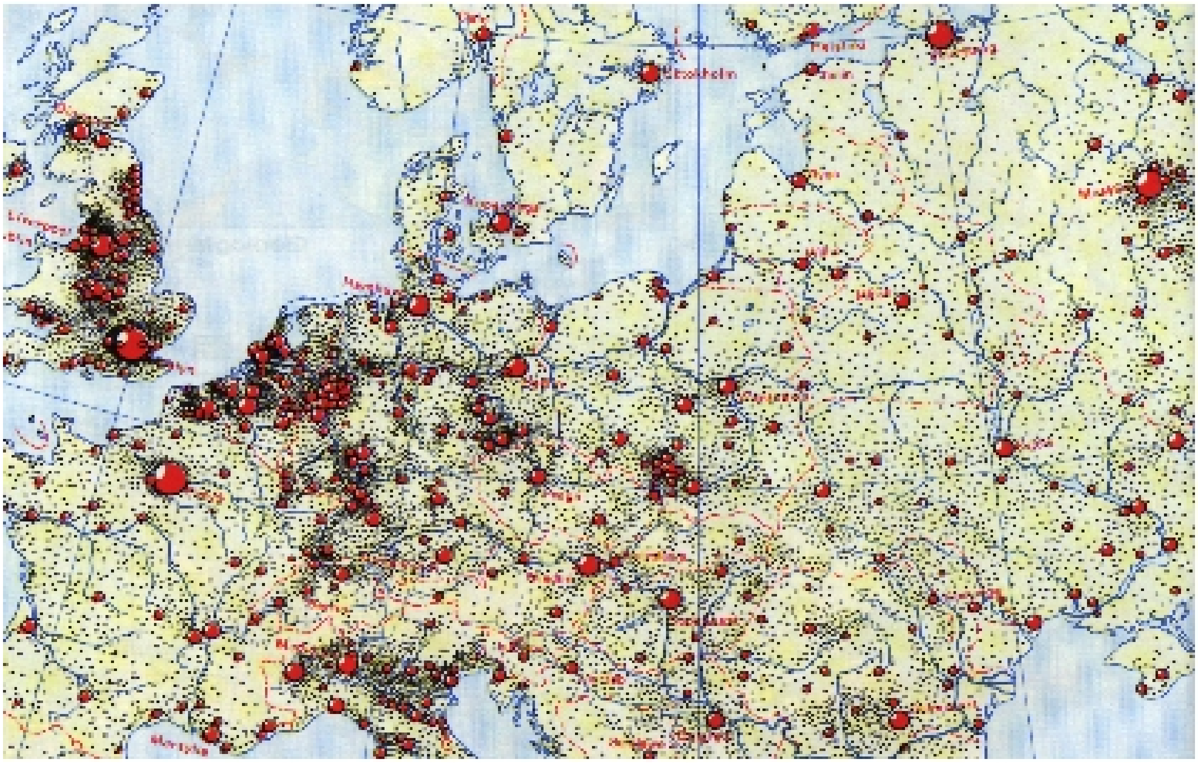
Country	Area (000 sq. km)	Population (000)	Density per/km	GNP per capita (US$1998)	GNP at PPP* per capita
UE+3					
Austria	84	8 070	96	26 850	22 740
Belgium	30	10 190	333	25 380	23 480
Denmark	43	5 300	125	33 260	23 830
Finland	338	5 150	17	24 110	20 270
France	551	58 610	106	24 940	22 320
Germany	357	82 070	230	25 850	20 810
Greece	132	10 543	82	11 650	13 010
Ireland	70	3 661	53	18 340	18 340
Italy	301	57 520	191	20 250	20 200
Netherlands	41	15 600	382	24 760	21 620
Norway	324	4 430	14	34 330	24 290
Portugal	92	9 964	109	10 690	14 380
Spain	506	39 371	79	14 080	16 060
Sweden	450	8 850	22	25 620	19 480
Switzerland	41.3	7 090	172	40 080	26 620
United Kingdom	245	59 126	244	21 400	20 640
Total	*3 361*	*239 237*	*142*		
CEEC I					
Croatia	57	4 498	82	4 520	...
Czech Rep.	78.9	10 300	131	5 040	11 380**)
Hungary	93	10 150	109	4 510	7 000**)
Poland	312.7	38 650	124	3 900	6 740
Slovak Rep.	49	5 380	110	3 700	7 850**)
Slovenia	20.3	1 990	98	9 760	12 520**)
Total	*553.9*	*66 470*	*120*		
CEEC II					
Albania	29	3 790	123	810	...
Belarus	208	10 220	49	2 200	4 480**)
Bulgaria	111	8 310	75	1 230	3 860**)
Moldova	34	4 312	130	410	...
Romania	238	22 570	95	1 390	3 970
Ukraine	604	50 700	84	850	2 170**)
Total	*1 195*	*91 804*	*79*		
CEEC – Baltic					
Estonia	45	1 460	32	3 390	5 010**)
Latvia	65	2 470	38	2 430	3 650**)
Lithuania	65	3 710	57	2 440	4 310
Total	*175*	*7 640*	*44*		
Russian Fed.***)	17 075	147 100	9	2 300	3 950

*) GNP converted to US dollars at the purchasing power parity (PPP) exchange rate.
) 1997; *) including Asian provinces.

Source: World Bank. World Development Reports 1998/1999, 1999/2000.

In Europe, the spatial distribution of population, economic activities and welfare is uneven. There are significant differences even within EU countries. For example, population density in the Benelux states is 20 times higher than in the northern regions of Sweden and other northern countries [23]. For the present European Union, not only the southern parts of Italy or Portugal but also selected regions of the Netherlands and notably of Germany are called peripheral because of their location and deep internal disparities [8]. When looking at the wider Europe, from the Ural to Iceland, the term *peripherality* takes on another dimension, not only because the distances are larger but also because of much lower population densities and average incomes sometimes many times below those in even the poorest regions of European Union countries. This is illustrated in Table 1 and Figure 1.

Figure 1. **Population distribution in Europe**



In the new political situation, changes are taking place in many directions. On the one hand, there is a new trend towards rapid integration among the border countries of Western and Central Europe. On the other hand, some new barriers have been created, as happened in the Baltic States as a result of the breaking up of the former Soviet Union and the regaining of independence by Estonia, Latvia and Lithuania. According to some, “instead of pushing for integration, these three states concentrate on strengthening their own national structures” [16]. This is, of course, fully justified by political factors. The same can be observed in new states in the Central Asia region.

2. DEVELOPMENT AND TRANSPORT DEMAND

As envisaged in the early 1990s, political and economic reforms in the countries of Central and Eastern Europe have already caused great changes in the volume and direction of passenger and goods transport. There has been a shift in demand from the need to transport raw materials and products of heavy industries to lighter consumer goods, from demand for low-quality to high-quality services and from international traffic among the countries of the "Eastern Bloc" to traffic between CEE countries and EU countries. Changes in modal split took place faster than expected. The situation in the Poland's freight transport sector (Table 2) is the best illustration of these trends.

Table 2. **Freight transport in Poland 1970-1998**

	1970		**1980**		**1990**		**1995**		**1998**	
	t-km billions	**%**	**t-km billions**	**%**	**t-km billions**	**%**	**t-km billions**	**%**	**t-km billions**	**%**
Railways	99.0	80.0	134.5	67.7	83.5	65.0	69.0	51.3	61.8	41.9
Road transport	15.7	12.7	44.5	22.4	30.0	23.4	51.2	38.0	69.5	47.2
Inland waterways	2.3	1.8	2.3	1.2	1.0	0.8	0.9	0.7	1.1	0.7
Pipelines	7.0	5.5	17.1	8.6	13.9	10.8	13.5	10.0	15.0	10.1
Total	**124.0**	**100.0**	**198.4**	**100.0**	**128.4**	**100.0**	**134.6**	**100.0**	**147.4**	**100.0**

Source: GUS, National Annual Statistics.

Generally throughout the region, growth in demand for passenger travel has been greater than growth in GDP. The situation in freight transport is different because economic reforms and, in particular, a reduction of the inefficiency of the centrally planned economies caused considerable reductions in transport intensity in the early 1990s.

Growth rates in road traffic vary among countries. While growth of national and especially international traffic has been extremely rapid in Poland[3] and other countries of Central Europe, it has been much slower in the Baltic States. For instance, Estonia experienced a significant drop in road traffic between 1990 and 1993, despite the rise in car ownership [4]. However, the situation is changing rapidly. In Lithuania, on the east-west corridor connecting Klaipeda with Belarus, road traffic volumes in 1995-96 increased by 18 per cent and the trend is expected to continue.

Probably the most dramatic changes are in the categories of goods transported. In the past, 80-90 per cent of traffic in the Baltic ports was outbound goods shipped in bulk, but now the fastest growth is in container traffic.

Many forecasts of travel/transport demand have been prepared for each country and for the region. The differences are striking. For example, various forecasts prepared for Poland in the early 1990s assumed that growth factors for international road traffic crossing borders for the period 1990-2020 would be between 3 (minimum scenario) and 10-12 (maximum scenario). This is discussed in the next section.

The greatest changes are caused by the rapid growth of motorisation and the growing role of road transport. In spite of relatively low income levels, the number of private cars is increasing rapidly and rates of car ownership per unit of GDP per capita exceeded by far those of much more developed countries. This development was envisaged, among others, by the author, who wrote in 1993 that, in spite of low disposable income, "there will be a strong tendency to own and use private cars. These trends might be slowed down by government intervention, but such intervention seems to be very unlikely" [4, p. 84]. In practice, instead of intervention, the government's taxation policy, combined with aggressive marketing by the automobile industry and banks offering attractive credits, induced car purchasing to an extent far beyond earlier forecasts.

The present situation is well illustrated by comparing the present car ownership rate with rates in other countries. For example, in Poland in 1997, with GDP per capita equal to USD 3 700, there were 220 cars per thousand inhabitants. Germany achieved this rate of motorisation in 1970 (GDP per capita = USD 11 400), Spain in 1985 (GDP per capita = USD 9 700) and Ireland in 1990 (GDP per capita = USD 7 470). Because this comparison does not take into account differences in purchasing power between countries, Table 3 presents the results of another comparative analysis in which car ownership is compared with GNP per capita converted to US dollars in purchasing power parities.

Table 3. **Gross national product (USD) and car ownership (1997)**

Country	**GNP (PPP)* per capita**	**No. of cars per 1 000 pop.**	**GNP/no. of cars**	**GNP/no. of cars Poland=100%**
Ukraine	2 170	90	24 111	0.8
Poland	**6 380**	**221**	**28 869**	**1.0**
Hungary	7 000	222	31 532	1.1
Portugal	13 840	378	36 614	1.3
Czech Republic	11 380	306	37 190	1.3
Germany	21 300	500	42 600	1.5
United Kingdom	20 520	392	52 347	1.8
Spain	15 720	308	51 039	1.8
United States	28 740	517	55 590	1.9
Denmark	22 740	307	74 072	2.6
Argentina	9 950	132	75 379	2.6
Korea	13 500	133	101 504	3.5
Turkey	6 430	52	123 654	4.3

* GNP converted to US dollars at the purchasing power parity (PPP) exchange rate.

Sources: [10, 26].

The figures in the last two columns of Table 3 confirm that car ownership in countries such as Poland and Hungary is much higher than can be explained by income level (purchasing power). It is 1.5 to 2.6 times higher than in highly developed countries such as Denmark, Germany, the United Kingdom and the United States, 3.5 times higher than in Korea and over four times higher than in Turkey.

The impact of this growth on road traffic volumes is still not optimal because average annual mileage is still lower than in the countries of the European Union. However, this will certainly change as incomes rise. Consequently, road traffic will be increasing even faster than the number of vehicles.

The seriousness of the situation is illustrated by the results of a comprehensive, far-reaching study prepared by the author's team within the framework of the Polish Country Study to Address Climate Change [7]. This study was part of a multi-country project, co-financed by the US government. Methodology developed in 1994-95 was used in the preparation of another study of a similar nature, commissioned by the Polish Ministry of Environmental Protection in 1998.

To facilitate forecasting of the greenhouse gas (GHG) emissions from the transport sector and testing alternative mitigation strategies, a computer model was built relating demographic and economic variables to transport demand, energy consumption and emissions of GHG. The model which was calibrated on data for recent years, was used to forecast volumes of passenger and freight traffic, energy consumption and GHG emissions for the period up to 2030 for different scenarios of economic development. The selected results of these forecasts for the reference scenario are shown in Tables 4 and 5 and in Figures 2 to 4.

Table 4. **Passenger traffic forecast for Poland (1998-2020)**
Reference scenario
(million trips per year)

	1995	**1998**	**2000**	**2005**	**2010**	**2015**	**2020**
INTERCITY TRANSPORT							
Rail	466.0	400.0	373.5	401.8	422.1	455.5	506.4
Intercity bus	1 131.0	1 055.0	1 104.1	1 198.1	1 284.6	1 351.3	1 395.6
Air	1.8	2.5	2.8	3.1	3.4	3.6	3.9
Inland water transport	1.2	1.0	1.1	1.2	1.3	1.3	1.4
Sea transport	0.6	0.6	0.5	0.7	0.9	1.1	1.3
Car	488.4	569.8	624.5	714.3	800.4	873.4	927.4
Sub-total	2 089.0	2 028.9	2 106.4	2 319.1	2 512.6	2 686.4	2 836.1
URBAN TRANSPORT							
Bus	5 028.7	4 535.9	4 092.8	3 966.2	3 787.5	3 744.8	3 911.5
Rail transport	1 916.5	1 682.4	1 518.1	1 471.1	1 404.8	1 389.0	1 450.8
Car	8 017.2	9 638.4	10 778.7	12 454.7	14 098.8	15 462.9	16 419.5
Sub-total	14 962.4	15 856.6	16 389.6	17 892.1	19 291.1	20 596.7	21 781.8
TOTAL	**17 051.4**	**17 885.5**	**18 496.0**	**20 211.2**	**21 803.7**	**23 283.1**	**24 617.9**

Table 5. **Freight transport forecast for Poland (1998-2020)**
Reference scenario
(million tons per year)

	1995	**1998**	**2000**	**2005**	**2010**	**2015**	**2020**
Rail	225.3	226.2	232.3	229.5	220.3	204.7	185.3
Road transport	1 086.7	1 143.1	1 226.9	1 408.3	1 589.1	1 747.5	1 872.5
Inland water transport	7.8	8.4	10.0	12.5	15.0	17.5	19.9
Sea transport	26.2	25.1	23.6	24.8	25.5	25.5	24.7
Pipelines	33.4	30.8	31.4	35.2	38.9	41.9	44.2
TOTAL	**1 379.4**	**1 433.6**	**1 524.2**	**1 710.3**	**1 888.8**	**2 037.1**	**2 146.6**

Figure 2. **Passenger traffic forecast for Poland**

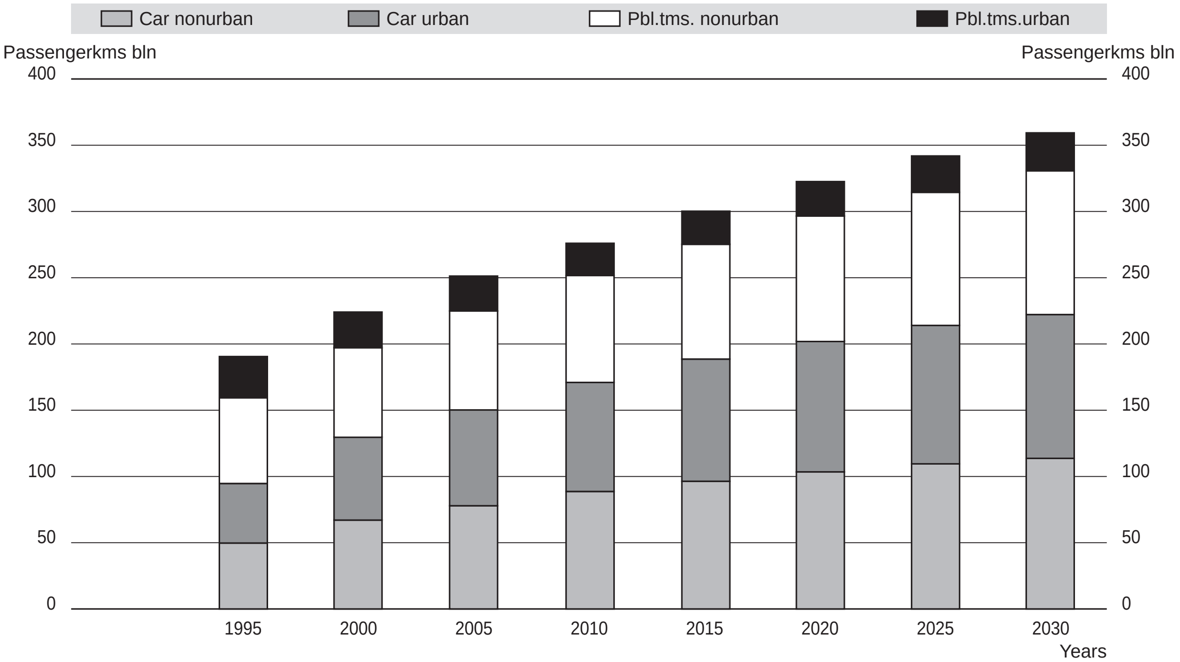


Figure 3. **GHG emissions for transport in Poland 1995-2020**
Reference scenario

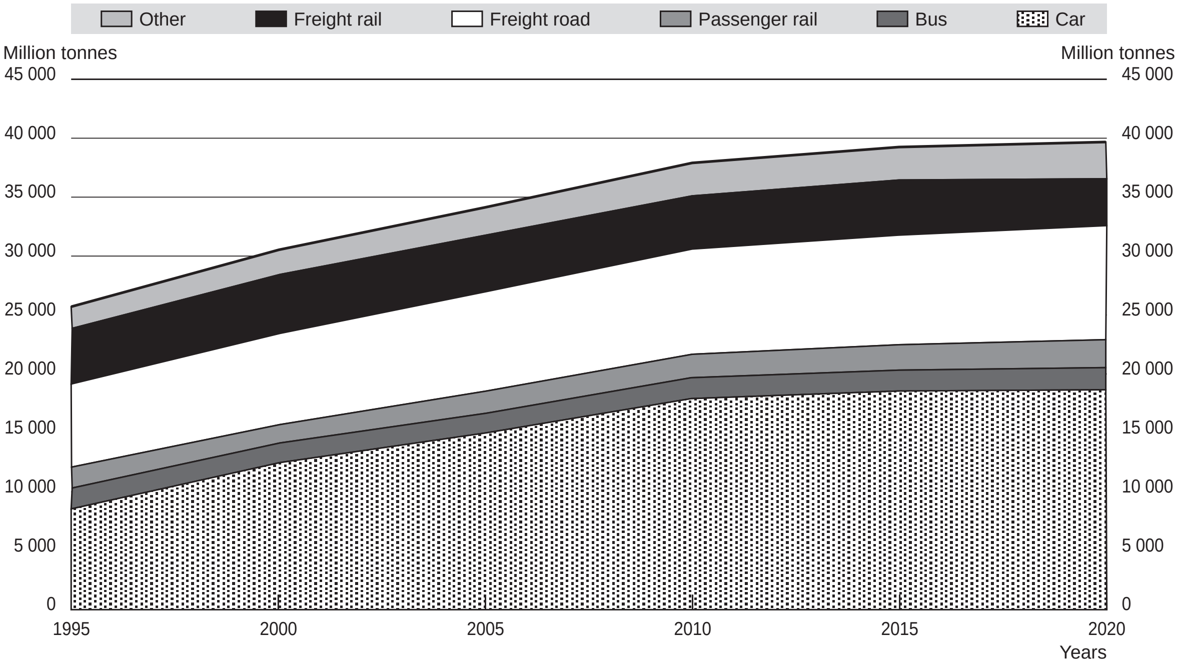
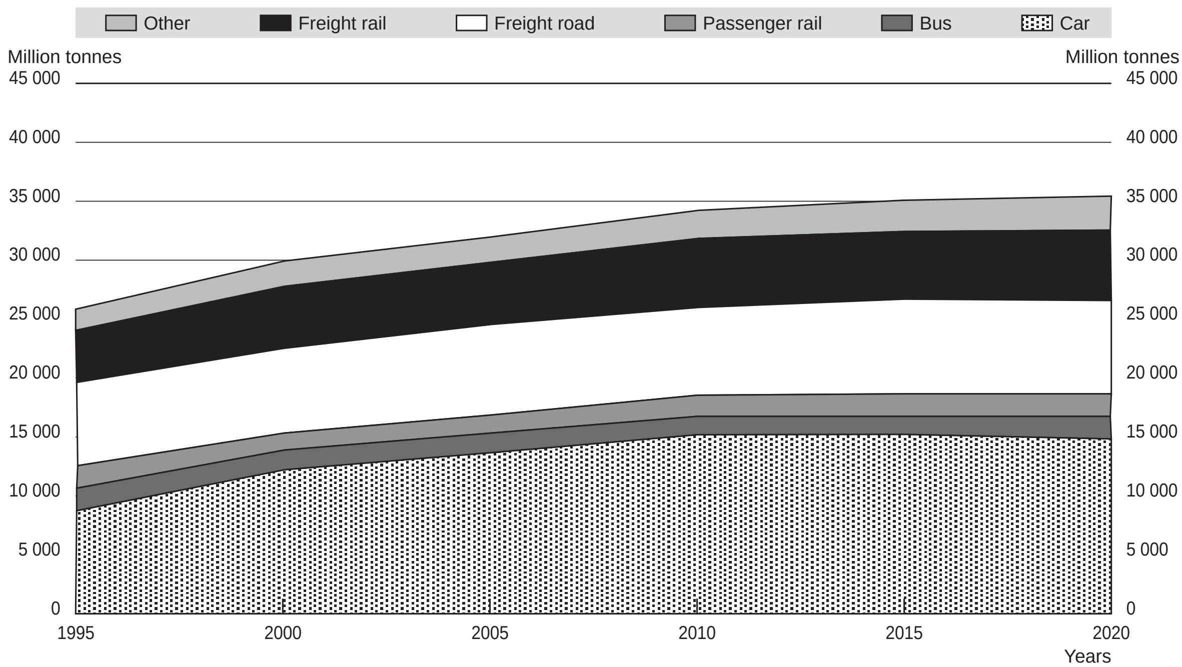


Figure 4. **GHG emissions for transport in Poland 1995-2020**
Reduction scenario



Similar forecasts were prepared for other economic development scenarios and for scenarios assuming various transport mitigation policies. The resulting predictions of CO_{2eq} are presented in Table 6.

Table 6. **CO_{2eq} emissions (thousand tons per year) for economic and reduction scenarios**

Scenario	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Reference	25 760	30 456	34 203	37 776	39 153	39 611
Reference with reduction	25 760	29 881	32 188	34 527	35 181	35 755
Slow economic growth	25 760	29 814	31 683	33 549	33 719	33 414
Fast economic growth	25 760	31 098	37 303	42 967	45 540	46 431
Fast economic growth and reduction	25 760	30 389	35 022	39 226	40 861	41 655

According to these forecasts, the economy's transport intensity and mobility will grow a little slower than incomes. In the first 10-15 years, energy consumption and related GHG will grow at a rate close to that of transport volume. Then, gradually, this growth will slow as the result of technological progress and changes in the organisation of transport. In a reference economic growth scenario without any intervention to reduce GHG emissions, emissions will reach 151 per cent of the 1995 level in 2020.

Various mitigation strategies have been tested. They can be classified into five categories: (i) strategies leading to the reduction of transport demand; (ii) strategies affecting the modal shift to cleaner means of transport; (iii) strategies promoting technological improvements of the vehicle; (iv) strategies inducing a shift to better fuels; and (v) strategies promoting better operation. In the reference economic growth scenario, which assumes a combination of elementary strategies in the long term, total emissions from the transport sector would be 11 per cent lower than in the absence of intervention and would stabilise at about 139 per cent of the present emissions level [7].

With a moderate mitigation policy, emissions would be about 137 per cent of the 1995 emissions level. However, for the scenario of accelerated economic growth – without intervention – GHG emissions would reach 180 per cent of the present level in 2020. With the assumed mitigation strategy, this value would be reduced to about 162 per cent of the present level.

These forecasts can be compared with similar ones for the European Union [8]. If present trends continue, total CO_{2eq} emissions will rise by 40 per cent in the period 1990-2010. If economically efficient measures are applied, growth would be reduced to 20 per cent. Taking into account that the periods covered by the two forecasts differ, these results can be treated as comparable.

The rate of growth is not acceptable from the point of view of sustainable development. In all these forecasts, the emissions exceed the limits – critical loads – determined by various studies and by international organisations dealing with global warming. For example, in the recently published "alternative transport policy for Poland", prepared by the Institute for Sustainable Development [1], it was assumed that the total CO_{2eq} emissions in 2010 should not exceed 14 million tons. This is 2.5-3 times below the forecasts presented in Table 6. Consequently, it was recommended that a sustainable national transport policy should be adopted that would lead to a threefold reduction of energy consumption and a fourfold reduction of CO_{2eq}.

However, reversing trends will not be easy, especially in transition economies. On the one hand, reducing differentials in mobility is a clear objective of growth and convergence, but, on the other hand, increased mobility means greater pressure on underdeveloped transport infrastructure and on the environment. Finding a sound balance between meeting economic development objectives, social objectives and protection of the environment is a difficult task.

What can be done to control the growth of demand for transport and modal split?

3. MEASURES FOR DECOUPLING TRANSPORT GROWTH FROM ECONOMIC GROWTH

Policy measures for decoupling transport growth from economic growth and the extent to which this could be done in the next two decades (to 2020) were studied, *inter alia,* in the POSSUM project. This section discusses the applicability of the policies proposed – with EU countries in mind – in Central and Eastern Europe.

3.1. Passenger transport

The four main types of strategies for *passenger transport* include: market-based instruments, regulation (including spatial planning), information technology (including substitution effects) and lifestyle changes.

3.1.1 Market-based instruments

It is generally accepted by economists (but so far not necessarily by politicians and the general public) that pricing can be used to internalise the external costs of transport. Users should pay according to their use of the system, particularly when travel takes place under congested conditions. A substantial increase in petrol and diesel prices to reflect the full environmental costs seems to be the simplest way of implementing the "user pays" principle. Vehicle tax could also be related to fuel efficiency and vehicle emissions. It is often suggested that the advantageous position of the airlines should also be reviewed so that VAT and appropriate environmental taxes are applied to aviation fuels.

It is envisaged to follow this path for long-term transport policies in countries such as Poland. However, when considering the transition economies, it is necessary to take into account the fact that, given the much lower income levels, the economic and social consequences of higher transport costs may be even less politically acceptable than in developed economies.

International finance institutions continually recommend that the countries of Central and Eastern Europe eliminate price distortions within the transport system wherever possible. Among other things, this means that all forms of subsidy to private and public transport should be phased out. Experience has shown that this will not be easy or, what is even more important, beneficial from the point of view of sustainable development. For instance, in some of the CEE countries in the first years of the transition period, subsidies to urban public transport were reduced to an extent rarely seen in EU countries [21]. For example, in Poland, the average cost covered from the farebox rose radically, from 40 per cent in 1988 to 74 per cent in 1994. From 1995 this trend reversed – the cost covered decreased to 68 per cent in 1996 and to 64 per cent in 1998.

The reduction of subsidies had serious impacts on urban public transport. Funds available for vehicle replacement and infrastructure development and maintenance were sharply reduced. This led to the ageing of the transport fleet and deterioration of the transport infrastructure and, more important, loss of passengers.

Raising fares accelerated the shift of passengers from mass to private transport, which was also related to the increase in private car ownership. In Poland, the number of single tickets that could be bought by the average monthly salary dropped from 6 700 in 1985 to 1 800 in 1989, 580 in 1995 and 550 in 1998. During the same period, the number of litres of petrol that could be bought for the same amount increased from 180 litres in 1989 to 420 in 1990 and to 450 litres in 1998. In other words, in the period 1985–98, urban transport fares rose by a factor of eight in comparison with petrol prices. It is therefore no surprise that the share of urban public transport dropped from 90-95 per cent in the late 1970s to 60-70 per cent at present. The same phenomenon has occurred in intercity long-distance transport, where strong pressures to reduce subsidies caused fares to rise enough to contribute to modal shift.

Applying other fiscal measures in transition economies will be difficult. The electorate opposes even relatively low car and fuel excise taxes. In 1997, the automobile lobby was successful in demanding the abolition of differentiation in car purchase excise taxes (higher tax rate for higher value cars). It was even difficult to introduce parking charges in cities such as Warsaw where, for various reasons, area-wide parking charges were only introduced as late as mid-1999.

For the future, road pricing is mentioned in policy declarations such as the transport policy adopted by the Warsaw City Council in 1995 and in a draft of a new national transport policy for Poland.[4] While there is growing understanding among professionals that this would be the most appropriate single measure to internalise external costs, for political reasons there is little chance that it will be implemented soon.

Furthermore, it must be remembered that policies such as congestion pricing and traffic restrictions are appropriate for larger cities, where the provision of an efficient and effective public transport alternative is possible. Such measures may be less appropriate *in more remote and less densely populated areas of Europe with a sparse network and low levels of demand*. In such places, it may be more efficient to travel in an "environmentally clean" car, rather than by public transport.

Consequently, prospects for wider application of market-based instruments in the CEECs during the first decade(s) of the 21st century do not seem very good.

3.1.2. Land-use planning and spatial development controls

Land-use planning and spatial development controls can be used to reduce trip length. It has been demonstrated [2] that about 20-30 per cent of the variation in travel patterns can be attributed to land use and physical characteristics, and the remaining 70-80 per cent to socio-economic characteristics. Land-use factors most conducive to low travel distances include:

- High residential population densities.
- Larger settlement sizes.
- Mixed use of space, which reduces distances between local and regional employment, services and facilities.

It is well known that, in contrast to the rapidly growing cities of many developing countries, the practical application of these principles in western European cities is limited because development involves restructuring more than dynamic growth. If it is assumed that around 75 per cent of the built environment will remain the same between now and 2020 and that any new development is shaped according to the above-mentioned criteria, the overall effect on travel demand may be a reduction of 5-6 per cent. Travel demand may be further reduced if new development has synergy effects with existing developments, for example, if services created in new development areas can also be used by residents of neighbouring areas. Land-use planning and sustainable development policies can also encourage the development of activities (e.g. shopping, leisure) that are locally based rather than in distant (often out-of-town) locations.

The situation is different for transition countries, whose regional and urban patterns were inherited from the centrally planned economy. These patterns were inefficient from the viewpoint of transport intensity. The controlled development of many cities meant that large industrial and residential areas were separated from other employment and service centres and created excessive demand for travel.

In the period of reform, the distribution of urban activities is changing rapidly. In formerly mono-function areas (such as large residential estates), employment opportunities and services are growing. This creates opportunities for short-distance commuting and meets the demand for shopping locally. Consequently, the need to travel is reduced. At the same time, because the local retail market is underdeveloped, it is developing extremely rapidly.

For example, in Warsaw (1.65 million inhabitants in the city and about 2.5 million in the metropolitan region), retail space almost doubled in ten years. In the last five years, the city has gained around 373 000 square metres of retail space of international standard, most in the form of shopping centres, retail warehouses and stand-alone hypermarkets. In 1999, there were 26 such centres operating and another eight were under construction. Unfortunately, most of this development has taken place at the outskirts of the city, not necessarily close to higher density residential areas. This has increased demand for travel by car, thus inducing a modal shift and contributing to the rapid growth of road traffic.

The two processes described above work in different directions, but the final impact is still negative, because the increase in the transport intensity of an already inefficient city structure, caused by the development of peripheral shopping and services centres, is much greater than the reduction of travel demand caused by the growth in the number of places of work and of services in residential areas. If this trend is not stopped, there will be no chance of reducing demand for travel in general and for travel by private car in particular. Generally, in transition economies, land-use planning and control of development in order to reduce demand for travel and dependence on the car is more difficult than in more developed countries such as the Netherlands ("The Right Business in the Right Place"; A, B, C categories, etc.), the United Kingdom (DOE planning policy guidance to local authorities); Switzerland (case of Zurich), Canada and others [14]. One reason is that, after decades of goal-oriented central planning, the role of planning was dramatically reduced. As in other sectors of economic and political life, this was a natural reaction to the old system, and it will take time for the role of planning to be fully appreciated.

Fortunately, there are some signs of a growing understanding of the importance of controlling urban growth. For example, in recent years, urban transport policies announced by the authorities of some Polish cities have addressed the issue of the transport intensity of urban structures. Following Krakow, where the principles of transport policy were defined in 1993, the Warsaw City Council adopted a so-called "sustainable transport policy" in 1995. In 1996-99, similar policies were formulated in other large cities such as Bialystok, Gdynia, Lodz and Wroclaw.

In formulating policy proposals, extensive use was made of the results of the first OECD/ECMT project on Urban Travel and Sustainable Development [14]. This is clear from the following points of the above-mentioned policy document for Warsaw (quoted text in italics), concerning means and measures relating to urban planning and development control. Each point is commented on to describe the extent of its implementation.

1. *Stimulation of the concentration of jobs and services in the centre and areas well served by public transport, especially those in direct proximity to rail–based transportation (railroad, metro, tramway); this principle is also to be applied to high-density residential building construction*. There is rapid development in the central urban area, which is well served by rail-type transport (positive feature). Unfortunately, urban sprawl is stimulated by the above-mentioned development of shopping centres in peripheral areas which are not well served by public transport.

2. *Stimulation of mixing of activities (residential, work, services, recreation) in order to limit the need to travel longer distances, and making it possible to reach the destination on foot or by bicycle*. Restructuring in the direction of mixed land uses exists. In the beginning, this process was not really directed, but the "directions of urban development", adopted in 1998, made this a main objective.

3. *Parking policy, encompassing the introduction and enforcement (in granting building permits) of parking standards, and setting a minimal (for Zones II and III) and acceptable/maximum (Zone I)*[5] *number of parking spaces which must be provided by the investor on his site*. Parking standards will be introduced in the very near future on the basis of the "directions of urban development" adopted in 1998.

4. *The reserving of parking areas for a park-and-ride system (in direct proximity to the peripheral public transport stations and stops) in spatial development plans, as well as the reserving of land for public transport loops.* First projects in preparation.

5. *The seeking of an optimum form for solving the problem of economic, spatial and transportation system development co-ordination and planning for the metropolitan area.* Plans have been prepared, but implementation has been slowed by the extremely complex administrative structure (four levels of local government).

This example gives reasons for some optimism; however, as already stated, it will be some time before these policies are fully or even partially applied[6].

3.1.3 Information technologies

The development of information technologies (IT) may also affect transport intensity in the transition economies of the CEECs. As in other areas, these countries lag behind the highly developed countries. However, there are two good reasons to consider IT as particularly promising and appropriate for them. One is that there is very rapid progress in bridging the present gap. The second is related to the aforementioned dispersion of the population and economic activities across the vast area of the CEECs. This may stimulate the wider use of telecommuting and teleconferencing and, most of all, distance learning, thus reducing the need to travel. IT services in banking, marketing, for obtaining product and sales information, interactive media, etc., will also have consequences for transport demand. Forecasts such as those described in the POSSUM report [15] and Himanen *et al.* [11], which foresee a 3-4 per cent substitution by 2010 of commuting trips by information technology, are probably not relevant for CEE countries. Nevertheless, since almost universal use of a wide range of new technologies can be assumed by the year 2020, the potential impacts of telecommuting on travel demand should be taken into account in long-term transport demand forecasting.

3.1.4 Life styles and attitudes

Various aspects of life styles and attitudes may have significant effects on passenger travel demand. Some researchers suggest that attitudes affect travel patterns more strongly and perhaps more directly than land-use factors. A better understanding of attitudes to travel, the formation of these attitudes and the effect of land use on these attitudes is necessary.

From the already demonstrated preferences of people in transition economies, decoupling passenger transport growth from economic growth is likely to be difficult. The strong tendency to own a car is discussed above in the context of the relation between GNP and car ownership in developed countries and transition economies. Travel behaviour surveys have also proved that the use of vehicles (measured by annual mileage) is increasing. Other signs of growing mobility include rapidly growing tourism and holiday travelling.

3.2. Freight transport policies

Three key factors affect the growth of freight transport:

- The material intensity of the economy.
- The spatial structure of production and consumption.
- The organisation of transport.

In order to reduce the demand for freight transport, three basic strategies can be used:

- Dematerialisation of the economy.
- Reduction of the spatial range of material flows.
- Optimisation of the organisation of transport.

3.2.1 Dematerialisation of the economy

In the last few years, there has been a growing interest in the *dematerialisation* of production and consumption, *i.e.* the reduction of the use of resources per unit of product or service has, for some time, been considered as an important and promising element of sustainable development policy. One of the most interesting ways of measuring the *material intensity of the economy* is by assessing *the total material requirement* (TMR), defined as the sum of *direct material inputs* used in production or consumed and *indirect material inputs*, which are related to or result from the abstraction or displacement of the former.

So far, only one attempt to analyse transition economies with regard to *material intensity* is known to the author. In the study [6], the TRM indicator and some secondary indicators calculated for Poland were compared with the corresponding indicators calculated for selected, highly developed countries such as the Netherlands, Japan, Germany and the United States. The methodology developed by the Wuppertal Institute for Climate, Environment and Energy was applied.

The most important results of the study are presented in Table 7.

Table 7. **Material inputs in selected countries**

	Poland 1992	**Poland 1997**	**Japan 1991**	**Nether-lands 1991**	**Germany 1991**	**United States 1991**
DMI local (mln t)	453	479	1 424	236	1 367	4 581
DMI import (mln t)	39	62	710	303	406	568
DMI total (mln t)	492	541	2 133	539	1 773	5 149
DMI per capita	12.7	14.0	17.1	35.5	22.0	20.2
ER local (mln t)	485	467	1 143	69	2 961	15 494
ER import (mln t)	88	217	2 439	632	2 030	594
ER total (mln t)	573	684	3 582	701	4 991	16 088
ER/DMI (%)	116%	126%	168%	130%	282%	312%
TMR (mln t)	1 065	1 226	5 716	1 240	6 764	21 237
TMR per capita (t)	27.6	31.7	45.9	81.6	83.9	83.3

DMI – direct material input; ER – ecological rucksack; TMR – total material requirement.

Source: [6].

These comparisons demonstrated clearly that:

- *The material intensity* of the Polish economy *per capita* is still much lower than that of developed countries; however, when related to GNP, material inputs were approximately four times higher in 1992 than in highly developed economies.
- In recent years, *material inputs* have grown, with the most rapid growth observed in imported products, with the share of hidden flows very high in most countries (except the United States). Fortunately, with the rapid growth of GNP, the TMR/GNP index has been decreasing; in the period 1992-97, it declined from 12.63 kg/USD in 1992 to 8.57 kg/USD in 1997.

The consequences of the observed trend for transport demand are obvious. If present trends continue, and, as suggested in [6], dematerialisation is chosen as one of the objectives of economic development, growth in freight transport volumes in the CEECs is likely to be considerably slower than is assumed in most transport demand forecasts prepared in recent years.

3.2.2 Managing the spatial range of the circulation of goods

Reducing the spatial range of the circulation of material is difficult but extremely important for peripheral countries where population is dispersed and distances are long. Unfortunately, the transport and environmental impacts of business or political decisions are rarely taken into account. In addition, after the period of shortages of all categories of goods, people in transition economies have a strong interest in products imported from all continents. This leads to inefficiencies not only in terms of transport intensity but also relating to servicing, spare parts, etc.

Among the sub-strategies considered by planners and economists, the following seem especially promising: (i) enhancement of regional consumer markets; (ii) strengthening of regional production networks; and (iii) “glocalisation”.

The strengthening of regional consumer markets is mainly a lifestyle and marketing issue, but companies can also be encouraged by state and local governments to produce near to their markets. This is easiest to do for the food and building industries, which represent a considerable share of the total transport market.

Regional production networks have been important motors of economic growth in the transition economies. Large international companies often make use of regional sourcing. It is obvious that such spatial production patterns produce less transport than global sourcing concepts. Various policy measures can be used to strengthen this trend, such as those that increase transport costs. Unfortunately, structural funds mainly base their support on the “export base” theory and require companies to sell beyond regional markets.

There is also growing interest in *glocalisation* (*glocal production*) as a potential way to reduce transport demand without reducing access to the full range of products and services. Glocal production can be characterised as large network firms that combine economies of scale and scope and maintain a network of local and global organisational units with close communication links. In the information society, it is the management of information and know-how that counts. Material flows can be decentralised without jeopardising the efficiency of a European or global company. In transition economies, there are many examples in the car industry (e.g. Polski Fiat) or the fast-food sector.

Unfortunately, as stressed in [15], “in the past decades the liberalisation of trade as well as technological changes have strongly loosened the linkage between material production and a specific territory. The internal market, the GATT/WTO agreements, improvements in telecommunication and strongly decreasing relative costs of transport have resulted in larger markets and a steep increase in freight transport. It might be asked whether these trends will continue at such a pace in the future. The euro may further push intra-European trade."

In addition, within the transport sector, internal factors make decoupling of transport demand from economic development difficult. Public investment in the development of transport infrastructure and subsidised transport operation lead to a rise in transport speeds and a reduction of transport costs. Together with the improved quality of services (e.g. logistics), this may induce additional transport volume rather than reduce demand.

Another problem is related to the potential conflict between the objectives of economic development and reduction in the economy's freight transport intensity. Proposals to moderate the growth in freight transport are often criticised because of fears of negative effects on the economy and the labour market. Another view is that "decoupling freight transport from economic growth would mainly mean to accelerate structural change in a certain direction. The losers represent the old, ripe, material-oriented industries, the protagonists of the era of mass production, who still have considerable influence and power. The winners are linked to the rising service and information based industries. The potential of decoupling therefore is mainly limited by political and not by economic difficulties." [15]

3.2.3 Conclusions concerning freight transport intensity

There is no doubt that there is a large potential for slowing the growth of freight transport intensity in CEE countries. Although it is very difficult to make precise estimates, it has been estimated on the basis of rough guesses [15] that the overall potential for decoupling freight transport growth from economic growth could be similar to that envisaged for EU countries, i.e. of the order of 35-50 per cent compared to present trends. This means that, if appropriate measures are taken, freight transport, rather than increasing, might remain at close to present levels.

In any case, it is essential to carry out full transport impact assessments, not only for transport programmes and projects but also for all major business and policy decisions that may affect the demand for transport.

4. MAIN ISSUES IN ALLOCATING RESOURCES

Even if the countries of Central and Eastern Europe adopt sustainable transport policies and undertake the steps needed to control the rise in demand for transport, it will be necessary to improve and develop transport systems. With limited resources, the selection of priorities has to be based on sound criteria. This is not an easy task, as several strategic questions should be answered:

- What is the right proportion between investing in upgrading/development of international transport corridors and in improving national/regional/local networks and facilities?
- How may resources be divided between transport means?
- How should resources be divided between investing in new infrastructure and in maintenance, renovation and upgrading of existing infrastructure?

– What is the right balance between investing in short-term measures and in long-term programmes and projects?

– What weights should be assigned to partially conflicting objectives: efficiency (speed, costs), safety and environmental protection?

– Should the reduction of regional differentiation be given priority over the objectives of maximising overall economic growth (on the national scale)?

Each of these questions can be the subject of lengthy debate. The author has already discussed some [4]. Part of this discussion is continued here and some new issues are considered as well.

5. CONFLICT BETWEEN MEETING THE NEEDS OF INTERNATIONAL TRANSPORT AND DEMAND FOR REGIONAL AND LOCAL TRANSPORT

It is not surprising that attention at international level focuses on solving problems of long-distance international traffic. Until the late 1980s, a very small part of the road/railway networks of the Central and Eastern European region was included in the European transport system. This is best illustrated by the extent of the networks encompassed by the European Agreement on Main International Traffic Arteries (AGR) and the European Agreement on Main International Railway Lines (AGC). The density and quality of road and railway networks in the eastern part of Europe was much lower than in the west. Projects such as the Trans-European Motorway (TEM) connecting the Baltic Sea with southern Europe were implemented extremely slowly.

In recent years, all governments in the region have demonstrated their understanding that the quality of transport and communications links between them and between the region and the rest of Europe is crucial to the integration process. There has been, *inter alia*, active participation in various new initiatives and programmes and with international bodies such as the United Nations Economic Commission for Europe (ECE), the European Conference of Ministers of Transport (ECMT) and regional groups of countries (Baltic, Black Sea, Central European Initiative, Mediterranean). However, the strongest push towards reducing the gap in the quality and effectiveness of transport systems in Central European countries was related to intentions to join the European Union. Association agreements between the European Union and Estonia, Latvia, Lithuania, Poland, the Czech and Slovak Republics, Hungary, etc., as well as partnership and co-operation agreements between the EC and the Russian Federation, the Ukraine and the Republic of Belarus, have given the process a new dimension. Finally, questions relating to this part of Europe led, at the Pan-European Transport Conferences, to decisions relating to the so-called Crete/Helsinki corridors.

Difficulties with the implementation of the programme for the development of the Trans-European transport corridors are, to a very large degree, caused by the fact that, given limited resources, national and local transport policies have to take into account conflicting objectives and problems relating to local and regional transport.

In many cases, this is well justified by the respective share of international and national traffic/transport. When considering international traffic and its intensity in relation to national/local traffic in Central and Eastern European Countries, it has to be noticed that:

- The economies of these countries are much smaller than those of European Union countries.
- The region's spatial pattern is different from that of Western Europe.
- There are considerable differences between sub-regions, which are best demonstrated by differences in GNP (see Table 3).

As shown in Section 1, when one moves east and north-east from the Vistula river:

- Average population density is much lower.
- Large urban centres are rare and the distances between them large (e.g. Warsaw-Minsk: 540 km; Minsk-Moscow: 700 km; Moscow-St. Petersburg: 700 km). Little population and few activities are concentrated along the transport corridors linking these centres (see Figure 1).

All these factors taken together mean that any comparisons of traffic intensity and patterns in Western Europe and Central and Eastern Europe have to be made with great care. This is particularly true for international transport. Short-distance traffic between the Netherlands, Belgium and Denmark (including cross-border shopping) is classified as international, while a considerable part of long-distance movements in the Russian Federation or even in Sweden and Poland belongs in the national traffic category.

However, it is not only a matter of classification. Large distances between population/economic activities centres and hence high costs (and long travel times) reduce the likelihood of exchange. Reducing travel time through costly investment in transport may increase the likelihood of longer travel distances, but **small volumes of medium- and short-distance traffic** along the corridor rarely make such investment economically/financially viable.

In the last ten years, dozens of international traffic forecasts have been prepared for CEE countries. The first forecasts for Poland envisaged growth of border-crossing traffic in the period 1990-2010 at between 2 per cent and 11 per cent for passenger traffic and between 1 per cent and 11 per cent for freight. International traffic was predicted to grow very rapidly at borders between EU countries and countries of Central and Eastern Europe until 2000. As regards the eastern borders of Poland, slow growth in traffic was expected to 2000, and after that, the growth rate would depend on the economic development of Belarus, Ukraine, the Russian Federation and other countries of the former Soviet Union (FSU). It was also anticipated that a considerable part of international passenger trips and freight transport would have its origin or destination close to the border.

A comparison of these predictions with statistical data on international traffic/transport for the period 1995-99 shows that volumes of international traffic increased a little faster than expected, while forecasts concerning trip distribution appear to have been on target. Consequently, the recent long-term traffic forecasts assume that international traffic in the region will grow more slowly than envisaged, that it will grow at 3-5 per cent a year, and that most of the increase will be in road traffic. However, it is also predicted that there will be considerable differentiation between the western and eastern borders of "intermediate" countries such as Poland, the Czech Republic and Hungary. For example, the forecast [23] envisages that the number of passenger cars crossing the western border of Poland will grow rather slowly, while on the eastern border (Belarus, Ukraine) there may be growth of 300-400 per cent to 2020. However, present traffic volumes on the eastern border are far below those on the western and southern borders.

Traffic forecasts prepared by the Warsaw University of Technology in 1996-97, in the framework of a study on motorway and expressway systems (Figure 5), provide another demonstration of the importance of national over international traffic. This can be seen when analysing traffic volumes predicted for 2025 on the three main roads east from Warsaw:

- Warsaw-Terespol-(Minsk-Moscow): planned motorway A-2, a part of the pan-European corridor II.
- Warsaw-Bialystok-(Vilnius and Grodno): a part of the Via Baltica corridor I.
- Warsaw-Lublin-(Lvov): not included in the Helsinki corridors.

According to the cited forecast, traffic volumes on the first route – the future A-2 motorway, first in the hierarchy of international roads – would be much lower than on the other two, which are planned as expressways, i.e. routes of a lower category. High volumes on these two roads are caused by the concentration of population and economic activities along two national corridors: Warsaw-Lublin and Warsaw-Bialystok. Consequently, it would be much more efficient to improve road infrastructure in these corridors first.

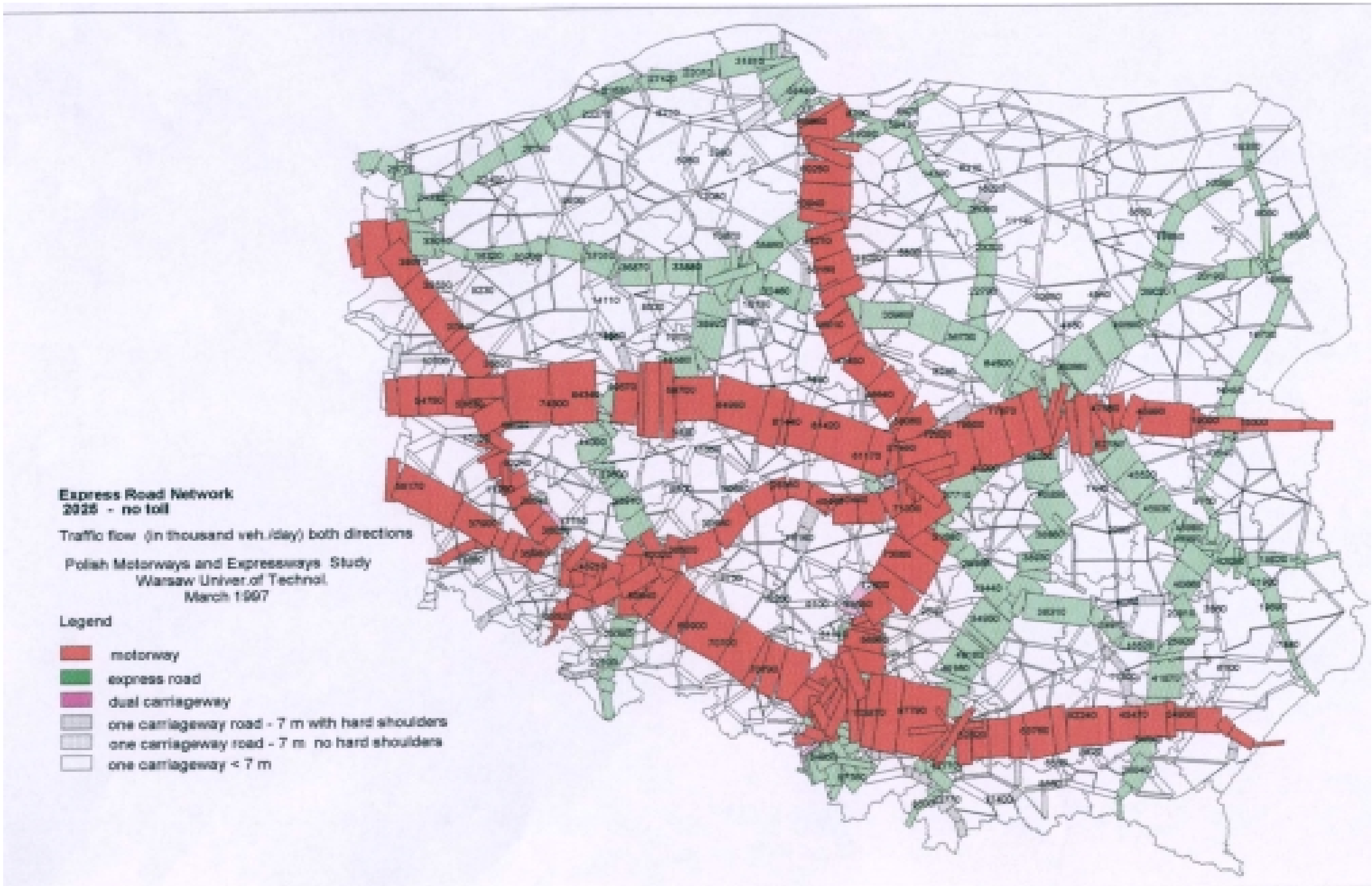
Forecasts for passenger rail transport for the period to 2010 on the main east-west line E-20 in the pan-European corridor II (Berlin-Poznan-Warsaw–Minsk–Moscow), the E-30 line (Dresden-Wroclaw-Katowice-Krakow-Lvov corridor III), and the E-65 line (Gdansk-Katowice-Zebrzydowice-Vienna/Bratislava/Budapest), upgraded to a speed of 160 km/h, assumed average growth of passenger traffic of 28 per cent. National traffic will dominate on most sections, except for the Berlin-Poznan-Warsaw section of the E-20 line, where international traffic will be significant.

There are also, however, forecasts according to which international traffic in the CEE region will grow much faster than national traffic. This happened in the most recent PHARE/TINA (Transport Infrastructure Needs Assessment) traffic study for the Ten Pan-European Transport Corridors [24]. Some results of this study are shown in Table 8. The most important feature of the study was that it dealt with the whole group of CEEC countries. This was different from forecasts prepared for one country, one transport mode or even one corridor or region.

Table 8**. Growth rates of domestic and international transport in selected countries (1996-2015). Scenario C: economic reference scenario, infrastructure moderate development scenario**
(index 1996=100)

	Passenger		**Freight**	
	Domestic	**International**	**Domestic**	**International**
Bulgaria	131	191	138	180
Czech Republic	134	170	140	200
Estonia	126	167	170	231
Hungary	131	194	170	259
Poland	150	174	173	227
All countries	139	185	156	216

Figure 5. **Road traffic forecast for Poland - 2025**



The differences between the results of the PHARE/TINA traffic study and of national forecasts such as those for Poland cannot be explained simply by different assumptions concerning the pace of economic growth, changes in international co-operation and the impact of the development of transport infrastructure and services on transport patterns. The effect of distance is probably underestimated in the models used.

On the other hand, possibilities for land transport to serve transcontinental, very long-distance traffic are under discussion. For example, the idea of Far East–Europe railway corridors was recently considered again by the Organisation of Co-operation of Railways (OSJD) at its XXVIIth Ministerial Meeting in Akmola (Kazakhstan). A memorandum of understanding was signed concerning the development of two OSJD corridors:

- No. 3: extension of the pan-European corridor III (Dresden)-Zgorzelec-Wroclaw–Katowice–Lvov–Moscow to the Pacific coast.

- No. 5: extension of the pan-European corridor V, Budapest–Kiev to China.

Forecasts for these corridors are based on the assumption that, after upgrading infrastructure and improving operation, a very attractive alternative to sea transport may be created. The time for transporting containers from China to Germany might be reduced to 12 days on routes where sea-railway transport now takes up to 35 days. But even if this idea is implemented, the absolute volumes of freight transport would be much lower than those of national transport.

From these considerations it is clear that:

- The needs of international traffic are often overestimated, particularly in large (such as Russia) and medium-size countries (such as Poland and Romania). This is particularly true with regard to peripheral countries.
- After a period of very fast growth in international traffic (transit and originating/ending in a given country) in intermediate countries such as Poland and the Czech Republic, growth on western borders will be much slower. On eastern borders the rate of growth will probably be much higher, but in absolute numbers traffic volume will be considerably lower than on western borders.
- Most international traffic will have origin/destination points located in the nearest country and mainly close to the border.
- Consequently, even with rapid growth in international traffic, its share of total traffic volumes will be meaningful mostly in areas close to borders.

Final conclusions concerning the issue of the priority to be given to improving infrastructure on international routes are a source of controversy for many planners and, especially, politicians:

- For intermediate and peripheral countries, international transit alone will rarely justify costly investment in transport infrastructure as long as there is not considerable demand for national/local transport.
- Consequently, the most viable projects are those which serve both short- and long-distance movements.

In many cases, the problem of international traffic can be solved by the elimination of bottlenecks at border crossings. For example, in Poland, if all the road traffic crossing the eastern border was concentrated at one border-crossing point, it could be served by one full, standard six-lane motorway.

With these conclusions in mind, it may be interesting to look at the consistency of national transport policies and policies of international bodies and institutions with regard to countries of the CEE region. Here, the impact of the accession process and the policies of international finance institutions on the major transport infrastructure investment decision-making process is probably most important.

6. IMPACT OF THE EUROPEAN UNION AND INTERNATIONAL FINANCE INSTITUTIONS ON INVESTMENT DECISIONS IN TRANSITION ECONOMIES

The accession process requires that the accession countries concentrate their main transport infrastructure efforts on the pan-European corridors crossing their territory in order to improve the linkage between their country and EU Member States, as well as with immediate neighbours also applying for EU membership. The investment projects for these corridors are priority candidates for EU accession funds. They are seen as projects of mutual interest and thus fall into the category "projects of European (Community) interest". Declared EU institutional funding criteria, both those of PHARE and the European Investment Bank (EIB), favour projects aimed at:

- Supporting the development of infrastructure in pan-European corridors to create an efficient transport system in an integrated Europe.
- Promoting infrastructure projects that contribute to regional development.

Accordingly, all recent national transport policy decisions, plans and programmes give priority to the modernisation and development of transport infrastructure in the Crete/Helsinki corridors and other routes of international importance (for example, those covered by AGR, AGC and AGCT). Regional development objectives are considered secondary.

More detailed plans and programmes give priority to projects aimed at improving conditions for long-distance international transport. However, in some instances, these projects are not the most viable. As stressed earlier, because of the geographical location of CEE countries, the needs of international traffic/transport and, in particular, long-distance transit movements are in many cases overestimated. The most feasible projects are those which serve both short- and long-distance movements. However, if these projects are not on the *list of transport corridors*, there is less chance that they will be co-financed from the EU funds such as PHARE and, since 2000, ISPA[7].

Analysis of the investment policies of accession countries over the last few years clearly shows that their governments take this principle into account and tend to locate the co-financed investment projects in east-west corridors of strategic importance. For example, in Poland, corridor II (Berlin-Warsaw-Moscow) and corridor III (Berlin/Dresden-Wroclaw-Katowice-Krakow-Kiev) belong to this category. Projects in the remaining two corridors (I: Warsaw-Kaunas-Tallin-Helsinki and VI: Gdynia/Gdansk-Katowice-Czech/Slovak Republics) are much smaller in scale.

In this situation, the question is sometimes asked whether the focus on international corridors does not reduce funds available for road maintenance or investment in other roads of greater or equal importance? So far, this has not created a serious problem, since there are few investment projects for the international corridors and they are financed with a high share of external resources (international finance institutions, PHARE). Therefore, they lessen the funds available for maintenance and other investment projects only to a limited extent. In fact, they may be beneficial in terms of maintenance, because demand for resources for upgrading/developing main roads and railways is reduced.

Paradoxically, this situation may change in coming years as the flow of EU funds is expected to rise significantly, mainly owing to the existence of a new financial aid instrument – ISPA. ISPA, which supplements PHARE from 2000, is designed to promote infrastructure projects in the field of transport and the environment. The increased EU support will automatically place an increased burden on the beneficiary country, because they will have to provide an adequate amount of matching funds for the project(s). The ISPA budget will probably amount to EUR 7 billion, to be spent in the period 2000-06 for transport and environmental projects in the ten candidate countries.

The allocation of large amounts of money to corridor projects may reduce, to some extent, investment in other national or regional roads, despite the fact that, in many cases, these may be as or more important for the whole network than links that are part of the international corridors. Also the backlog for road maintenance and rehabilitation may increase. This is a difficult problem, as the funds made available or generated from national sources for roads are, in virtually all countries, much below actual needs.

The consequences of the policies of the EU and international finance institutions for the railway system may be similar. In a situation of limited resources, concentrating attention on major lines of international importance creates a danger of neglecting other lines, some of which are of no less importance for national transport. The deterioration of local/suburban railway systems serving large cities and agglomerations is probably among the least desirable results. On the other hand, the modernisation of certain railway lines, such as the E-20, which is part of corridor II – Berlin-Poznan-Warsaw-Terespol–(Minsk–Moscow) in Poland, which receives support from the European Commission, may have a positive effect on the **image of railways** and may consequently reverse the present trend of a shift of passengers from railways to road transport. In the longer perspective, it can generate support from the public for modernising other lines as well, although this depends on the quality of service provided.

The priority given to international corridors is clear, among other things, from the orientation of the TINA project. TINA, started by the Commission in 1996, aims primarily at identifying, in the territories of 11 associated countries, transport networks of European importance with a view to the future extension of the Trans-European Network (TEN) to those countries upon their accession. The TINA network will be composed of roads, railways, inland waterways, airports, seaports and terminals to be upgraded or built up to 2015. It also includes a list (database) of potential investment projects with their possible implementation horizon. The TINA network incorporates all Crete/Helsinki pan-European corridors, which will constitute the backbone of the network, and some additional links, necessary for the efficient functioning of the national network but also needed from the perspective of an integrated Europe.

` The importance of TINA derives from the fact that, from 1999, only investment projects identified as part of the TINA network are eligible for EU funding (ISPA, EIB), although there is room for some exceptions.

Countries of the region are also collaborating with international financial institutions that are not linked to the European Commission, namely the World Bank and EBRD. In this context, it is interesting to compare the EU approach to transport infrastructure financing with that of the World Bank/EBRD. Generally, differences in the approaches of the EU (EIB, PHARE/ISPA) and the World Bank/EBRD to road funding are found at two different levels.

At the general transport policy level, the EU – both EIB and PHARE/ISPA – are committed to the development of transport infrastructure within defined pan-European corridors and networks (TINA) in order to stimulate the development of the TEN. They are also interested in promoting projects that support regional development. However, as mentioned earlier, in practice this is a secondary objective, and cities are dealt with only in exceptional cases.

The World Bank looks less at the international context of a transport project, but tries to determine whether the project is economically viable, fits into national priorities and has government support. Unlike the other international finance institutions, the EBRD – which is strongly oriented towards the private sector – looks for projects which do not have to be guaranteed by the government.

As regards road funding, the European Union is willing to finance road projects supported by the government provided that are in line with their general policy. Upgrading and construction projects are accepted but maintenance is not. While the EU promotes public-private partnerships (PPP), it does not directly support the private sector.

The World Bank gives priority to modernisation and maintenance activities. New road/railway construction or upgrading projects are financed occasionally. In the last recommendations for Poland [27], it was suggested that “the Ministry of Transport should revisit the timing and phasing of the motorway programme and look at other alternatives which could still meet Poland’s needs in the coming years, but at lower costs”. Recommendations to reinforce roads to handle heavy trucks are commented on below. With regard to railways, it recommended placing emphasis on the “downsizing and restructuring of state railways” rather than on capital-intensive infrastructure projects.

Until very recently, the EBRD was not interested in projects traditionally funded by national or local governments, but only looked at private or public-private schemes for construction and upgrading. This situation is changing and the bank sometimes offers loans and technical assistance to local governments[8].

It should also be noted that EIB, the World Bank and EBRD have tightened their co-operation in the field of transport in the last few years and that they very rarely compete for projects. Most often, they try to respect the complementarity rule, i.e. to address different parts of the transport sector.

The involvement of the three international finance institutions in Poland’s transport sector to 1999, as a percentage of overall lending, is as follows: EIB: 62 per cent; World Bank: 32 per cent; EBRD: 6 per cent. As regards pure EU funding for roads, both EIB and PHARE committed about ECU 950 million in the 1990s (up to 1999) to road projects (nearly 100 per cent in Crete/Helsinki corridors), but only half this amount for railways.

Final conclusions concerning the shares of investments for meeting the needs of international transport and national/local transport and the policies of the EU and international finance institutions are as follows:

- In intermediate peripheral countries, international traffic alone rarely justifies heavy investment in transport infrastructure.

- EU policy, as expressed in general support for investing in *transport corridors*, promotes the development of transport infrastructure serving long-distance international traffic.

- Generally, the World Bank's lending policy gives priority to the maintenance, rehabilitation and modernisation/upgrading of existing infrastructure, while the EIB and EBRD support upgrading and new infrastructure projects.
- Very little attention is given to local/urban transport problems, except to facilitate long-distance international traffic by supporting/financing, for instance, the construction of bypasses.
- In a situation of limited resources, the need for government participation in the costs of projects of international importance may lead to the neglect of competing construction, upgrading and maintenance projects which, in many instances, may be much more economically viable.

This leads to the issue of appropriate standards and technologies.

7. APPROPRIATE STANDARDS AND TECHNOLOGIES

It is often stated that CEE countries should quickly adopt all international (EU) quality, technical, safety and environmental standards and should use the best available technologies. However, as the author has emphasised on many occasions [e.g. 3, 16], this does not take into account the full costs and their relation to the financial resources available. The experience of the last decade has shown that virtually none of the countries considered can afford to achieve full harmonisation of standards and norms in a short time. Therefore, careful selection of priorities and judicious programming of concrete decisions and actions are required, taking into account not only the marginal costs of adopting a particular standard as compared to the social and economic benefits but also the opportunity cost of capital, which in CEE countries is very high.

Of the many issues that might be discussed here, three have been selected: weight standards for roads, high-speed railways and motorways.

7.1. Road weight standards

The European Union Council Directive 96/53, establishing allowable axle load, dimensions and weight of vehicles, requires that a maximum axle load of 11.5 tons should be applied for a primary road network.

At present in Poland, only new motorways and expressways are designed to this standard. Other national roads, of a total length of 17 000 km, are either adapted or allowed to carry traffic of up to 8-10 tonnes/axle. The cost of bringing the whole national network to EU standards would be enormous. This is being studied and will be estimated in the PHARE multi-country funded study, “Costs and Benefits of Enlargement”.

This is one of the subjects of an ongoing screening exercise on Polish and EU legislation on road transport. The conditions and timing of the adjustments to Polish law are being negotiated, as also occurred for some present EU Member States, e.g. the United Kingdom.

Nevertheless, the need to raise international roads (E) and the most important national roads to European standards was taken into account in the preparation of programmes such as the “Strategy for the Maintenance and Development of the National Road System to 2015” and the “Plan for the Development of Transport Infrastructure to 2015”, prepared in 1998. It was envisaged that up to 30 per cent of all funds of the General Directorate of Public Roads would be allocated to upgrading the above-mentioned roads, including connections to border-crossing points and ports. According to the World Bank [27], “the state investment budget will need to double allocations for road rehabilitation, if main roads are to be strengthened to accommodate trucks up to the EU weight limits. Poland may require transitional exemptions to keep out the heaviest trucks and/or large transfers from EU funds to bring its roads up to the standard quickly.” In fact, this is now happening. At present, over 30 ongoing projects of this type are financed by PHARE funds. Most are on western and some on southern borders.

However, it will take considerable time to adapt other roads to accommodate the increased weights.

7.2. Railways

Very high-speed railways (300 km/h and over) are an example of technology that is often mentioned among investment priorities in CEE countries, at least on pan-European corridors. In particular, the Berlin-Warsaw–Moscow line appears on maps and there is detailed discussion of alignment, for example, in the Warsaw and Poznan metropolitan areas. Promoters use the positive experience of the French, German and Spanish railways as an argument, but this does not take into account the limited financial resources and the completely different distribution of settlements and economic activities along the corridors in question. As discussed earlier, given the density and distances, a huge investment would not be viable. This also seems true for more densely populated sections of corridors such as the Berlin–Warsaw section of corridor II, where the existing E-20 railway line has just been modernised to a speed of 160 km/h (and possibly 200 km/h with more advanced rolling stock).

Generally, given the difficult situation of railways in the CEE countries, which urgently need to restructure and rehabilitate existing infrastructure, there is no justification for planning new lines in the next 10-20 years. It is more realistic to make better use of the existing dense network.

7.3. Motorways

For roads, there is ongoing discussion of the development of motorway and expressway networks. As described above, in many CEE countries, relatively low traffic volumes are predicted on large sections of major routes passing through low-density areas. For these sections, a single-carriageway expressway, a solution that is less suited to the densely populated regions of western Europe, can be a viable alternative to the full standard motorway[9]. This issue is discussed further in the section on a new transport policy for Poland.

7.4 Maintenance, rehabilitation/modernisation, development

Various diagnostic studies of transport systems in countries of the region[10] have pointed out that inadequate maintenance has caused very serious deterioration of transport infrastructure. Compared with other resource allocation options, maintenance offers the best cost/benefit ratio. In addition, the efficiency of maintenance programmes can be considerably increased if a modern approach is taken to the programming and management of infrastructure maintenance[11].

Rehabilitation and modernisation of existing infrastructure is the second most efficient strategy. This is particularly so for railways and tramways where a radical improvement in operational effectiveness has been achieved, for instance, through the rehabilitation of track, modernisation of traffic control and improved management.

8. DIRECTIONS FOR A NEW NATIONAL TRANSPORT POLICY IN POLAND

A new proposal for the medium- and long-term national transport policy (MTiGM, 1999) can serve as an example of changes in the overall approach to solving transport problems on the eve of the 21st century in an intermediate country on the edge of the European Union. This proposal was prepared in 1999 as an alternative to the transport policy formulated by the former government in 1994-95. At the time of writing, it was a subject of wide discussion and consultations.

The objective of a new national transport policy was formulated as follows: “creation of a transport system which would be sustainable in terms of technology, economy, spatial, social and environmental aspects. This should be achieved in a country with a developing market economy and taking into account international competition.” Assumptions concerning ways of meeting this objective are as follows:

1. Transport demand is linked to GDP, which is related to economic activity, productivity and consumption levels. To decouple GDP and transport intensity, measures such as physical planning, fiscal policy and management are needed. Transport services should not generate new demand.

2. Meeting the needs of transport infrastructure should be strictly related to the overall national public finance policy. Programmes should be based on the results of efficiency analysis and financing possibilities.

3. The infrastructure and the whole transport development programme should be assessed from the viewpoint of use of non-renewable resources and environmental impact. One of the long-term objectives is not to exceed the critical loads defined in the national and global environmental policy.

4. The proposed phasing of implementation is strictly linked to the process of accession to the European Union.

The long-term strategy (to 2015) encompasses, *inter alia*, the following points:

- The objective of sustainability requires that the modal split between transport means will meet the objectives of economic efficiency and environmental policy.

- The railways and road system will have to become self-financing, with support from the public budget limited to objectives such as: defence, international agreements concerning TEN and transport in selected areas such as large metropolitan areas. For the road sector, it means "that revenues from excise fuel and vehicle taxes, the use of public road land and motorway tolls should balance the expenditures of the whole transport sector".

- Specific objectives for the road system include: improvement of traffic safety, elimination of backlogs in maintenance, creation of an efficient connection with EU countries, first of all TEN, and improvement of road systems serving metropolitan areas.

- For railways, priority is given to east-west and north-south lines of international importance, including the improvement of border crossings.

- In the case of cities and metropolitan areas, the state contribution will depend on meeting conditions such as efficient management, co-operation of local authorities and adoption of a sustainable transport policy at local and regional level.

- Other points cover: ports, airports, combined transport, logistics and telematics.

Generally, adoption of this policy would be consistent with the national policy for sustainable development. Clearly, this would require orienting the development process away from present trends, which would inevitably lead to severe problems of congestion, economic inefficiency and environmental pollution. Of three policy options: (a) BAU – continuation of present trends; (b) modified policy; and (c) sustainable development of the transport system, the third is recommended.

Proposed means of implementation include: restructuring (commercialisation) of public transport enterprises (first of all, railways); wide use of efficiency criteria for investment and management of operations; internalisation of external costs; introduction of public-private partnerships (PPP) and mechanisms for state and local co-operation; communication with the general public and interest groups.

International co-operation, with concentration on the EU and international finance institutions, will rely on: (a) taking the international context into account in programming projects in order to take advantage of synergy effects; (b) rationalising public expenditure by review of projects/programmes by external partners; (c) attracting experienced investors to increase efficiency through competition.

The evolution of the approach to the motorway programme is especially interesting. The development programme assumed the creation of a system of 2 600 km of motorway under a BOT (build-operate-transfer) scheme, with public financing not exceeding 15 per cent. This appeared to be too ambitious for a number of reasons: high construction costs; the results of stated preference surveys which showed that Polish users were unwilling to pay enough to make most of the sections financially viable; unexpected difficulties in getting acceptance for some sections; and, last but not least, the strong opposition of ecological organisations to the whole programme. It is therefore not surprising that private sector offers were much more limited than expected at the beginning of the decade. In fact, Hungary's experience has shown that in transition economies, it is still difficult to generate enough revenue from toll motorways to cover construction and operating costs.

Taking all of the preceding into account, the new policy widens the scope for public-private partnership and more flexible implementation of the motorway construction programme, including postponing the construction of sections for which traffic forecasts envisage lower volumes. On these sections, existing roads are to be modernised first. Tolls are to be applied not only on motorways but on other roads as well. This modification of an earlier programme is very much in line with the previously mentioned recommendations of the World Bank [27].

Generally, the most important feature of the new policy is that it assumes reorientation of a policy based on the principle that supply should follow growth in demand, caused, first of all, by a rise in motorisation. In contrast, the new policy envisages decoupling economic growth and transport demand through means such as fiscal policy, development of mass transport, support for the development of transport logistics and, generally, intelligent transport systems. For the time being, this policy proposal has not been expressed in quantitative terms. Therefore, it is difficult to compare it with the "alternative transport policy" recommended by the Institute for Sustainable Development.

It is also not certain how these proposals of the Ministry of Transport will be received by the parliament, various interest groups and the general public. As already stated, this newly motorised society has a very strong preference for individual transport, and all attempts to apply measures to control the use of the automobile and slow down modal shift to road transport are strongly opposed.

9. CONCLUSIONS

The transformations that have taken place in Central and Eastern Europe have created a new political situation. Most of the predictions from the early 1990s were very optimistic and assumed very rapid development of transport infrastructure. The author of this report was more pessimistic and, in a paper presented at the 95th Round Table [4], drew a more moderate picture, writing *inter alia,* that in CEE countries "the most probable directions of the development of transport infrastructure in the next ten to fifteen years are as follows:

a. **Railways** – selected existing lines will be modernised to allow 160 km/h speed for passenger traffic and 120 km/h for freight trains; under-utilised sections will be closed and, hopefully, remaining lines will be better maintained....

b. **Roads** – there will be competition between programmes aiming at rehabilitation, modernisation and maintenance and programmes oriented towards the development of motorways and expressways; there will also be competition between responding to needs of international and national/local traffic.

c. **Maritime transport –** ports will be adapted to the changing structure of freight....

d. **Inland water transport –** in spite of its merits and long-term potential, it is unlikely that, in a period of competing needs, much investment will be made to upgrade and develop the existing waterways system.

e. **Combined transport** will be promoted; railways and ports will be adapted, new terminals built, etc.

f. **Air transport - ...** construction of new airports cannot be expected; modernisation of selected existing airports and, first of all, air traffic control systems will take place.

g. **In urban areas** rapid growth of motorisation will cause traffic and environmental problems; consequently, improving the quality of public transport will be essential; limited resources will not allow investment in new, expensive systems and attention will turn to making better use of existing means of public transport through modernisation and better operation."

Seven years later, virtually all of these predictions appear to be correct, with the possible exception of combined transport, where very little progress has been made. Differences in the quality of the EU and CEE countries' transport systems are slightly less marked than ten years ago. Differentiated standards, bottlenecks and lack of interoperability still reduce the capability of the transport system to serve national and international traffic.

Changes in **transport flow volumes and distribution** are multidirectional. Passenger traffic is increasing, freight transport decreased in the first half of the 1990s and then grew slowly. **Motorisation** is growing much faster than GDP, and the consequences are not limited to transport. International traffic is growing rapidly, but there is a great difference, in absolute numbers, between volumes on EU and on eastern borders. Generally, as one moves east, traffic rapidly decreases. This is due to lower GDP (and motorisation), low density, dispersion of activities and very long distances.

Even with the present low level of transport intensity, intensity is high in relation to GDP. To ensure sustainable development, it is necessary to seek ways to decouple economic growth from the rise in demand for transport. Various means were examined in Section 3 from the viewpoint of their potential in the CEE region.

International co-operative efforts have aimed at upgrading and developing the main pan-European corridors. Countries' regional and individual initiatives have paralleled efforts by the EU, UN-ECE and ECMT to promote the creation of a **coherent pan-European transport system.** Nevertheless, there are conflicts of interest in some areas. Infrastructure modernisation/development programmes and projects are often prepared with only one category of demand in view, namely, international traffic. In many cases, he spatial distribution in CEE countries means that the needs of international traffic/transport and, in particular, long-distance transit movements are often overestimated. The most viable projects are those that serve both short- and long-distance movements.

National budgets, even with EU support and the increased involvement of international finance institutions, are still unable to meet all of the competing objectives in the transport sector and the economy, where development objectives often conflict with social transfer and environmental objectives.

In this situation and in view of the experience of the past decade, the following policy directions seem to be appropriate in most countries of Central and Eastern Europe:

- New infrastructure is not always the best solution, at least as long as **existing infrastructure** is not rehabilitated and fully used through better management; upgrading of existing systems cannot be limited to investing in **hardware**[12] but should start by streamlining management and operation, development of human resources, etc. Priority must be given to overcoming **bottlenecks and barriers**, above all at borders between countries with different political regimes.

- Motorway development programmes have to be reviewed and probably curtailed. For many corridors, other options should be sought; in **large** countries with **low population density** and **low levels of economic activity**, solving problems of international and national long-distance traffic does not necessarily require costly infrastructure such as motorways or a new high-speed passenger railway along the whole length of transport routes. Upgraded railways that serve both passenger and freight traffic, and single-carriageway expressways may be more viable options. Very high-speed railways are probably not viable in the foreseeable future, if at all.

- It is still not realistic to envisage achieving full harmonisation of standards in a short time because of the economic situation in CEE countries. Consequently, more effort should be made to select **appropriate standards** at various stages of development.

- **Complementarity** of networks at different levels (local, regional, national, international) is extremely important.

NOTES

1. POSSUM (Policy Strategies for Sustainable Mobility), Project No. ST-96-SC.107, funded by the EC under the Transport RTD Programme of the 4th Framework Programme.

2. Under-Secretary of State, Ministry of Transport and Maritime Economy.

3. For instance, in Poland in the period 1990-96, the number of cars crossing the borders increased six-fold.

4. Version dated October 1999.

5. Zone I – the central zone; Zone II – intensely built–up areas; Zone III – other areas.

6. A critical assessment of policy implementation can be found in [20].
7. Instrument for Structural Policies for Pre-Accession.

8. For example, financing of an advanced traffic management system and modernisation of intersections and tramway tracks are being negotiated with the Warsaw City Board.

9. This was one of the major conclusions of the “Study of motorway and expressway system for Poland”, which aimed at updating the national road development programme. The study was prepared in 1997 for the National Road Planning Bureau by the Institute of Roads and Bridges of the Warsaw University of Technology.

10. E.g. by the World Bank, EBRD, Japan International Cooperation Agency, Danish Road Administration, Atkins, etc.

11. E.g. pavement management system, bridge management system.

12. For instance, rehabilitation of track and power supply systems, vehicles (rolling stock), rail, road and air traffic control systems, etc.

BIBLIOGRAPHY

1. *Alternatywna polityka transportowa* [The Alternative Transport Development Policy in Poland Following the Principles of Sustainable Development]. Institute for Sustainable Development, Warsaw, December 1999.

2. Banister, D. and D. Stead (1997), *Sustainable Development and Transport*. Report for the Bundesforschungsanstatt für Landeskunde und Raumordnung (BfLR) URBAN 21 Project.

3. Council of Europe Colloquy (1993), "The Challenges Facing European Society with the Approach of the Year 2000: The Transborder Co-operation within Sustainable Regional/Spatial Planning in Central Europe. Coll/Vienna (93) 3.

4. ECMT (1994), *Transport Infrastructure and Systems for a New Europe*. Report of the 95th Round Table on Transport Economics, March 1993, Paris.

5. ECMT (1997), Group on Trends in International Traffic and Infrastructure Needs. Monographs.

6. *Ekorozwoj przez odmaterializowanie produkcji i konsumpcji*. [Sustainable Development through Dematerialization of Production and Consumption]. Institute for Sustainable Development, Warsaw, September 1999.

7. *Elaboration of a programme for the GHG emission reduction in the transport sector. In: Strategies of the GHG Emission Reduction and Adaptation of the Polish Economy to the Changed Climate*. Polish Country Study, Warsaw, 1996.

8. European Commission, On Transport and CO_2; Developing a Community Approach. Communication from the EC. Doc. COM(1998)204.

9. Foucher, M. (1995), The European Union in a New European Context. In: *Towards a New European Space*. Akademie für Raumforschung und Landesplannung, Hanover.

10. GUS (1999), *Statistical Yearbook of the Republic of Poland – 1999*. Central Statistical Office, Warsaw.

11. Himanen, V., P. Kasanen and M. Lehto (1996), *Information Transfer Saves Time and Trouble: Reduction of the Use of Energy for Work-related Passenger Transportation*. LINKKI Publication 10/1996. Helsinki University, Helsinki (in Finnish, Summary in English).

12. Infrastructure and Transport Systems Renovation - Notably in the East-West Framework. ECMT Round Table 95: *Transport Infrastructure and Systems for a New Europe*, ECMT, Paris, 1994.

13. Ministry of Transport and Maritime Economy (1999). *Zalozenia polityki transportowej Panstwa na lata 2000-2015 dla realizacji zrownowazonego rozwoju kraju* [Foundations of National

Transport Policy for Years 2000-2015 for the Sustainable Development of the Country]. Draft. Warsaw, October.

14. OECD/ECMT, *Urban Travel and Sustainable Development*, Paris, 1995.

15. POSSUM. *Policy Strategies for Sustainable Mobility*. Project No. ST-96-SC.107. funded by the EC under the Transport RTD Programme of the 4th Framework Programme. Final Report. December 1998.

16. Problems of Infrastructure Planning in Central Europe within the European Transport Networks. In: *The Challenges facing European Society; Transborder Co-operation within Sustainable Regional/Spatial Planning in Central Europe*. European Regional Planning, No.55, Council of Europe Press, 1993.

17. Raagmaa, G. (1997), New Conditions for Regionalization in the Baltic Sea Space. In: *European Space, Baltic Space, Polish Space*. Part I. Arl, Hanover, Euroreg, Warsaw.

18. Suchorzewski, W. (1997), Miejsce Polski w europejskim systemie infrastruktury technicznej. [Poland in the European System of Technical Infrastructure]. In: *Problematyka przestrzeni europejskiej* [Problems of European Space], (ed. A. Kuklinski). Euroreg, Warsaw.

19. Suchorzewski, W. (1998), "First Attempts to Introduce Sustainable Transport Policies in Cities of Central Europe", Eurocities Conference: Sustainable Transport Policy for Cities in East and West. Gdansk, 16-17 April.

20. Suchorzewski, W. (1999), "Transportation Policy for the Capital City of Warsaw - Three Years after Adoption", ECMT/OECD International Workshop: Implementing Strategies to Improve Public Transport for Sustainable Urban Travel, Athens, 3-4 June.

21. Suchorzewski, W. (1999), The Funding of Public Transport Investment in Central Europe. Paper presented at the UITP/ECMT Seminar on "Financing Urban Public Transport", Paris, 13-14 October.

22. Szalo, P. (1995), Demographic and Social Aspects of European Integration. In: *Towards a New European Space*. Akademie für Raumforschung und Landesplannung, Hanover.

23. TecnEcon (1996), *A4/A12 Motorway Traffic Study*.

24. *Traffic Forecast on the Ten Pan-European Corridors of Helsinki*. PHARE Project No. 98-0225. NEA-INRETS-IWW, Final Report, 1999.

25. Vickerman, R. (1996), *Restructuring of Transport Networks*, EUREG, No. 3/1996.

26. World Bank. *World Development Report 1998/1999*. Washington, DC.

27. World Bank (1999). *Poland: Strategic Priorities for the Transport Sector*.

PERIPHERALITY AND PAN-EUROPEAN INTEGRATION:
THE DEVELOPMENT OF TRANSPORT IN THE PHARE COUNTRIES

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SUMMARY

Rijswijk, November 1999

1. INTRODUCTION

In 1998 and 1999, a multi-country Phare project to produce traffic forecasts on the ten pan-European Transport Corridors of Helsinki was carried out.

A consortium was formed to implement the project. It included the NEA (NL) as project leader, IWW (D) and INRETS (F) as western partners and one institute per Phare country: CDV (Czech Republic), CELU (Latvia), DISCOUNT (Bulgaria), FIDA (Lithuania), IN-PUMA (FYRoM), IPSA (Bosnia and Herzegovina), ITS (Albania), INCERTRANS (Romania), KTI (Hungary), OBET (Poland), PROMETNI (Slovenia), TTU (Estonia) and VUD (Slovak Republic).

The project's first step was to create a base-year database for passenger and freight flows, which included mode of travel, region of origin, region of destination, type of goods (freight) and purpose of trip (passenger). In addition, a network including secondary links was developed. As much of this detailed information was not directly available, and as several sources were identified for the different types of information required, much attention was given to the methodology. A top-down approach was taken; data from higher levels were subdivided to estimate detailed data where these were not available. One advantage of this method is that it offers the possibility of updating the database when additional detailed data become available without affecting the higher levels. In 1998, two seminars in which all 16 institutes involved participated were organised to develop this approach. Although the targeted level of regional detail (NUTS2) was quite ambitious, the consortium succeeded in building matrices for the whole region.

The forecasting techniques used involve growth models, applied to the scenarios chosen to represent economic and demographic developments, the evolution of transport times and costs, taking into account the effects of harmonization of European transport markets. They made it possible to derive passenger and freight flow matrices both overall and by mode. These flows were assigned to the infrastructure network by translating the volume of freight transport and the number of passengers into numbers of vehicles (road) and trains (rail).

2. THE SCENARIOS

An important aim of this project was the analysis of future developments in terms of economic growth and the speed at which the Phare countries are integrated into Europe. The results of this analysis of future developments were translated into the different scenarios adopted.

Since 1989, the central and eastern European countries have undergone profound economic changes. The end of the planned economy and the progressive reorientation of production first resulted in a strong decrease in productivity. Then, in 1996, there were clear signs of improvement. Inflation rates, which had risen sharply (to over 600 per cent in Poland in 1990) dropped back to more manageable levels. New financial institutions and other business services were established to give significant support to privatisation and restructuring programmes. The main negative consequences were the rapid increase in unemployment, which rose from negligible levels in 1989 to between 12 per cent and 14 per cent in the first half of 1993 in Poland, Hungary and Slovakia, price increases while actual salaries were decreasing and the fact that the various social groups no longer had access to lodging, health and education.

To strengthen the recovery process, central Europe turned towards the stability and proximity, as well as the opportunities, offered by the European Single Market.

Because of the uncertainty surrounding the post-transition years, it is very difficult to make forecasts. A more useful approach is to build scenarios. Here, the scenarios are a set of hypotheses relative to the transport environment. The hypotheses concern the main socioeconomic variables: demography, GDP, income, industrial production, etc., and their trends.

In order to assess an infrastructure project or a transport policy, the region’s transport strategy had to be included in the scenarios and policy hypotheses (mainly institutional policy in the transport sector and transport policy) had to be included. However, the development of infrastructure must also be part of the scenarios, since it is a condition for economic growth and has implications for modal split.

2.1. Two economic scenarios: high growth and low growth

Between 1992 and 1993, economic activity progressively recovered in most of the Phare countries at levels of 20 per cent to 40 per cent below the highest level reached at the end of the previous decade.

In this situation, characterised by a lack of stable trends and a “young” economic recovery, the only reasonable way to foresee the socioeconomic future for each of the central and eastern European countries is first to gain a sound understanding of their history and their socioeconomic structure, their internal/external balance (and/or maladjustment), and the structure and mechanisms presiding over their evolution. In a second step, the various “consistent models” of development and government policies which might arise from such a basis can be forecast for each country in the form of scenarios (sets of hypotheses) that are more or less optimistic from the point of view of the evolution of GDP.

The dates considered for the different countries’ integration into Europe are:

Table 1. **Scenarios of integration to EU**

	High Scenario	Moderate Scenario	Low Scenario
Albania	after 2015	after 2015	after 2015
Bosnia	after 2015	after 2015	after 2015
Bulgaria	after 2015	after 2015	after 2015
Czech Republic	2005	2005	2010
Estonia	2010	2010	after 2015
Hungary	2005	2005	2012
Latvia	after 2015	after 2015	after 2015
Lithuania	after 2015	after 2015	after 2015
FYRoM	after 2015	after 2015	after 2015
Poland	2005	2005	2010
Romania	after 2015	after 2015	after 2015
Slovakia	after 2015	after 2015	after 2015
Slovenia	2005	2005	2012

First, two scenarios (high and low) were developed for each country and two sets of variables were estimated for the period 1995-2015.

For each country, the high and low economic scenarios were compared to the TINA "moderate" scenario (as published in the TINA interim report) to verify the appropriateness of the GDP growth rates chosen for each country for the different periods considered. Only limited adjustments were required, mainly owing to data only made available (1996-98) after the TINA assessment. These comparisons made it possible to define a third scenario for each country, adjusted on the basis of TINA's conclusions. Table 2 presents elements of this moderate scenario.

Table 2. **Socioeconomic moderate scenario; average variations 1996-2015**

	GDP growth	Population growth	Produc-tivity	Inflation	Budget balance	Imports	Exports	Current balance
	% per year	% per year	% per year	% per year	% of GDP	% of GDP	% of GDP	% of GDP
Albania	6.47	1.03		10.07		47.12	16.31	-0.17
Bosnia-Herzegovina	4.21	0.52	4.06	6.97		53.66	56.13	-2.21
Bulgaria	2.06	-0.60	6.20	28.14	-3.31	75.21	46.55	-8.94
Czech Republic	3.33	0.05	4.44	5.90	-1.09	38.07	47.70	-2.46
Estonia	4.08	-0.52	5.58	6.64	-1.10	48.04	57.31	-15.10
FYRoM	4.19	0.42	4.15	7.18	-2.86	57.58	62.07	-11.05
Hungary	3.89	-0.32	3.89	12.00	-3.32	40.34	33.79	-2.35
Latvia	3.71	-0.77	4.19	6.57	-0.60	33.56	30.54	-3.67
Lithuania	4.17	-0.30	4.89	4.67	-2.15	55.36	44.08	-5.16
Poland	5.17	0.24	3.68	5.33	-1.85	53.97	37.03	-0.12
Romania	2.79	-0.15	5.56	21.22	-3.78	32.14	27.14	-12.56
Slovakia	4.44	0.31	5.13	4.90	-3.63	74.58	46.98	-7.61
Slovenia	4.22	-0.06	3.87	6.55	-1.13	87.00	53.86	-11.61

Trends in the different economic sectors under the socioeconomic "moderate" scenario are summarised below. The evolution of production by sector is of prime importance for forecasting transport.

Table 3. **Average annual growth rate by country/sector; 1996-2015 (20 years)**

Moderate scenario (%)

	Agriculture	Industry	Services	Mining & quarrying	*GDP*
Albania	2.77	9.22	10.31	2.88	*6.47*
Bosnia Herz.	2.52	3.18	5.97	0.46	*4.21*
Bulgaria	-0.55	1.97	2.98	-0.96	*2.06*
Czech Republic	1.16	1.99	5.55	-0.50	*3.33*
Estonia	1.38	4.21	4.53	2.30	*4.08*
FYRoM	2.20	5.54	4.08	1.1	*4.19*
Hungary	1.67	4.26	4.14	0.43	*3.89*
Latvia	3.61	4.90	3.00	4.68	*3.71*
Lithuania	-0.80	5.71	4.23	-0.18	*4.17*
Poland	2.56	3.92	6.96	0.13	*5.17*
Romania	-0.15	2.02	5.31	-0.76	*2.80*
Slovakia	2.12	5.24	4.17	2.80	*4.44*

2.2. Transport policy environment

Transport has reflected and accentuated fluctuations in economic activity. The decline in transport was generally much stronger in the eastern countries than in central Europe. Transport fell almost 50 per cent before freight transport stabilised and began to recover. A similar drop occurred in passenger transport, in line with falling incomes (and with increased unemployment). In addition, foreign trade was completely reoriented towards EU countries. The EU share of foreign trade in Phare countries is now some 60-70 per cent. COMECON collapsed within two years (and the share of trade with EU countries doubled during this period), although the countries of the Visegrad agreement were partly able to stem the collapse. These changes strongly favoured road transport, which adapted to the structural changes more rapidly than rail transport, which was initially stronger: 75 per cent in 1985, 60 per cent in 1996.

Such turnarounds cannot be understood without studying both transport structures and the activities on which transport relies. The starting point in Phare countries is very high transport volume in relation to added value, at four or five times the ratio in EU countries. This is linked to an economy based on heavy industry, with expensive administrative management of flows and industrial interdependency of countries, which resulted in high transport volumes and costs. As a result, the recovery of growth will not result in an equivalent recovery of freight volumes. The relative fall in freight volumes will be due to rationalisation and reorganisation.

For passenger transport, the situation is less clear. The present rate of motorisation is clearly higher than the average income level would lead one to expect. Moreover, it is known that the decline in household consumption was not as sharp as the fall in industrial production. The share of the informal market is estimated to be more than 30 per cent higher than the official figures given in the EBRD report. Even though statistical tools will be improved rapidly, there remain significant gaps in the information on transport provision in comparison to the EU.

Differences with the EU in terms of economic structures, education and culture are, however, much less marked, owing to the rapid changes of the 1990s. In transport, many small and medium-sized companies were created very rapidly, and this may cause problems for the standardisation of social conditions in Europe. In contrast, the restructuring of large companies, especially the railways, has generally been much slower.

What then are the prospects for transport policy? This question can only be answered using a model based on the collection of a significant amount of regional data. For railway policy, the major data source was the UIC report, which includes detailed information for each country on the degree of alignment on European directives and on the implementation of market-economy management principles. For the other modes, this source was complemented by Agenda 2000, which recapitulated the degree to which each country has complied with European regulation in economic and legal fields.

In relation to the forecasting process, the experts estimated the degree of adjustment of modal split behaviour between central Europe and western Europe. This has been made dependent on the other elements of the scenarios and on time.

2.3. Infrastructure development

The provision of new infrastructure will influence economic development as well as the modal split in transport. This element of the scenarios is also difficult to forecast: on the one hand, there is a great need for improvements, both qualitative and quantitative; on the other, there are financial restrictions. Since the project's main objective was to develop tools for evaluating new infrastructure projects, a wide variety of scenarios were created. These range from a status quo scenario to one that assumes completion of the entire improved TINA backbone network. A middle scenario is based on a gradual development of networks in relation to the growth of GDP.

2.3.1 Combination of the various elements of the scenarios

The main source of the economic element of the scenarios has been the interim TINA report. However, since the latest figures show slower economic growth to 2000 than the forecasts of one year earlier, adjustments have been made. Three economic scenarios were defined, called low, moderate and high.

Another important element of the scenarios was the speed of harmonization between central and western Europe, including the date of accession to the European Union. Here again, different scenarios were defined on the basis of the different economic scenarios and the different status of the individual countries.

The main source for the infrastructure scenarios was the TINA interim report, which again led to three scenarios. The two extremes were again an unchanged infrastructure and the complete TINA network with an intermediate realistic scenario developed under the responsibility of a consultant, based on an investment level of 1.5 per cent of GDP.

The three dimensions described above were combined to make a set of five scenarios.

The moderate economic scenario was modelled to create several combinations which take account of infrastructure development and the level of harmonization of the transport market:

- The existing network in combination with a relatively slow integration into the transport market (Scenario B).
- A partially completed network owing to financing possibilities (evaluated by the consultant) in combination with moderate integration (Scenario C).
- The complete TINA network updated to western standards and relatively high integration of transport markets (Scenario D).

The low economic scenario was elaborated on the basis of existing infrastructure and a relatively low degree of integration of the transport market (Scenario A). The high economic scenario was elaborated on the basis of completed infrastructure development and a high degree of market integration (Scenario E).

2.3.2 Methodology by scenario

		Infrastructure scenarios		
		Do nothing	**Middle**	**All infrastructure improved to western standards**
Economic scenarios	**Low**	A: Analogy modal split as percentage of development	(-)	(-)
	Moderate	B: Analogy modal split as percentage of development	C: Analogy model (middle scenario)	D: Analogy model (high scenario)
	High	(-)	(-)	E: Analogy model (high scenario)

(-) not developed.

3. THE RESULTS

Databases, containing the information on freight and passenger flows and on their assignment to the infrastructure links, for base year and forecasting years, as well as on the networks, the tools for applying variants to the scenarios and calculating sensibility analyses, along with presentation tools, have been placed in a "toolbox" by country and made available to the participating institutes as well as to the Phare and TINA secretariats.

3.1. Freight transport

The main results by scenario are given in Tables 4 and 5.

Table 4. **Total transport (thousands of tons); base year: 1996, forecasts for 2015**

Scenario	Domestic transport				Export						Import					
	Road	Rail	Inl. ww.	Total	Rest	Road	Rail	Inl. ww.	Sea	Total	Rest	Road	Rail	Inl. ww.	Sea	Total
Base year	1973253	341502	10151	2324908	2543	59592	79205	3696	60972	206007	42118	41815	91633	3270	54726	233562
Scenario A	2891251	350976	11191	3253420	5216	140703	127960	8784	111106	393768	70647	121457	137370	5527	85005	420006
Scenario B	3281011	372383	13027	3666423	6569	165137	146198	10450	126214	454567	78753	147412	163556	6292	96491	492504
Scenario C	3376344	277050	13027	3666423	6569	192984	118350	10450	126214	454567	78753	176000	134968	6292	96491	492504
Scenario D	3399556	253838	13027	3666423	6569	195986	115348	10450	126214	454567	78753	179621	131347	6292	96491	492504
Scenario E	3713647	251037	13761	3978447	8035	218298	130123	12840	141701	510998	90139	204806	144492	7199	106214	552851

Table 5. **Modal split total transport (%); base year: 1996, forecasts to 2015**

Scenario	Domestic transport				Export						Import					
	Road	Rail	Inl. ww.	Total	Rest	Road	Rail	Inl. ww.	Sea	Total	Rest	Road	Rail	Inl. ww.	Sea	Total
Base year	84.9	14.7	0.4	100.0	1.2	28.9	38.4	1.8	29.6	100.0	18.0	17.9	39.2	1.4	23.4	100.0
Scenario A	88.9	10.8	0.3	100.0	1.3	35.7	32.5	2.2	28.2	100.0	16.8	28.9	32.7	1.3	20.2	100.0
Scenario B	89.5	10.2	0.4	100.0	1.4	36.3	32.2	2.3	27.8	100.0	16.0	29.9	33.2	1.3	19.6	100.0
Scenario C	92.1	7.6	0.4	100.0	1.4	42.5	26.0	2.3	27.8	100.0	16.0	35.7	27.4	1.3	19.6	100.0
Scenario D	92.7	6.9	0.4	100.0	1.4	43.1	25.4	2.3	27.8	100.0	16.0	36.5	26.7	1.3	19.6	100.0
Scenario E	93.3	6.3	0.3	100.0	1.6	42.7	25.5	2.5	27.7	100.0	16.3	37.0	26.1	1.3	19.2	100.0

A comparison of the increase in road and rail explains the differences between Scenarios B, C and D (Table 6). These differences are caused by differences in the development of infrastructure and in the speed of market harmonization. The completion of road projects attracts traffic from rail, even in cases where new rail infrastructure has been created.

Table 6. **Comparison of road and rail transport in Scenarios B, C, and D (2015, 1996 = 100)**

Infrastructure scenario	Domestic		Export		Import	
	Road	Rail	Road	Rail	Road	Rail
Low (B)	166.3	109.0	277.1	184.6	352.5	178.5
Moderate (C)	171.1	81.1	323.8	149.4	420.9	147.3
High (D)	172.3	74.3	328.9	145.6	429.6	143.3

Table 6 shows a substantial difference between the low infrastructure Scenario B and the moderate infrastructure Scenario C, while there is only a small difference between the moderate infrastructure Scenario C and the high infrastructure Scenario D.

In Scenario B, road transport tonnage is still less than rail transport tonnage for import flows; however, for Scenarios C and D, road transport tonnage is larger than rail transport tonnage.

Tables 7.1-7.6 show trade per trade block, while Tables 8.1-8.5 give this information in the form of an index. It is clear that the shift towards western Europe is increasing. Here, the share of road transport is already high. In relation to the rest of Europe (eastern Europe), the share of road transport is more modest at present, but it is changing faster than the other segments.

Table 7.1. **Total trade Phare countries, per transport mode, all goods base year: 1996, 1 000 tonnes**

Partner	Transport mode at destination					
	Other	**Road**	**Rail**	**Inland waterways**	**Sea**	**All modes**
Phare countries - domestic	0	1 973 253	341 502	10 151	1	**2 324 908**
Inter Phare countries	761	17 299	66 066	182	4 304	**88 612**
Western Europe	3 370	67 232	37 184	3 627	50 496	**161 909**
Rest of Europe	34 078	10 844	62 271	1 360	16 556	**125 108**
Rest world	6 452	6 031	5 318	1 796	44 341	**63 937**
Total	**44 661**	**2 074 658**	**512 340**	**17 117**	**115 698**	**2 764 474**

Table 7.2. **Total trade Phare countries, per transport mode, all goods – 2015 Scenario A, 1 000 tonnes**

Partner	**Transport mode at destination**					
	Other	**Road**	**Rail**	**Inland waterways**	**Sea**	**All modes**
Phare countries – domestic	0	2 891 251	350 976	11 191	2	**3 253 420**
Inter Phare countries	1 889	46 460	122 862	283	9 808	**181 302**
Western Europe	5 101	160 030	58 033	8 740	93 828	**325 732**
Rest of Europe	46 518	41 038	75 810	1 834	20 505	**185 705**
Rest of world	22 355	14 598	8 656	3 453	71 967	**121 028**
Total	**75 863**	**3 153 376**	**616 336**	**25 501**	**196 110**	**4 067 187**

Table 7.3. **Total trade Phare countries, per transport mode, all goods – 2015 Scenario B, 1 000 tonnes**

Partner	**Transport mode at destination**					
	Other	**Road**	**Rail**	**Inland waterways**	**Sea**	**All modes**
Phare countries – domestic	0	3 281 011	372 383	13 027	2	**3 666 423**
Inter Phare countries	2 208	58 271	143 826	330	11 243	**215 879**
Western Europe	5 346	185 400	63 931	10 348	105 239	**370 264**
Rest of Europe	51 960	52 165	92 117	2 022	23 796	**222 060**
Rest of world	25 808	16 678	9 908	4 041	82 424	**138 860**
Total	**85 322**	**3 593 525**	**682 165**	**29 769**	**222 704**	**4 613 486**

Table 7.4. **Total trade Phare countries, per transport mode, all goods – 2015 Scenario C, 1 000 tonnes**

Partner	**Transport mode at destination**					
	Other	**Road**	**Rail**	**Inland waterways**	**Sea**	**All modes**
Phare countries – domestic	0	3 376 344	277 050	13 027	2	**3 666 423**
Inter Phare countries	2 208	64 802	137 295	330	11 243	**215 879**
Western Europe	5 346	206 797	42 534	10 348	105 239	**370 264**
Rest of Europe	51 960	79 095	65 186	2 022	23 796	**222 060**
Rest of world	25 808	18 193	8 394	4 041	82 424	**138 860**
Total	**85 322**	**3 745 231**	**530 459**	**29 769**	**222 704**	**4 613 486**

Table 7.5. **Total trade Phare countries, per transport mode, all goods – 2015 Scenario D, 1 000 tonnes**

Partner	Transport mode at destination					
	Other	Road	Rail	Inland waterways	Sea	All modes
Phare countries – domestic	0	3 399 556	253 838	13 027	2	**3 666 423**
Inter Phare countries	2 208	66 782	135 315	330	11 243	**215 879**
Western Europe	5 346	208 765	40 566	10 348	105 239	**370 264**
Rest of Europe	51 960	81 602	62 679	2 022	23 796	**222 060**
Rest of world	25 808	18 357	8 230	4 041	82 424	**138 860**
Total	**85 322**	**3 775 062**	**500 628**	**29 769**	**222 704**	**4 613 486**

Table 7.6. **Total trade Phare countries, per transport mode, all goods – 2015 Scenario E, 1 000 tonnes**

Partner	Transport mode at destination					
	Other	Road	Rail	Inland waterways	Sea	All modes
Phare countries – domestic	0	3 713 647	251 037	13 761	2	**3 978 447**
Inter Phare countries	2 492	82 870	153 763	425	14 620	**254 171**
Western Europe	5 468	227 258	43 775	12 487	117 196	**406 185**
Rest of Europe	58 167	92 112	67 278	2 232	25 677	**245 465**
Rest of world	32 048	20 767	9 889	4 895	90 418	**158 017**
Total	**98 175**	**4 136 654**	**525 742**	**33 801**	**247 914**	**5 042 285**

Table 8.1. **Index total trade Phare countries, per transport mode, all goods – 2015 Scenario A, 1996 = 100**

Partner	Transport mode at destination					
	Other	Road	Rail	Inland waterways	Sea	All modes
Phare countries – domestic	-	147	103	110	200	**140**
Inter Phare countries	248	269	186	155	228	**205**
Western Europe	151	238	156	241	186	**201**
Rest of Europe	137	378	122	135	124	**148**
Rest of world	346	242	163	192	162	**189**
Total	**170**	**152**	**120**	**149**	**170**	**147**

Table 8.2. **Index total trade Phare countries, per transport mode, all goods – 2015 Scenario B, 1996 = 100**

Partner	Transport mode at destination					
	Other	Road	Rail	Inland waterways	Sea	All modes
Phare countries – domestic	-	166	109	128	200	**158**
Inter Phare countries	290	337	218	181	261	**244**
Western Europe	159	276	172	285	208	**229**
Rest of Europe	152	481	148	149	144	**177**
Rest of world	400	277	186	225	186	**217**
Total	**191**	**173**	**133**	**174**	**192**	**167**

Table 8.3**. Index total trade Phare countries, per transport mode, all goods – 2015 Scenario C, 1996 = 100**

Partner	Transport mode at destination					
	Other	Road	Rail	Inland waterways	Sea	All modes
Phare countries – domestic	-	171	81	128	200	**158**
Inter Phare countries	290	375	208	181	261	**244**
Western Europe	159	308	114	285	208	**229**
Rest of Europe	152	729	105	149	144	**177**
Rest of world	400	302	158	225	186	**217**
Total	**191**	**181**	**104**	**174**	**192**	**167**

Table 8.4**. Index total trade Phare countries, per transport mode, all goods – 2015 Scenario D, 1996 = 100**

Partner	Transport mode at destination					
	Other	Road	Rail	Inland waterways	Sea	All modes
Phare countries – domestic	-	172	74	128	200	**158**
Inter Phare countries	290	386	205	181	261	**244**
Western Europe	159	311	109	285	208	**229**
Rest of Europe	152	753	101	149	144	**177**
Rest of world	400	304	155	225	186	**217**
Total	**191**	**182**	**98**	**174**	**192**	**167**

Table 8.5. **Index total trade Phare countries, per transport mode, all goods – 2015 Scenario E, 1996 = 100**

Partner	Transport mode at destination					
	Other	**Road**	**Rail**	**Inland waterways**	**Sea**	**All modes**
Phare countries – domestic	-	188	74	136	200	**171**
Inter Phare countries	327	479	233	234	340	**287**
Western Europe	162	338	118	344	232	**251**
Rest of Europe	171	849	108	164	155	**196**
Rest of world	497	344	186	273	204	**247**
Total	**220**	**199**	**103**	**197**	**214**	**182**

3.1.1 Conclusions concerning the development of freight transport

1. Freight transport will grow considerably between 1996 and 2015. Depending on the scenarios and measured in tonnes, domestic transport in the Phare countries will grow by 40-70 per cent, exports by 90-150 per cent and imports by 80-140 per cent.

2. Growth in freight transport will be higher than average in commodities such as building materials and in all kinds of end products, but lower than average in food, minerals and fuels.

3. Growth will be lower than average in Romania, Bulgaria and the Czech Republic, higher than average in Hungary (domestic and exports), Slovakia (domestic and exports) as well as in Slovenia, the Baltic states and, from a comparably low level, in Bosnia-Herzegovina, FYROM and Albania.

4. The share of road transport will grow. For domestic transport (measured in tonnes) it will rise from 85 per cent to 89-93 per cent, depending on the scenario, for exports, from 29 per cent to 36-43 per cent, again depending on the scenario and for imports from 18 per cent to 29-37 per cent. The variant Scenario D1 (used for sensitivity tests) shows that road transport may grow even more at rates of up to 400 per cent (for imports) and even more in several countries (for instance, Slovakia).

5. In 2015, the share of rail transport will be lower than in 1996. Depending on the scenario, domestic transport by rail will range between a decrease to 70 per cent of its present level to small growth. Flows of imports and exports by rail will grow by about 50 per cent; this is lower than the growth of trade.

6. In terms of the development of trade per trade block, the orientation towards western Europe appears to be increasing. At present, the share of road transport is already high. To the rest of Europe (eastern Europe), the share of road transport is more modest at present but is changing faster than the other segments. This gives growth in road transport of between 400 per cent and 650 per cent, depending on the scenario.

7. The causes of the changes in modal split are threefold:

- Stronger than average growth of sectors where the market share of road is already high (such as end products).
- Harmonization of transport market throughout Europe, leading to higher shares of road transport on almost all links and for all commodity groups.
- The development of infrastructure (Scenarios C, D and E), which will favour the development of road transport.

3.2. Passenger transport

3.2.1 Trends in number of trips

The main developments per scenario are presented in Table 9.

Table 9. **Total passenger traffic between the defined traffic zones base year (1995) and forecast 2015 per scenario (million passenger trips)**

	Million passenger trips			Change from base year 1995 (= 100)		
Scenario	**Domestic**	**International***	**Total**	**Domestic**	**International***	**Total**
Base year	2319.097	396.384	2715.481	100	100	100
Scenario A	2913.648	630.397	3544.045	126	159	131
Scenario B	3120.527	697.623	3818.150	135	176	141
Scenario C	3229.316	734.159	3963.475	139	185	146
Scenario D	3287.934	757.267	4045.201	142	191	149
Scenario E	3376.373	848.200	4224.573	146	214	156

International traffic (indices 159 to 214, depending on the scenario) is growing much faster than domestic traffic (indices 126 to 146).

In terms of the evolution of modal split, the main conclusion is that in all Phare countries, if they are not constrained by a restrictive regime, road traffic by car will grow dramatically, first because of socioeconomic growth and second, because of induced traffic and modal diversion if good infrastructure is supplied. At first glance, some country differentials seem surprising, *e.g.* the growth rate for Slovakia is higher than that of the Czech Republic or Slovenia. When one examines the input data, the reason is apparent: Slovakia's starting level in 1995 is lower, population growth is expected to be higher and economic dynamics are expected to exceed those of neighbouring countries, according to the socioeconomic scenario.

Similar reasons are found for the development of road traffic in Bulgaria and Romania. The more optimistic assumptions for demographic and economic changes in Bulgaria explain the higher base level of development. The high jump in road traffic in the case of full infrastructure implementation is mainly due to induced traffic with the existence of a higher level of infrastructure quality.

The development of railway passenger transport is moderate in most countries (it is recommended not to take into account Albania – strong growth of traffic – and Lithuania – decrease in traffic – owing to the unreliability of the data that are the basis of traffic forecasts for these two countries). It is surprising that the differentials between the scenarios are very low. This phenomenon can be explained by the overlap of different driving forces. In the scenarios, better economic performance is linked to better infrastructure for road and rail. This means that in the case of higher economic growth, car ownership will increase and car use will as well, because of its dependence on car ownership. This effect offsets the effect of providing better rail infrastructure in the case of moderate or high economic growth.

This model result supports the hypothesis that the railways cannot hope to see their position improve if economic indicators improve and more money is spent on infrastructure and railway technology. Once there is balanced funding for road and rail (and air as well), the dynamics of growth will be much stronger for the road sector than for the rail sector. The reasons are the flexibility and availability, comfort, prestige and individuality of car ownership and driving.

3.2.2 The evolution of passenger-kilometres

The traffic performance indicators which show the evolution of passenger-kilometres travelled indicate that in countries that expect rapid economic growth, the performance indicators will grow faster than traffic volumes (number of trips). This implies that the average length of trips is increasing.

Again, the most dynamic growth is expected for car travel. Depending on the country and the scenario, the rise of road transport is between 60 per cent and 300 per cent. Countries with good economic growth prospects, such as Poland, Hungary, Slovakia and the Czech Republic, show growth indicators of about 250 (1995 = 100) under the high-growth scenario assumptions with full infrastructure provision. However, under modest assumptions as well, car traffic will almost double in these countries. Regarding the railways, the increase in passenger-kilometres is significantly higher than the rise in the number of trips. The dynamism, if any, is to be found in the growing length of trips made by rail.

Figure 1. **Growth index of domestic traffic by rail**

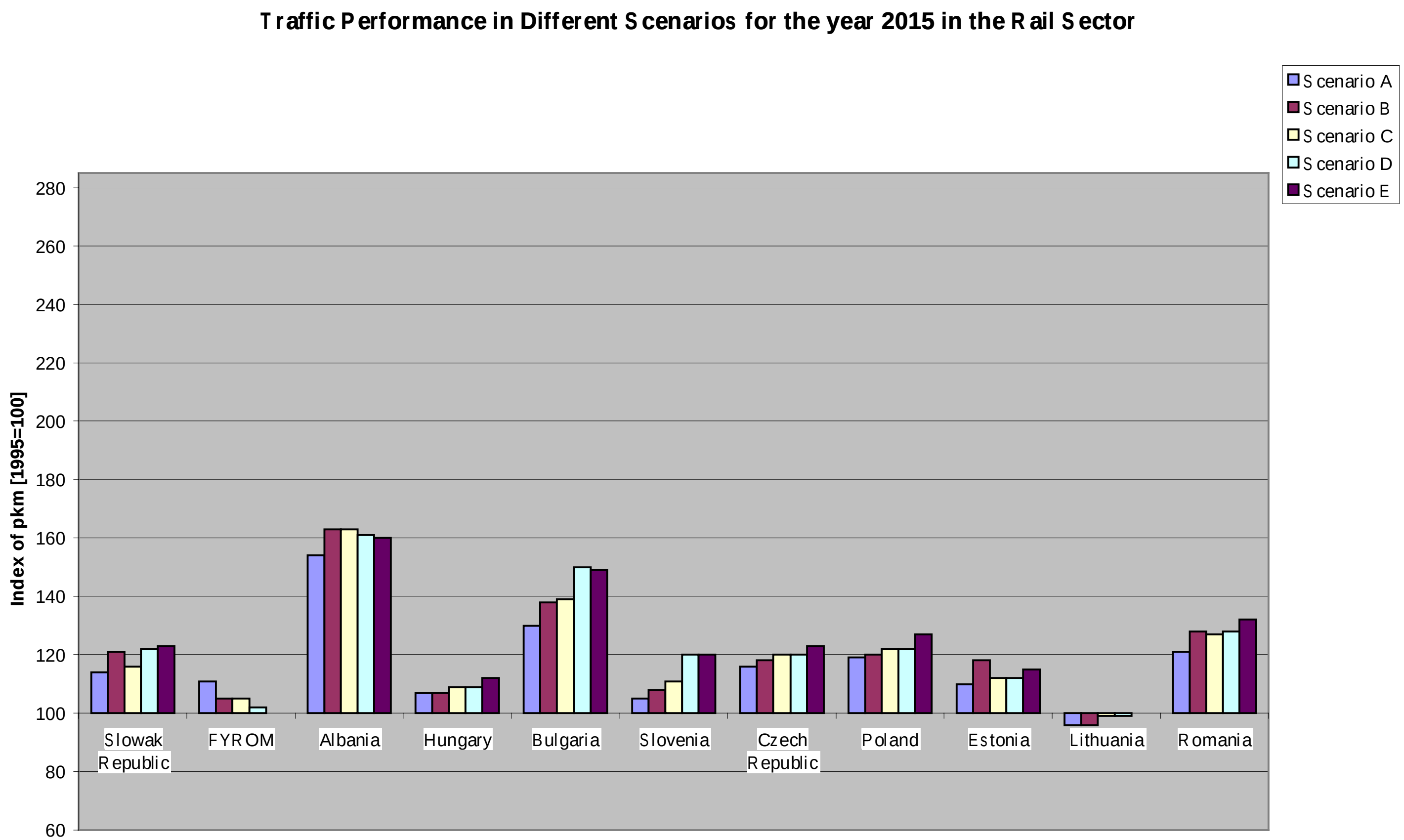


Figure 2. **Growth index of domestic traffic by road**

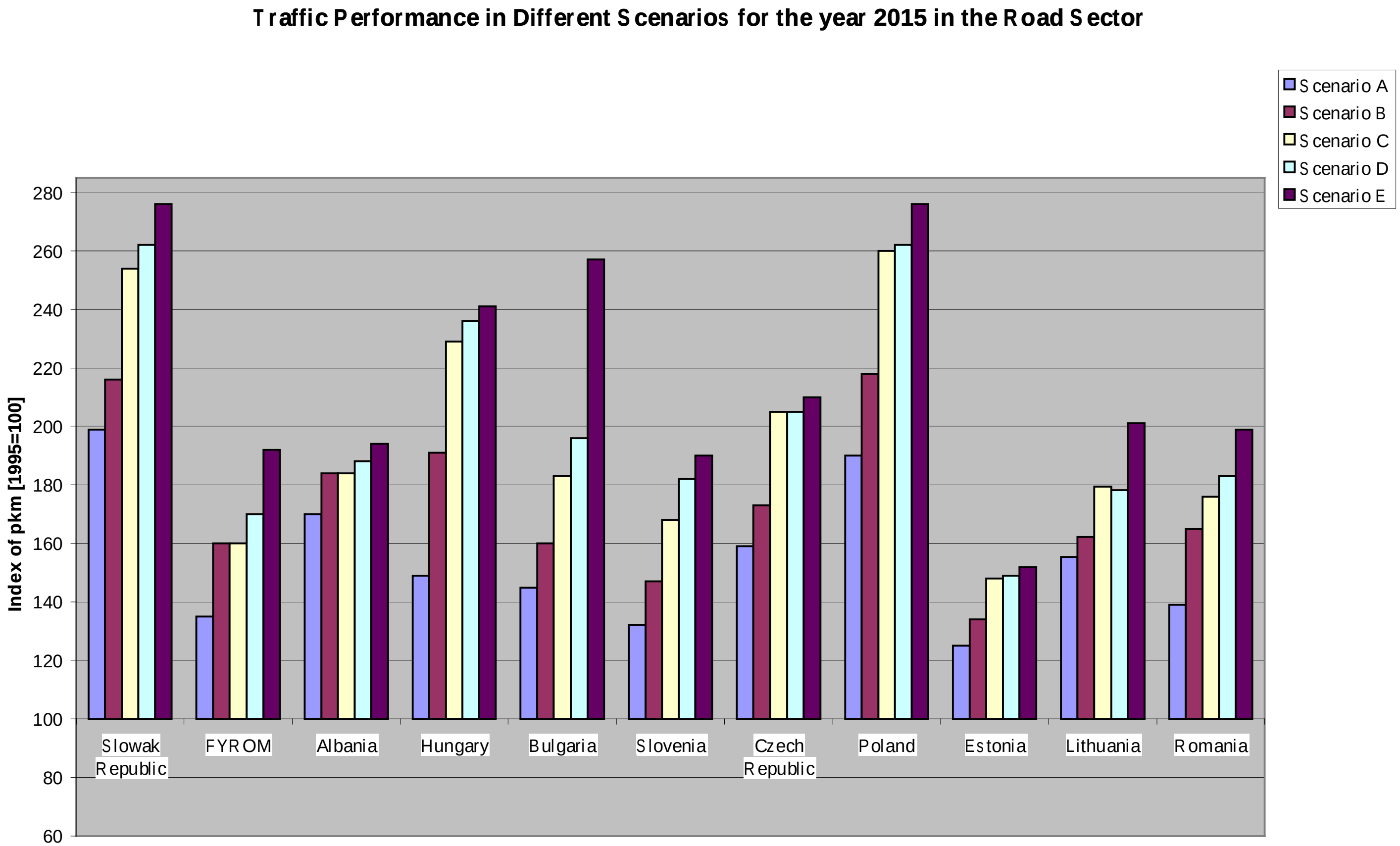


Figure 3. **Growth index of international rail traffic by country of departure/destination, 1995 to 2015**

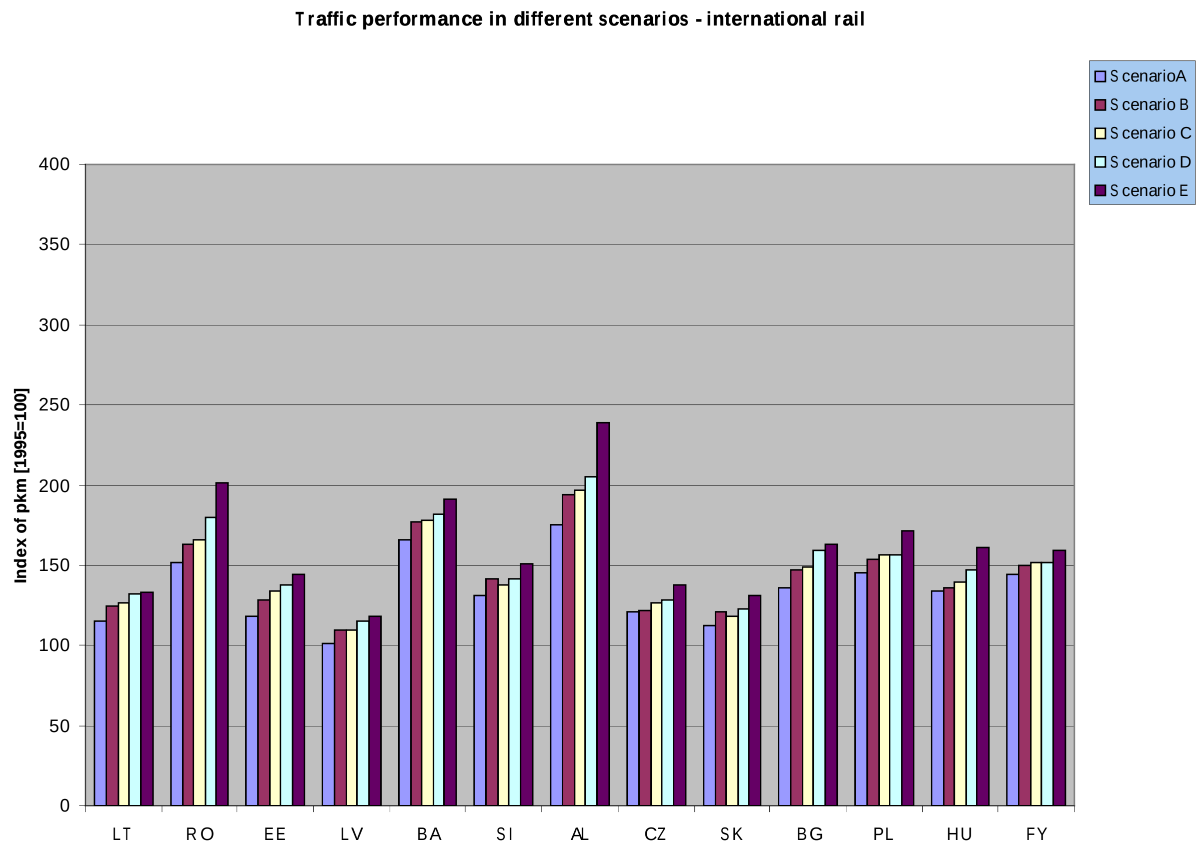


Figure 4. **Growth index of international road traffic by country of departure/destination, 1995 to 2015**

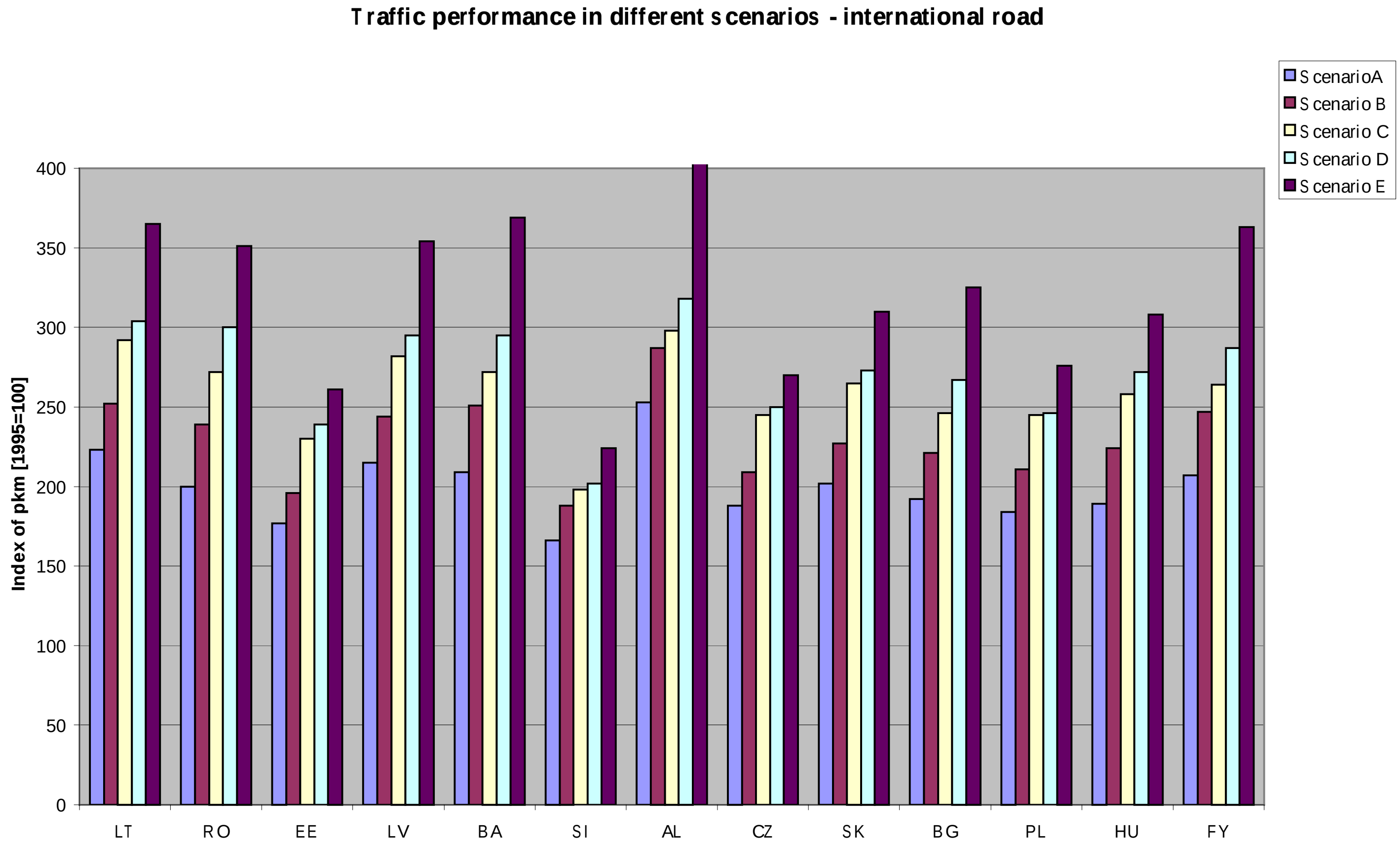
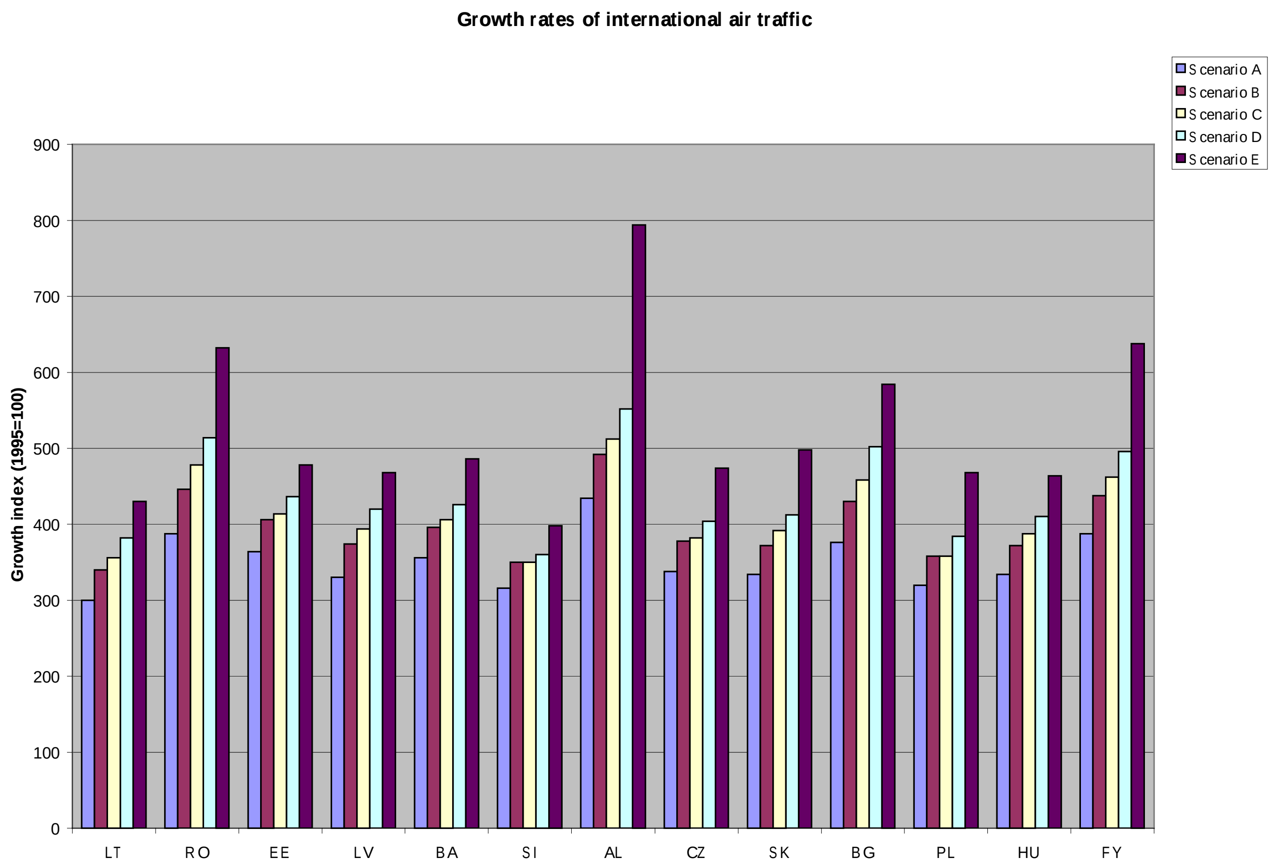


Figure 5. **Growth rates of international air traffic**



3.2.3 International passenger traffic

Aggregate traffic forecasts show border-crossing traffic activity increasing by a factor of two to four, depending on the country and the socioeconomic scenario. Small countries (*e.g.* Lithuania, Latvia, Albania) show higher growth rates for international traffic than large countries (*e.g.* Poland). It is remarkable that this trend is already very apparent in the status quo scenario A, with low economic growth and no change in infrastructure quality. In fact, for most countries, international traffic more than doubles even under pessimistic assumptions.

Car traffic is the main component of this trend. Furthermore, bus traffic on international links will probably increase by more than 50 per cent on average. This is due to the expanding market for international trips for leisure/holidays, where bus operators can achieve a strong position because they can offer cheap, door-to-door services with the most flexible routing for sightseeing travellers.

The international passenger market for railways will also expand; however, overall growth rates will be moderate. For the more developed countries, growth of rail traffic on international links is estimated at about 20-50 per cent until the year 2015. Although this is positive, it means that the modal share of railways will decline considerably because the railways will lag behind even in the case of massive investment in infrastructure. If no priority is given to the railways in terms of investment, pricing or regulatory policy, eventually motivated by their better environmental performance, it will be nearly impossible to halt the decline in the modal share of the railways in the passenger transport market.

4. EFFECTS ON INFRASTRUCTURE NEEDS

The results of the distribution of traffic on the road network are illustrated in Figure 6 (base year: 1995), Figure 7 (Scenario B, 2015) and Figure 8 (Scenario D, 2015). Only segments with over 40 000 private car units (PCUs) a day are shown. In 1995, two sections (in the Czech Republic) received more than 60 000 vehicles a day; according to Scenario B, in 2015 there will be over 60 000 vehicles a day on 56 sections and on 118 sections according to Scenario D. The majority of these sections are located on the international corridors.

Hungary and Poland are well represented in the “top 20” sections in 2015 (Tables 10 and 11), each with sections carrying over 100 000 vehicles a day. The Czech Republic and Slovakia are also represented in the top 20 in terms of traffic density.

Figure 6. **Road transport, 1995**

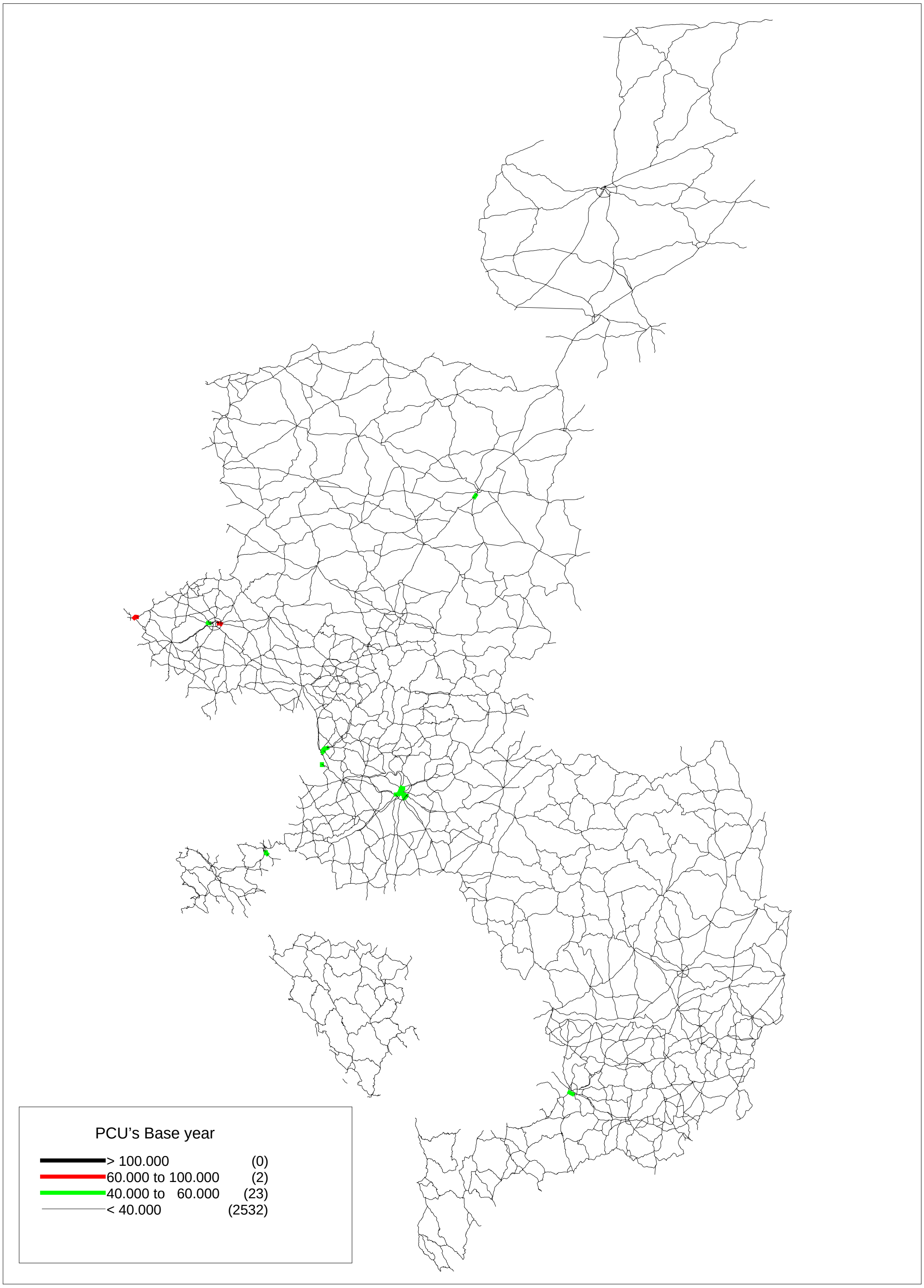


Figure 7. **Road traffic, Scenario B, 2015**

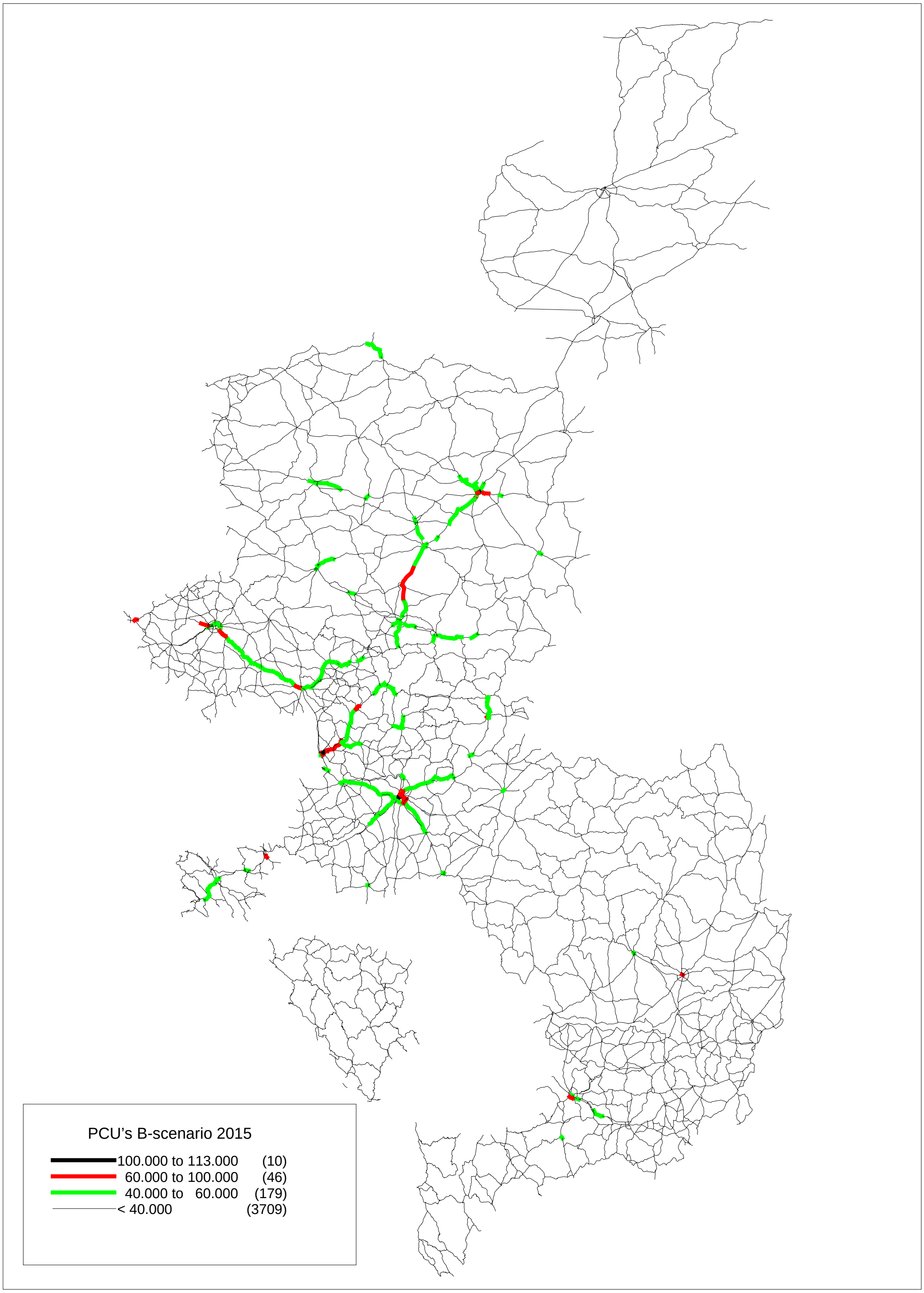


Figure 8. **Road Traffic, Scenario D, 2015**

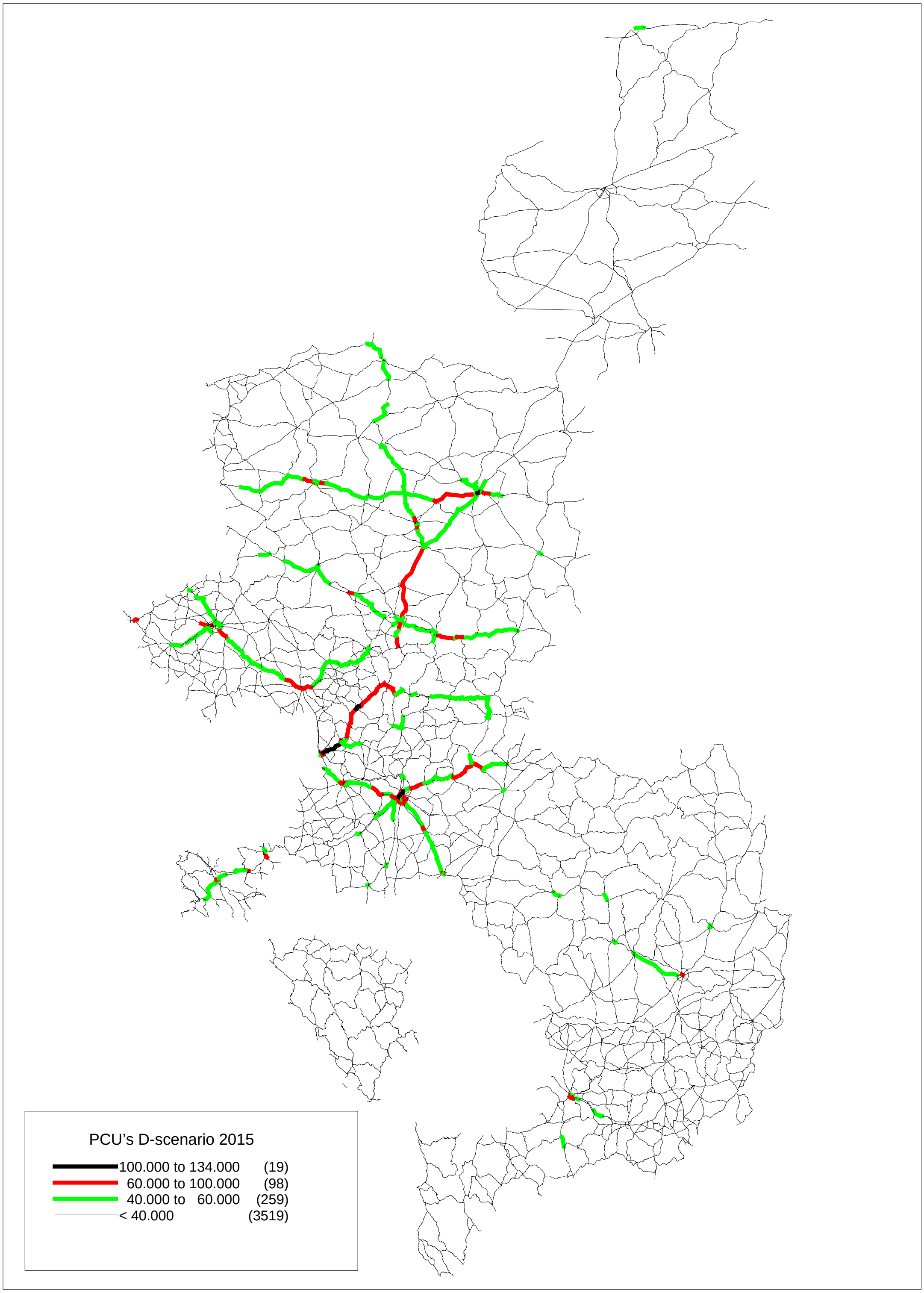


Table 10. **Top 20 road sections with the highest density in 2015, Scenario B**

PCUs base year	PCUs Scenario B 2015	PCUs Scenario D 2015	Index Scenario B (1995=100)	Index Scenario D (1995=100)	Country abbrev.	Region name
0	112940	132821	-	-	HU	Közép-Mágyarország
0	112940	132821	-	-	HU	Közép-Mágyarország
0	111654	133650	-	-	PL	Warszawa
0	111434	132202	-	-	HU	Közép-Mágyarország
52800	106673	124538	202	236	HU	Közép-Mágyarország
52800	106673	124538	202	236	HU	Közép-Mágyarország
52800	106673	124538	202	236	HU	Közép-Mágyarország
54402	105063	96161	193	177	PL	Warszawa
44381	101490	112783	229	254	SK	BRATISLAVA
52800	100277	105703	190	200	HU	Közép-Mágyarország
52270	96734	97466	185	186	SK	BRATISLAVA
52800	95896	110042	182	208	HU	Közép-Mágyarország
0	95235	115492	-	-	CZ	Praha
52800	94945	98627	180	187	HU	Közép-Mágyarország
52800	94358	96086	179	182	HU	Közép-Mágyarország
52800	94358	96086	179	182	HU	Közép-Mágyarország
0	93380	103446	-	-	SK	BRATISLAVA
52800	93335	102425	177	194	HU	Közép-Mágyarország
52800	93335	102425	177	194	HU	Közép-Mágyarország

Table 11. **Top 20 road sections with the highest density in 2015, Scenario D**

PCUs base year	PCUs Scenario B 2015	PCUs Scenario D 2015	Index Scenario B (1995=100)	Index Scenario D (1995=100)	Country abbrev.	Region name
0	111654	133650	-	-	PL	Warszawa
0	112940	132821	-	-	HU	Közép-Mágyarország
0	112940	132821	-	-	HU	Közép-Mágyarország
0	111434	132202	-	-	HU	Közép-Mágyarország
52800	106673	124538	202	236	HU	Közép-Mágyarország
52800	106673	124538	202	236	HU	Közép-Mágyarország
52800	106673	124538	202	236	HU	Közép-Mágyarország
0	95235	115492	-	-	CZ	Praha
44381	101490	112783	229	254	SK	BRATISLAVA
52800	95896	110042	182	208	HU	Közép-Mágyarország
0	76334	107738	-	-	PL	Warszawa
52800	100277	105703	190	200	HU	Közép-Mágyarország
0	93380	103446	-	-	SK	BRATISLAVA
0	92642	102431	-	-	SK	BRATISLAVA
52800	93335	102425	177	194	HU	Közép-Mágyarország
52800	93335	102425	177	194	HU	Közép-Mágyarország
21800	91344	101704	419	467	SK	BRATISLAVA
21800	91344	101704	419	467	SK	BRATISLAVA
14818	72797	101220	491	683	SK	TREN_ÍN

The growth of freight and passenger traffic will create a substantial need for infrastructure development. This applies in the first instance to international road links, since international transport and traffic are developing much faster than domestic traffic. The structural changes towards the production of high-technology goods and, above all, the growing importance of the services sector, require better quality connections in all modes. However, most of the growth, as well as the needs, will concern the road sector. The effect of the integration of the Phare countries into Europe contributes both to the growth of traffic and to the demand for better quality.

The need for infrastructure development means the need for large financing programmes, such as ISPA. One question is whether projects that are economically viable are also financially viable.

The question of whether particular sections of corridor motorways are financially viable or not heavily depends on the choice of scenario. Note that, in the project scenarios, no assumption was made with respect to road pricing. As soon as road pricing is introduced for motorways in order to partially finance the road through market revenues, it is likely that traffic will be diverted and induced traffic reduced, with the result that the high traffic volumes of the more optimistic scenarios may diminish. Since choices of individuals about the type of road to take will depend on income levels, it is likely that the rate of transfer to unpriced roads will be higher in central Europe than in western Europe. Therefore, a cautious approach is needed. More detailed analyses of the expected diversion of traffic for specific links, depending on local circumstances, will be needed.

As mentioned above, the share of road transport will grow enormously. There is no way to avoid this trend, although the degree of the shift can be influenced to some extent. If it is decided not to provide adequate infrastructure for road transport as a way to influence modal split, economic growth will be affected negatively. On the other hand, if quality improves in both rail and road transport and transport policy is favourable to rail, the size of the shift may be less than if transport policy is solely favourable to road. Even with transport policy more favourable to rail, international road transport will grow considerably, with road freight transport growing by 170 per cent over 20 years in relation to western Europe and by some 250 per cent to 400 per cent in relation to the central and eastern European countries.

Despite the reduction in market share of rail, transport on international rail links will grow in absolute figures. On several sections of international links, there will be more than 100 trains a day in 2015. This is the case for east-west links in Poland, the Czech Republic and Slovakia, Hungary, Slovenia, Romania and Bulgaria. Around large cities such as Warsaw, Prague, Budapest and Bucharest, some sections will carry more than 200 trains a day. Quality standards for this international network must be high and underinvestment will have a major impact on the role of railways in central Europe.

Local railway networks will face declining transport figures. This will lead to a reduction in network density. Local studies must establish where to invest in improvements and where to abandon railway transport.

Finally, some remarks on the future of intermodal transport. As in western Europe, this is high on the agenda as it contributes to sustainable development. However, in central Europe, organisational and technical problems prevent fast growth. Investment in equipment in harbour terminals is one thing, but the real problem is organisational. An extensive intermodal network can probably only be achieved in the medium term. As in western Europe, inland shipping can play a role in intermodal transport.

PERIPHERALITY AND PAN-EUROPEAN INTEGRATION: THE CASE OF THE CZECH REPUBLIC

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SUMMARY

Prague, June 1999

INTRODUCTION

From the viewpoint of the Czech Republic, pan-European integration is a central political, economic and social objective. The importance of this question is accentuated by the country's geographical position in the middle of Europe with two countries of the European Union – Germany and Austria – as neighbours. The process of drawing closer to the EU, which followed the fall of the totalitarian regime, has now been going on for almost a decade. Of course, the process of European integration is linked with the fulfilment of a number of conditions. At present, in the transport field intense preparations are being made for the admission of the Czech Republic to the European Union. These preparations are proceeding at various levels. They involve, in particular, the approximation of State transport policy and the related transport strategy, together with the organisation of transport networks and the harmonization of transport law.

The Czech Republic is a good model for the solution of the peripheral region problem. Geographically, the Czech Republic is not an obviously peripheral region. However, at present, it does lie on the fringe of the territory of the Member States of the European Community, as well as having an inadequately developed transport infrastructure, and from that point of view may be regarded as peripheral. It is therefore necessary to address the question of eliminating the existing shortcomings of the transport infrastructure in the European context and at the same time to solve the problem of the backward regions within the country itself.

PART A: PAST AND PRESENT EXPERIENCE

1. UP-TO-DATE OVERVIEW OF TRANSPORT POLICY IN THE CZECH REPUBLIC

1.1. Change of political system and its impact on transport

As a result of its historical development, the Czech Republic has one of the densest rail and road networks. Moreover, it has a fair number of civil airports and, thanks to the Elbe waterway, a direct link with the North Sea. In terms of the density of the transport network the Czech Republic counts as an advanced country.

However, during recent decades the transport infrastructure of the former Czechoslovakia has adapted to developing world transport trends only to a limited extent. The Prague-Bratislava motorway was built, Prague Airport was reconstructed, and the main railway lines electrified and equipped with modern safety systems. Rail transport was oriented towards the carriage of bulk materials in heavy freight trains and the main transport arteries ran towards the east – towards Russia and the countries of the former socialist bloc. The links with Western Europe were badly neglected.

Not until the change in the political and economic circumstances following the events of 1989 did the need for high-grade transport links with the European transport network fully emerge. The collapse of the eastern markets and the fall of the iron curtain caused an enormous change in the transport orientation of the Czech Republic. At the same time, the fundamental change in the political system led to the creation of new business opportunities. Thus, the reorientation of traffic flows imposed new requirements on transport. All modes of transport had to cope, with varying degrees of success, with this new situation.

Another important factor affecting transport policy was the break-up of the former Czechoslovakia and the emergence of an independent Czech Republic on 1 January 1993. This process was attended by an extensive remodelling of the economy based on the market mechanism and free enterprise. The consequent fundamental change in economic and business relations affected traffic flows, especially their direction, as manifested in a very steep fall in total transport demand of more than 32 per cent (as compared with 1989).

In freight transport, a characteristic feature of this development was a gradual shift in demand towards road transport. From 1990 the number of goods vehicles increased by 31 per cent to reach the present total of almost 355 000. At the last count, in 1995, traffic on the road network had increased by 26 per cent as compared with 1990, mainly on the motorways (34 per cent). There had also been a considerable increase in road transit traffic and border crossings. The greatest decline was in rail freight transport operations (down almost 53 per cent over the period 1989-96); water transport operations (down by as much as 61 per cent) were mainly affected by the fall in demand for the transport of solid fuel, although the level of foreign traffic was maintained. Air transport recorded higher growth trends. At the same time, train traffic on the rail network is currently far from exhausting track capacity and therefore there is no need for modernisation to solve capacity problems on the main lines. Combined transport has only a small share of the market (4 per cent of total goods transport by rail, as compared with 10-30 per cent on Western European railways).

During the last ten years, the development of public passenger transport has also been strongly influenced by the above-mentioned fundamental economic and social changes. These led to a constant decline in the number of rail and bus public transport passengers, especially in the period up to 1993 during which the number of passengers carried by public transport declined by 33 per cent.

A feature of the development of personal motor vehicle transport so far has been the constant and very rapid increase in the number of private cars and their performance. During the period 1989-97 the number of cars increased by 51.5 per cent to reach a total of over 3.456 million vehicles, the equivalent of one private car for every 2.98 people, while in Prague, for example, there is one car for every two people (in six years, traffic density in Prague has increased by two thirds).

1.2. Progress in building up the main transport corridors

The restructuring of the economy and the economic record of the Czech Republic are having a specific effect on the transport market and the extent of the demand for transport. The abandonment of the old and the adoption of new trading practices has led to the redirection of traffic flows with an increased emphasis on quality. The opening up and unification of Europe is one of the most important factors to affect trends in goods and passenger transport. The progressive attachment of the countries of Central and Eastern Europe to the European Community also implies the progressive reorientation of transport. It should be noted that, despite all the difficulties, road transport has quickly adapted to the new requirements and has strengthened its position in the transport market.

1.2.1 Development of the road network

The Czech road network is well developed in terms of its extent but less so in terms of quality. It is unable to cope with the growth of road transport operations. The Czech Republic is lagging considerably behind the advanced European countries in providing a highway infrastructure with a high-grade interconnecting motorway network. The lack of a comprehensive network of motorways and express roads is proving an obstacle to the country’s economic development. At present, there are only two routes that are adequate in terms of capacity and quality, namely, the Prague-Brno-Slovak/Austrian border and Prague-Rozvadov-German border routes (apart from the Pilsen bypass). In all other cases the traffic must partially follow roads under construction leading to incomplete sections of motorways and express roads. This results in congestion, especially at the points where the traffic crosses over from a higher to a lower highway category. The finished length of the motorway network should total 1 057 km, but only about 49 per cent of that is so far open to traffic, forming an independent network completely detached from the European system. The layout of the road network has many defects in terms of direction and width (31 per cent of major roads are in a dilapidated or unsatisfactory state, while the situation with the others is even worse). Out of a total of 15 829 bridges, 11 per cent are unfit for use. Likewise, there are still large numbers of level crossings. The present highway administration is too slow in carrying out infrastructure repairs and construction and reconstruction work to meet the requirements arising from the sudden increase in the volume of road transport operations, higher traffic density and the growth in car ownership.

Along the main transport corridors another serious source of congestion, apart from the incomplete motorway and express road network, is the unsatisfactory border crossing infrastructure. This is mainly due to the fact that in the past, for political reasons, there was no call to build efficient border crossings leading into the countries beyond the Iron Curtain, particularly on minor roads. A further problem was the construction of eastward border crossings after the break-up of the Czech and Slovak Federal Republic. In connection with new rail and road border crossing construction it is also necessary to take into account the fact that once the Czech Republic has joined the European Union some border crossings will no longer be justified, while in some cases it may well be necessary to install infrastructure and equipment in conformity with the Schengen agreements.

In developing the road network of the Czech Republic it is necessary to start out from the pressing need to solve the existing problems which involve, in particular, the construction of major bypasses around built-up areas and border crossing approach roads, the building of motorways and express roads to replace overloaded sections of the existing network, the elimination of traffic blackspots and the reconstruction of substandard bridges. The general aim is gradually to bring the capacity and condition of the Czech Republic’s roads and bridges up to a level comparable with that in the countries of the EU.

Motorways are planned and are gradually being built along the most heavily used road transport routes, in particular to connect the capital Prague, the most important source and destination of road traffic, with the larger conurbations and to link up with the road networks of neighbouring countries along the main international routes under the AGR agreement and the established pan-European multimodal corridors of maximum transport significance. The points at which the motorways will cross State boundaries have been established and fixed on the basis of intergovernmental agreements. Forecasts of road and motorway traffic density are verified by means of regular national censuses at five-yearly intervals and cross-border traffic development and trends by means of special surveys, mainly carried out at two-yearly intervals.

Express roads are planned and gradually being built along major routes to interconnect the towns and cities of the Czech Republic with a heavy traffic load and link up with the express road systems of neighbouring countries. The construction of the R 10 Prague-Turnov express road has been fully completed, and other such roads are partially open or under construction.

As for the other Class I roads, as a rule, continuous reconstruction in long complete sections is not planned, but they will be gradually improved by means of partial resurfacing and the elimination of traffic blackspots.

A long-term development programme has also been prepared for the remainder of the road network and is being progressively implemented.

From this appraisal it follows that the state of the road network is unsatisfactory. The wear on the roads due to the sharp increase in road transport is getting steadily worse. A comparative analysis clearly shows that since 1989 investment in the road system has failed to meet the requirements of a rapidly growing road transport economy.

Since 1993, there has been a marked intensification in motorway and four-lane highway building with a view to speeding up the interconnection of the Czech and European motorway networks. The result has been an uneven distribution of highway funds between investment and non-investment (maintenance and repair) programmes, which has led to the technical condition of the network steadily deteriorating.

The main criterion for the construction of new highways is the traffic load. According to the results of a national traffic census, in 1995 traffic was 21 per cent heavier overall and 33 per cent, 28 per cent, 16 per cent and 10 per cent heavier on motorways and Class I, II and III roads, respectively, than in 1990. This growth corresponded to a sharp increase in motoring, without having a significant effect on the distribution of transport work to the benefit of non-road and mass transport.

Thus, on the basis of the results of the national transport census it must be concluded that a number of the Czech Republic's existing main road links, which will have to be replaced by motorways and express roads, are already overloaded with traffic, while on some stretches (especially in and around the large towns) there is frequent traffic congestion. Given the continuing rapid development of road transport and the delay in building the planned motorway and express road system, a distinct worsening of the situation on the existing main road links must be expected, with certain sections or areas becoming difficult to traverse. In addition to a worsening of the traffic situation there is likely to be a deterioration in the living environment near the existing main roads (especially where they pass through towns and communities) and an increase in the number of traffic accidents.

1.2.2 Development of the rail infrastructure

The Czech rail network is fairly dense and bears comparison with the Western European countries. The decline in rail transport operations has led to a reduced load on the rail network and from that point of view there is no shortage of rail track capacity. Nevertheless, the rail infrastructure does have one very serious problem, namely, the poor technical and operating condition of the tracks and junctions, which is adversely affecting capacity, train speeds and operating safety. On about 400 sections with a total length of almost 300 km it is necessary temporarily to limit train speeds because of the above-mentioned unsatisfactory state of the track. Forwarders and the public are pressing hard for improvements in the speed, quality and safety of passenger and goods transport by rail. Modern means of transport permit a considerable reduction in rail journey times, but this is being prevented by the poor condition of the antiquated rail infrastructure (parameters of the track, junctions and safety equipment).

Unless remedied in good time, the unsatisfactory state of the rail infrastructure could cause serious difficulties in meeting transport requirements, not only from the standpoint of quality and speed but also in connection with the anticipated growth of the Czech economy and the plans to revitalise the role of the railways, which emphasize the greater use of environmentally friendly modes of transport, taking into account the actual capacity of the most heavily loaded sections of track. In addition, it will be necessary, at the same time as bringing the entire rail transport system into line with European Community directives, to raise the rail infrastructure to the appropriate level, especially on the important international rail links. Accordingly, in the first place, priority must be given to modernising the "Czech Railways rail transit corridors" which are defined as follows:

1) (Germany) – Decin – Prague – Ceska Trebova – Brno – Breclav – (Austria/Slovakia);

2) (Austria) – Breclav – Prerov – Ostrava – Petrovice u Karvine – (Poland);

3) (Germany) – Cheb – Pilsen – Prague – Olomouc – Ostrava – Petrovice u Karvine/Mosty u Jablunkova – (Poland/Slovakia);

4) (Germany) – Decin – Prague – Veseli nad Luznici – Horni Dvoriste/Ceske Velenice – (Austria).

On the basis of the preparations for the admission of the applicant countries to the European Union, the following tracks leading to the territory of the Czech Republic have been included in the TINA network – the future expanded TEN network:

(a) The core TINA network includes those lines which also form part of the following pan-European multimodal corridors:

- Corridor IV: (Berlin) – Decin – Prague – Brno – Breclav – (Vienna/Bratislava);
- Branch A of corridor IV: (Nuremberg) – Cheb – Pilsen – Prague;
- Corridor VI: (Gdansk – Katovice) – Petrovice u Karvine – Cesky Tesin – Zilina (temporary route, linking up with corridor V through Slovak territory);
- Branch B of corridor VI (link between corridors IV and VI): (Katovice) – Petrovice u Karvine – Ostrava – Breclav – (Vienna/Bratislava).

(b) Other important lines are included in the supplementary TINA network.

The approach to modernisation of the existing lines included in the above-mentioned corridors is governed by the European agreements (AGC, AGTC) adopted at UN/EEC level and by the European rail network development plans drawn up at European Commission and International Union of Railways (UIC) level.

Thus, the most important lines have been included in four national rail corridors earmarked for reconstruction in order to ensure high-grade links with neighbouring countries. The total length of the four national rail corridors is 1 962 km, but there will be only 1 442 km of modernised track, since some corridors overlap. Within the framework of this modernisation programme, the roadbed and superstructure, including railway bridges and selected tunnels, will be comprehensively upgraded and the traction system renovated and, where necessary, replaced. The modernised corridors will permit an increase in train speeds to 160 km per hour and the establishment of a structure gauge in accordance with the AGTC (UIC GC) agreement. It will also be possible to operate goods wagons with an axle load of 22.5 tonnes (load class D 4). The implementation of these plans will not only ensure that the capacity of the rail infrastructure is adapted to the demand for transport but will also enable it to meet the requirements for higher standards and, above all, greater speed and safety.

Apart from the modernisation of the most important railway lines, it is proposed to carry out a track electrification programme, mainly along the lines of international interest. In the year 2005 the reconstruction of additional lines covered by international agreements will begin. In the case of those lines which satisfy the conditions for increased freight earnings it is planned to start reconstruction in the year 2010.

The priorities for investment in rail network development include, in particular:

- Modernising the rail transit corridors in accordance with the parameters of the corresponding AGC and AGTC international agreements, including stretches with critical junctions;
- Ensuring the safety, operability and proper maintenance of the other national and regional lines;
- Implementing the programme for further electrification of the railways;
- Optimising the additional lines covered by the AGTC agreement and connecting (bypass) lines.

The immediate aim of the railways is to achieve, on the selected lines covered by international agreements, maximum speeds of up to 160 km per hour thus ensuring, as a priority, high-grade international connections with Berlin, Vienna, Warsaw, Nuremberg, Munich and Linz, while meeting the internal requirements for fast, high-grade communications between the individual regions of the Czech Republic.

It is proposed that the development of the rail network should include providing the investment necessary to ensure that the lines passing through critical junctions and stations are of the same standard as those leading into them, so that the future modernised corridors are free of bottlenecks. This applies, in particular, to the following nine junctions and stations on Corridor I: Decin, Prague, Kolin, Pardubice, Usti nad Orlici, Chocen, Ceska Trebova, Brno and Breclav. The corresponding costs are estimated at 34 021.6 m crowns.

1.3. Main principles of Czech transport policy

The new transport policy of the Czech Republic is based on the following premises:

– A fundamental change in ownership relations;
– A gradual change in the industrial structure;
– Reorientation of the European markets;
– A further adjustment of the price structure and changes in input prices;
– A sharp fall in the demand for transport and changes in the modal split;
– A mismatch between the development of highway capacity and the growth of traffic;
– The rapid development of private car traffic;
– The increased importance of the environmental aspects;
– The incomplete transformation of the transport sector, especially the railways;
– The unsatisfactory quality of the transport infrastructure;
– The lack of available capital for promising transport schemes;

- The growth of debt and debt service among transport entities;
- The effects of liberalisation and market opening on the transport sector;
- The operation of the EU common market, notably in relation to external EC borders;
- The growth of unemployment and its social impact on the population;
- The ever-increasing synergetic effect, throughout the national economy, of the health and activity of the transport industry;
- The lessons learned from the mistakes made by the EU Member States in implementing their transport policies.

1.3.1 The main transport policy objectives

These include:

- Harmonization of the conditions for carriers entering the transport market;
- Gradual implementation of individual EU transport policy measures adapted to Czech conditions;
- The functional efficiency of the transport system in relation to the defence of the realm and Czech entry into NATO;
- Completion of the transformation of the transport system, especially rail transport;
- Maintenance of the authority of the State over transport infrastructure development;
- Creation of a competitive transport market environment for carriers;
- Amendment of the fiscal and sector legislation with a view to harmonizing the system of taxes and charges applicable to the transport sector, including the progressive internalisation of external transport costs;
- Continued implementation of effective transport infrastructure development programmes;
- Amendment of the law with a view to harmonizing the regulations governing access to the profession, including evidence of technical competence and financial fitness;
- Matching the demand for capacity with the supply, taking into account the changes in modal split;
- Reforming the public-interest services while raising standards;
- Development of a consistent approach to and rules for the transport infrastructure and transport facilities;
- Application of active and passive measures to improve the safety of means of transport;
- Priority for public over personal transport;
- Support for research into environmentally friendly means of transport;
- Active co-operation in the framing of regional development programmes;
- Reduction and elimination of the adverse effects of transport on the environment;
- Improvements in the quality of public passenger transport;
- Progressive improvement in the mobility of disabled persons.

1.3.2 Priority tasks in rail transport

- Amendment of the Railways Act No. 266/94 in accordance with the EC legislation;
- Formulation of a commercial policy harmonized with and respectful of the EC legislation, especially in relation to the definition of third-party interests in a coherent transport network;
- Consolidation of the existing railway company, Ceske drahy s.o.;

- Transformation of Ceske drahy s.o. into a business-oriented company with clearly-defined commercial objectives;
- Privatisation on the basis of a firmly established long-term development strategy and commercial policy.

The main aim of this process should be the strategic conversion of the State railway into a transformed profit-making public company driven by a realistic strategy designed to maximise revenues and minimise costs (a decision has been taken to establish the State enterprise Czech Railways as from 1.1.1999).

This means:

- Developing a Czech Railways consolidation programme, including comprehensive measures to improve the financial position and curb negative trends;
- Gradually clearing Czech Railways of debt as a precondition of the consolidation programme;
- Proposing a framework for railway privatisation (leasing arrangement) and access to the transport infrastructure which establishes the ownership, organisational and legislative conditions for the possible separation of part of the railway system from Czech Railways, while adhering to the following basic principles:

  - preservation of the integrity of the rail network;
  - separation of the transport infrastructure from operations;
  - privatisation and liberalisation of the traffic on the transport infrastructure managed by the State;
  - privatisation of the peripheral segments of regional lines, especially in recreational and similar areas;
  - a long-term rail development policy that respects the EC legislation and the conditions prevailing in the Czech Republic;
  - retention of the option of eventually converting the transformed State enterprise Czech Railways into a commercial joint-stock company.

1.3.3 Priority tasks in road transport

In conformity with the EC legislation on access to the profession, it will be necessary to require:

- civic probity (in accordance with the EC criterion);
- financial fitness (in accordance with the EC criterion);
- technical competence (recognition of diplomas or passing of a prescribed examination);
- evidence of three years of national experience as a precondition for participation in international traffic.

With respect to market access:

- Application of the principle of international permits under bilateral agreements and multilateral ECMT permits and gradual adoption of the EU systems and rules, on the basis of respect for the principles of non-discrimination and equal treatment;
- With regard to cabotage, the application in negotiations with the EU of the quota increase procedure, with a view to upholding the principles of reciprocity and non-discrimination with respect to Czech carriers;

- In international bus traffic, application of the principles of international permits under bilateral agreements, including the comprehensive adoption of the international INTERBUS agreement, and in negotiations with the EU access to the international transport market on the basis of non-discrimination and equal treatment, including the provision of services subject to special rules (regular bus services and shuttle transport without accommodation)
- Acceptance, after a certain transition period, of the full application to Czech carriers of the EC driving licence rules and regulations, in accordance with EC directives
- Alignment of the national regulations on minimum training requirements for certain road transport drivers on those in force in the EU

Private car traffic

A characteristic feature of the development of private car traffic in the Czech Republic is the continuous and very rapid increase in both the number of cars and their performance.

Accordingly, the main objective is to keep private car traffic within acceptable limits in terms of the environment. It is therefore necessary to do everything possible to support public transport and the modernisation of the transport infrastructure. This means adopting a comprehensive system of measures based on the principle of sustainable development and fulfilment of the country's international obligations to stabilise and reduce the adverse effects of transport on the environment.

These measures will involve:

- Government support for public transport to make the service attractive;
- Improved intermodal co-operation so that the passengers can benefit from common unifying features such as common information systems, timetables and documents;
- Co-ordination of transport infrastructure construction to eliminate congestion-causing bottlenecks;
- Transfer to the self-governing districts (VUSC) of powers and responsibilities for establishing the range and quality of regional transport services, timetable co-ordination, licensing and tendering for the procurement of public-interest transport services;
- Harmonization of access to the individual modes of transport subject to the State's subsidy policy (budgetary support);
- Progressive harmonization of the economic conditions through the adjustment of tariff, tax, customs, technical and toll policies;
- Tightening up the technical requirements for motor vehicles;
- Progressive enforcement of reasonable restrictions on private car traffic in cities, especially Prague;
- Traffic-calming measures in large cities, including the construction of parking areas on the outskirts with easy links to the public transport system (park-and-ride).

1.3.4 Pricing policy and tariffs

The aim is fully liberalised pricing. Prices are to be regulated only in the public interest, in particular on grounds of social acceptability, for example, reduction of the impact on the environment.

1.3.5 *Harmonization of market conditions*

The biggest problem is how to achieve the harmonization of the two traditional sectors - road and rail transport - which are in competition with each other. However, healthy competition means creating a level playing field. At present, for example, the road transport infrastructure is financed largely from the State budget, whereas the rail infrastructure is mainly paid for and maintained by the railway company itself.

From the standpoint of the harmonization of market conditions, the EC transport policy White Paper envisages that, ultimately, the carrier will pay all the transport technology costs. However, this would entail a sharp increase in transport prices leading to bankruptcy for the smaller carriers and contributing to inflation. Accordingly, it will be necessary to proceed by stages as follows:

- In the first (pre-accession) stage, a fair arrangement for the carrier to pay the variable costs by the carrier, with some of the fixed and external costs being borne by the State;
- In the second stage, all or most of the fixed costs also to be reimbursed by the carrier;
- In the final stage, progressive internalisation of external costs and their payment by the carrier, to the extent that he is responsible for them.

1.3.6 *The implementation process*

*Stage I (pre-accession strategy)**

During the period of preparation for accession to the EU it will be possible to achieve most of the transport policy objectives, with the exception of those which require a longer transitional or implementation period or which will be the subject of negotiations with the EU.

*Stage II (immediately following accession)**

During this period the strategic objectives will be as follows:

- Adoption of the basic agreement between the Czech Republic and the EU on the accession of the Czech Republic, including the special annex on transport and transport regimes;
- Full harmonization of the economic conditions of access to the transport market;
- Completion of the modernisation of the main links between the Czech Republic’s transport network and that of the EU;
- Implementation of the electronic toll system on the road network;
- Transformation of the transport, border and customs regimes in accordance with the Schengen Agreement;
- Full application of the EC transport legislation, including the adjustment of transport regimes and changes in international agreements;
- Liberalisation of access to national transport networks;
- Adjustment of the differentiated tax system to internalise certain external costs in the transport sector.

*) Phase I could last from 1999 to 2003 and Phase II from 2004 to 2010.

1.4. Basic characteristics of Czech transport policy as regards harmonization with the European Union

1.4.1 Legal barriers

In 1993-97, the Czech Republic's transport legislation was completely revised. In the case of some acts, for instance, the Road Transport Act, the Railways Act and the Road Vehicle Operation Technical Requirements Act, brand-new versions were adopted. Furthermore, in 1997, the Czech Government approved three more transport bills. The drafting of transport legislation is based on a detailed knowledge of EU transport policy, including in particular the intermodal harmonization measures, equivalence of the relationship between transport and transport infrastructure, the revitalisation of rail transport and the adjustment of road tax and vehicle charges. These transport policy objectives reflect the *acquis communautaire* in the transport sector. The verification of compatibility is a continuing process aimed at achieving the complete harmonization of the Czech legislation by the end of the year 2001.

In the field of transport, the basic provisions of the primary EC legislation, deriving, in particular, from the Maastricht and Amsterdam Agreements, include:

- Common rules for international transport, the conditions under which carriers can conduct transport operations on the territory of another state and measures to improve transport safety;
- A transport regime for certain developing regions designed to involve them in the Common Market;
- Support provided only if it serves to co-ordinate transport or as compensation for the fulfilment of public service obligations;
- Elimination of all discrimination in transport based on the country of origin or destination of the goods;
- Determination of the main objectives, priorities and projects of common interest relating to trans-European networks;
- Co-operation between networks and harmonization of technical standards;
- Support for the development of trans-European networks and financing for projects of common interest.

Out of the 47 pieces of transport-related legislation listed in Chapter 6 of the White Paper concerning the preparation of associated countries for entry into the EU internal market, 32 are fully compatible and 15 currently only partially compatible with the Czech legislation. These latter should also be reflected in the law of the Czech Republic.

Out of the 72 pieces of EU technical legislation relating, in particular, to the type-approval of road vehicles, about 90 per cent are compatible with the EEC/UN type-approval regulations, which the Czech Republic is incorporating in its legislation.

The aim is to achieve complete approximation of the EC legislation to that of the Czech Republic by the end of the year 2001.

1.4.2 Technical barriers

In principle, there are no technical barriers. There are only differences in the quality of the equipment (this applies especially to rail transport) and differences in the level of development of the transport infrastructure.

1.4.3 Economic and social aspects

One of the key questions is the quantification of the impact of Czech entry on the EU transport market. Significant effects, both positive and negative, on the microeconomics of our transport sector are to be expected. The Czech carriers will have to meet tough criteria to gain access to EU markets (financial fitness, technical competence, good reputation, etc.). Firms and businessmen that fail to satisfy these conditions will lose their licences. On the other hand, the struggle to meet the conditions could bankrupt the financially weaker companies. At the same time, despite these negative effects, our carriers will be in a good position to compete on prices. This advantage will, of course, be gradually eroded by the increasing costs of conforming to EU technical (higher engineering and safety standards) and social (wages, benefits) requirements.

Harmonization of the introduction of transport network user charges will lead to a greater financial burden on the carriers, but also to higher government revenues. This should be positively reflected in investment in the maintenance and extension of the transport infrastructure. In rail transport, harmonization will mean reduced government subsidies for Czech Railways.

The provision of public-interest services forms a separate chapter. This issue is regulated by the Treaty of Rome and by the EU’s secondary follow-up legislation, which impose a public service obligation - to operate and maintain the transport infrastructure - even when, under the usual tariff and carriage conditions, the operator would find it unacceptable. The obligation to provide these services will involve maintaining a certain standard in the interests of the development of certain regions. It is expected that, in the fullness of time, the advantages will outweigh the disadvantages and lead, among other things, to improvements in traffic safety and moderation of the environmental impact.

1.5. Privatisation of Czech Railways and conditions of access to the track

From the documents on the restructuring of Czech Railways approved by the Czech Government, it follows that Czech Railways will not - at least for the time being - be entirely privatised. Only the unprofitable parts will be selected for privatisation. This means mainly those state assets which legally belong to Czech Railways, in particular the loss-making regional lines.

The rail privatisation procedure is governed by Law No 92/1991 Sb and the accompanying regulations.

With regard to privatisation, the main priority is to ensure that the new owners operate the required range of goods and passenger services in full conformity with the legislation and to achieve a reduction in Czech Railways’ costs. The idea is to keep the dead-end branch lines as an integral part of the network.

Generally speaking, most of the lines will be privatised by open tender under the so-called “foundation project”. The list of lines for privatisation comprises 126 state-owned sections with a total length of 3 290 km, or approximately one-third of the existing network with a book value of 7.5 billion crowns. Loss-making lines which make a disproportionate contribution to the operating and maintenance costs account for about 15 per cent of these assets.

The Ministry of Transport and Communications is considering introducing some additional conditions into the proposed legislation, in particular with a view to obliging the future owner to continue operating the privatised line under the conditions laid down in the laws and regulations.

The lines which the State wishes to keep in use in the public interest will be determined on the basis of an agreement between the regional and local authorities. In these cases the State will provide the future owners with an additional subsidy. The remaining lines will be put up for privatisation without any additional commitments or concessions.

To speed up the process, consideration is being given to privatising certain integral parts of the system to be operated by one carrier only. In the field of passenger rail transport, privatisation of the suburban networks of selected conurbations (Prague, Brno, Ostrava, Pilsen, Usti n. L., etc.) is envisaged. The aim is to incorporate suburban rail transport into a single integrated transport system.

The entry of private rail operators is authorised by Law No 266/1994 Sb. This also applies to the above-mentioned suburban rail transport segment, provided that the operator has the necessary rolling stock at his disposal (either his own or leased), but of course in competition with the State organisation Czech Railways.

The conditions on which carriers may obtain access to the rail transport system (national and regional) are laid down in Law No 266/1994 Sb. The provisions in force ensure uniform conditions of access, provided that the carrier's requirements do not exceed the capacity of the particular line or its technical parameters. The rail authority is authorised to issue licences and to regulate the licensing procedure.

To ensure that the EU and Czech legislations are harmonised, the Ministry of Transport and Communications is preparing a set of conditions governing access to the rail network, particularly the national routes. The introduction of optional insurance for carriers is envisaged.

The carrier and the rail operator sign an agreement on access to the rail network which includes the access conditions, the proposed timetable and the user charges.

There is no legal right to a licence because the rail authority regulates access on the basis of the capacity and technical condition of the track concerned. The routes and timetables are not mentioned in the licence issued, which refers only to the train density on the individual section in question. The carrier operates in conformity with his licence and his agreement with the rail operator. This applies to both passenger and goods transport, no matter whether the rolling stock is owned by the carrier or leased.

As far as international rail transport is concerned, we consider it essential that, pending the amendment of the document "International Rail Transport Agreement", Czech Railways should be the sole representative of all the carriers in legal matters. This also applies to cases in which an international contract of carriage is signed on Czech territory by another domestic carrier on behalf of Czech Railways. Within the context of future amendments to the COTIF Agreement, individual carriers from all the signatory countries will be able to obtain access to the rail system.

The charges for the use of national rail routes are determined in accordance with the law and protected as regulated prices. They are established by the Ministry of Finance on an annual basis. The charges for the use of regional lines are not regulated and are therefore contractual. The charges must fully cover the costs of maintaining the infrastructure plus a suitable profit for its further development.

1.5.1 Latest developments

There are currently about 30 licensed railway enterprises in the Czech Republic, most of which are operating in the freight sector. These firms are mainly domestic, but the above-mentioned legislation also grants access to foreign entities. The private carriers account for 3 per cent of total freight transport.

An agreement between the private rail carrier and Czech Railways is a prerequisite for access to the system.

1.6. Anticipated risks of the proposal and summary of the problem areas

The draft transport policy is being discussed and commented on at both technical and political levels, since this is a sector which makes considerable demands on the State budget and also has a huge influence on the environment. In particular, the relationship between the development proposals for the road and rail networks is being questioned; some feel that the motorway construction programmes are too ambitious, while others consider them inadequate.

The greatest threat to the proposal for the development of the transport networks lies in the rapid growth of private car traffic, which is currently considerably outpacing road and motorway construction. The probable slowdown in road and motorway construction will make the imbalance worse, with the usual negative consequences. Another serious problem is the lack of resources for maintaining the road network, which is causing it to deteriorate.

The contemplated modernisation of the main rail corridors will only partially improve the competitiveness of rail transport because, for financial reasons, the degree of modernisation has been reduced and the programme restricted to four corridors. Technically, the rest of the rail network is in a state of neglect and in the case of the regional lines the question of linkage with the overall solution of the transport problem in the regions has not been completely resolved. No further substantial modernisation of the rail system is under consideration at present. Additional funds or credits will have to be obtained if the risk of a slowdown in the modernisation of the transport infrastructure is to be reduced.

Lack of funds could considerably delay the implementation of the priority measures and could also mean a reduction in the contribution made by transport to the growth of GDP, with adverse economic consequences. There is also a threat to Czech accession to the EU, since a high-quality link-up with the European transport network is one of the conditions of accession.

The problem areas in the road transport sector can be summarised as follows:

- The marked increase in national and international (passenger and goods) transport since 1989, which has been accompanied by a radical reorientation of traffic flows and changes in origins and destinations, is making new demands on the capacity and quality of the transport network, which in the past was not properly repaired and maintained;
- This increase in traffic is causing serious problems in residential districts (parking, noise, emissions, congestion) and in environmentally sensitive areas;
- Along certain main European routes, such as Prague-Berlin, Prague-Linz and Prague-Vienna, the existing transport network is unable to provide links with neighbouring countries that are adequate in terms of quality and capacity;
- Most urban areas lack satisfactory bypass arrangements for transit traffic;

- Limited State budgetary resources are seriously restricting the pace of change;
- The system of road infrastructure user charges and tax policy are not fully consistent with EU practice.

The problem areas in rail transport are as follows:

- There has been a marked decline in the railways' share of total international and domestic transport;
- The state of the rail infrastructure is such that it cannot comply with European technical standards or satisfy the conditions of the AGC and AGTC agreements;
- The regions are not being adequately served;
- The question of the operation and privatisation of the regional lines has not yet been settled;
- Limited State budgetary resources are seriously restricting the pace of change.

PART B – PERIPHERALITY, ACCESSIBILITY AND REGIONAL DEVELOPMENT

These aspects have recently been the subject of much discussion not only in general terms but also in connection with the provision of transport services, since the necessary level of transport infrastructure is one of the key factors of regional development. The Czech Republic's regional policy is now taking shape. The principles of the government's regional policy have been established on the basis of proposals made by the Ministry for Local Development and a regional development support bill is now being discussed. It will be necessary to put in place a corresponding institutional and legal framework and to revise the present unco-ordinated approach to the solution of regional problems, which also affects transport.

The next chapter is devoted to the general principles of regional policy, since these principles are now taking shape and will ultimately determine the regional transport policy programme.

1. MAIN PRINCIPLES OF THE PROPOSED REGIONAL POLICY

The Government's regional policy is designed to unify opinion on the general rules for the conduct of regional policy, including the problems of interministerial co-ordination and fund management, and to align these sectors of government on EU practice. Regional policy is considered to be a planning activity of the State and regional and local authorities, aimed at promoting the well-balanced development of the country's various regions, reducing the relative differences in development levels and improving the structure of the regional economy. Within the framework of the regional policy system, it is proposed to draw up a "Regional Development Strategy" document which will include an analysis of regional development over roughly the last three years, determine the strengths and weaknesses of development in the individual regions, define priorities and make recommendations for future action.

It will be necessary to decide whether support for the regions will be entirely departmentalised or take the form of an integrated approach within the regional policy framework. These are very pertinent questions as far as transport is concerned since all-area programmes naturally have regional consequences, the final implementation of such programmes always being linked with specific regions.

From the institutional framework standpoint, it is proposed that there be a two-tier regional development policy, at the national and regional levels, which of course does not exist at present, the corresponding roles being played by central government, on the one hand, and the districts (*okresy*) and municipalities (*obce*), on the other. This situation is not sustainable in the long term and a successful regional policy is not conceivable without the existence of autonomous bodies at the regional level.

Meanwhile, as a result of this situation, regional policy is regarded as providing extraordinary one-off aid for the regions and the possibility of a programmed approach is being neglected.

The principles of regional policy define the concept of a region eligible for support. Under the conditions prevailing in the Czech Republic, structurally handicapped or economically weak regions may be supported, together with other regions, on the basis of a government decision.

As far as the evaluation of problem regions is concerned, the entry of the Czech Republic into the EU will require the adoption of a regional classification in accordance with the NUTS. It is assumed that there could be two regions of the Czech Republic (Bohemia and Moravia) at the NUTS I level. The future large territorial administrative units (14 *krajs* or counties) will form NUTS III units, while groups of these future large territorial administrative units, numbering 6-8, will form NUTS II units.

2. LINKAGE WITH THE REGIONAL POLICY OF THE EUROPEAN UNION

The Czech Republic’s existing regional policy concept is not yet aligned on the principles of the regional policy pursued in the countries of the European Union and stands alone.

The European Commission, for its part, has found that:

– There is no regional policy;
– Initiatives aimed at regional development are implemented through a number of nation-wide departmental approaches, while an independent regional development policy is lacking;
– The Ministry for Local Development should develop appropriate co-ordination mechanisms at the national level;
– It will be necessary to devise effective instruments and to augment the existing financial resources allocated to regional development;
– The Czech Republic is still waiting for the legal, administrative and budgetary framework for an integrated regional policy to be put in place and for alignment on the rules in force in the EU.

All the above-mentioned disparities relative to the regional policy of the EU do in fact exist. However, the proposed “Principles of government regional policy” eliminate these differences and after their adoption, which it is proposed should take the form of a new law on support for regional development, full compatibility with the EU legislation in this area will be achieved. The preparation of this law is regarded as a key to the future operation of regional policy in the Czech Republic. On its basis, specific transport measures will be gradually developed and subsequently implemented at the regional level.

3. PRESENT STATE OF TRANSPORT POLICY IN THE REGIONS AND REGIONAL TRANSPORT SERVICES

There is no comprehensive regional transport policy and, in essence, there could not be such a policy since the Ministry of Transport lacks partners at the regional level. Therefore the provision of regional transport services is an unco-ordinated process without a broader logic and the branch to suffer the most is rail transport, which is most heavily dependent on a co-ordinated approach. The result is an undesirable switch to buses and private cars.

In some regions, however, activities concerned with improving regional transport are beginning to be organised. Thus, the Ministry for Local Development and the Ministry of Transport are actively engaged in tackling the problems associated with the use of modernised multimodal corridors for interconnected transport in the regions. Some of these activities are mentioned in the following chapters.

3.1. Pardubice region

On the basis of the Constitution, from 1 January 2000 the Czech Republic will be divided into 14 *krajs* (counties), one of which will be the Pardubice *kraj*, composed of 4 *okresy* (districts). At the initiative of the Ministry for Local Development, a proposed regional development strategy for the Pardubice *kraj* has been drawn up. The aim of this document is to obtain a nation-wide overview of regional development needs, including transport requirements. Since there are as yet no functional bodies operating at *kraj* level, a so-called Regional Co-ordination Group was set up to carry out the work.

Part 1 of the proposal involves assessing the position of the region within the State, determining its strengths and weaknesses and the corresponding threats and opportunities. Then a strategic vision for the *kraj* up to horizon 2010 is sketched out and a set of objectives is proposed, together with the tactics for achieving them, including the provision of resources.

Part 2 of the proposal sets out the proposed strategic objectives, policies and activities.

For horizon 2010, when the Czech Republic hopes to achieve comparable economic and social parameters on a par with the average for the Member States of the European Union, a plan that covers six basic problem areas has been developed, together with a proposal for a set of objectives, policies and activities for achieving those objectives.

A strengths and weaknesses assessment (SWOT) will be carried out in these problem areas.

The following main objectives have been defined under the heading “Technical facilities and regional services”:

- Build a multimodal (i.e. road, rail, waterway and air transport) logistics centre in Pardubice for linking the various transport routes and transport technologies;
- Improve road transport conditions to facilitate access to the *kraj* and increase its traffic capacity;
- Make the river Elbe navigable up to Pardubice.

To achieve these objectives it is proposed that the strategic partners in the various fields should adopt the following tactics:

- The *kraj* will give priority to transport investment and to the modernisation and development of the transport infrastructure and logistical systems;
- Special support will be provided for improving the mobility and employability of the work force, in particular by promoting the development of high-grade transport service systems.

In the transport field the main development objectives, including the determination of priorities, have been established, together with the activities necessary to achieve them. The procedure will be apparent from the following tables.

The next part involves a “Survey of the conversion of the strategic objectives to the problem areas of the national strategy of the Czech Republic”. The individual problem areas are assessed by the SWOT analysis method. For example, in the section “Technical facilities and regional services” the following factors are included among the strengths of the region:

- The region is traversed by the Prague-Ceska Trebova-Brno/Prerov main rail corridor;
- There is an international airport and free zone at Pardubice;
- The Elbe is an international waterway;
- A road and rail border crossing into Poland.

The weaknesses of the region include, in particular:

- The *kraj* lacks a state motorway and express road system and the question of the link-up with motorway no. 11 has not yet been settled;
- Low traffic capacity (few Class I roads);
- Inadequate regional transport services;
- Unsatisfactory state of local roads.

This example shows how some regions are preparing for the new constitutional order and establishing their objectives, in particular, in the field of transport. We assume that the other regions will follow a similar course. Meanwhile, these initiatives are bypassing the activities of the Ministry of Transport despite the need to co-ordinate the requirements and plans of the regions with the plans being made at national level and to proceed with their progressive practical implementation.

ECONOMIC POTENTIAL – (E)		**OBJECTIVE 3**: CREATE EQUAL OPPORTUNITIES FOR DEVELOPMENT IN THE VARIOUS PARTS OF THE *KRAJ*	
Policy	**Activities**	**Priority**	**Indicators**
3.1. Improve the access of individual microregions to national transport routes	3.1.1 Provide links between the main roads of the *kraj* and the national motorway and express road system	1	• Measurement of accessibility in terms of time • Road capacity • Number of jobs in logistical services • Number of regional workplaces • Number of new jobs • Number of new programmes
	3.1.2 Expand capacity of Class I through roads and modernise the *kraj* road network by improving capacity and carrying out repairs and maintenance, including on local roads	2	
3.2. Draw up a regional transport plan	3.2.1 Develop a programme for providing funded transport services in rural areas with the following parameters: employment, education, health care, culture, etc.	1	
	3.2.2 Develop a programme for building and organising road transhipment facilities and logistical services for enterprise centres off main road and rail routes	2	

TECHNICAL FACILITIES AND REGIONAL SERVICES – (T)	CRITICAL FACTORS
OBJECTIVE 1: Build multimodal (i.e. road, rail, waterway and air transport) logistics centre in Pardubice for linking different transport routes and technologies	• Non-displacement of heavy traffic from town centres • Reduced share of combined transport in transport chain • Non-navigability of Elbe up to Pardubice • Non-completion of D 11 motorway, including feeder roads
OBJECTIVE 2: Improve road transport conditions to facilitate access to the *kraj* and increase its traffic capacity	• Critical condition of Classes II and III and local roads • Unimplemented plans for re-laying regional track hinders regional development • Reduced local authority revenues • Incoherent reorganisation of the highway economy • Poor urban environment • Low road capacity • Inaccessibility of the region in terms of time • Unreadiness of the region for development • High incidence of accidents on the existing roads • Problems with land acquisition • Protracted discussions about building projects with interested bodies and organisations (environmental movements, etc.).

TECHNICAL FACILITIES AND REGIONAL SERVICES – (T)		**OBJECTIVE 2**: IMPROVE ROAD TRANSPORT CONDITIONS TO FACILITATE ACCESS TO THE *KRAJ* AND INCREASE ITS TRAFFIC CAPACITY	
Policy	**Activities**	**Priority**	**Indicators**
2.1. Link up with built motorway and express road network	2.1.1 Increase pressure for bringing the D 11 motorway to the *kraj*. Create the legislative conditions for the implementation of public-interest projects	1	• Improved accessibility in terms of time • Measurement of frequency of arrival of vehicles in towns • Accident rate
	2.1.2 Accelerate the process of regional preparation for express road R 35 with a view to speeding up its construction in connection with the D 11	1	
2.2. Complete construction and assure capacity of Class I roads and improve the condition of Class II and III roads	2.2.1 Draw up a plan for the improvement of Class I roads	1	
	2.2.2 Develop methods of assessing (diagnosing) the state of the roads	2	
	2.2.3 Develop a model for the management of highway and local road maintenance with effective cost measurement	2	

TECHNICAL FACILITIES AND REGIONAL SERVICES – (T)		**OBJECTIVE 2**: IMPROVE ROAD TRANSPORT CONDITIONS TO FACILITATE ACCESS TO THE *KRAJ* AND INCREASE ITS TRAFFIC CAPACITY	
Policy	**Activities**	**Priority**	**Indicators**
	2.2.4 Prepare pilot project "Regional Development Plan" which, as an economic document, will also include the road maintenance problem. Assess whether within the development plan there has been a synergetic increase in the resources used for solving the problem	3	
2.3. Improve the road border crossing into Poland for freight traffic	2.3.1 Develop a proposal for a joint approach with Poland	2	
2.4. Improve the condition and operation of the railway lines.	2.4.1 Increase the pressure on the autonomous bodies for completion of the construction of rail transit corridors I and III with the corresponding parameters, including operational buildings	1	
	2.4.2 Modernise the Lichkov-Mezilesi rail border crossing, including electrification of the approach lines (Letohrad-Mezilesi section)	2	
	2.4.3 Actively involve the autonomous bodies in solving the problem of regional network operation	2	
2.5. Support the development of cycle tracks	2.5.1 Build regional and local cycle tracks and paths with connections to the supraregional and national systems	2	

3.2. The Sustrain Project

The Ministry of the Environment, together with the consultants SUDOP PRAHA a.s., has begun work on the long-term SUSTRAIN project. Work on this project has been carried out in Germany, the Czech Republic, Austria, the Slovak Republic and Hungary. The project is concerned with the effects of transport modernisation along the main corridors on regional development. The main aim is to assess the possibilities of regional transport in the areas adjacent to the European multimodal corridors passing through the Czech Republic and, moreover, the possibilities of improving transport services in the border regions between the individual countries participating in the project. Within the framework of this project an attempt will be made to judge the improvement in the competitiveness of the economy and the quality of life in the hinterlands of the principal rail and road corridors.

The construction of transport networks generally has an important multiplier effect on the economy of the adjacent areas (which may extend to the entire territory of a given state). The determination of this effect and the linkage with the prospective further development of communications in the Czech Republic will be part of the proposed project.

Phase I of the project will be structured as follows:

(a) Identification of the regions affected by the improvement in transport quality;
(b) Analysis of the present state of regional development;
(c) Cost and effect of building and modernising the transport networks;
(d) Regional development forecast;
(e) Analysis of the present state of development of the border regions/euro-regions and establishment of a common transport strategy.

(a) Identification of the regions affected by the improvement in transport quality

The improvement in the availability of transport made possible by network construction or modernisation will be felt throughout the regional economy. The main impact, however, will be concentrated in those regions directly adjacent to the improved system or those with sufficiently good links with that system.

In the first part of the project these regions will be defined. The criteria used for definition purposes will be the geographical conditions in the region and the configuration of the regional transport network. There are certain qualitative parameters of the existing or future transport links which can also have a positive effect on the development of the region. In the process of implementing the project these parameters can be more closely defined in terms of the population distribution and the economy or changes in the corresponding elasticities.

(b) Analysis of the present state of regional development

The regions identified in the first part have undergone previous development. This development had its limitations but also its merits. This part of the project is concerned with mapping the more significant components of regional development during the nineties. The development of the regions will be characterised with reference to:

- Population distribution;
- Demographic data;
- Regional economic data.

These data and statistics will start out from the historical situation and record the trends which began to develop in the region after 1989. The first two will map the level reached by the regions in accordance with the priorities of the citizen: technical infrastructure, health and education systems and the environment (employment will be charted under the third of the above-mentioned headings). These data will also include statistics on the standard of living of the inhabitants of the region.

As far as the regional economy is concerned, the basic structures in the individual regions which might be affected by future changes on the supply side of the transport market will mainly be determined. These are the industrial, agricultural and service structures, structures characterised in terms of the raw material base and the commodity composition of production, the position of key products on the domestic and international markets, etc. Employment and its development in recent years will be charted as an independent item.

All these data will be compiled in a form convenient for achieving the basic objective of the project.

(c) Cost and effect of building and modernising the transport networks

This part is concerned with transport infrastructure measures and their impact on the quality of the supply. It will provide the basis for inducing demand and the acceleration of regional development.

The first phase of this part of the project will deal with the outlays planned for building or modernising communications and inducing the appropriate further regional development. These communications or the measures necessary to improve their quality, as the case may be, will be identified in this phase.

The second phase will involve evaluating the success of these outlays in improving the supply of services, reducing journey times, changing traffic flows on certain routes, improving the travel culture, etc.

Once the third part of the project has been processed, an assessment of the impact of the modified regional demand for transport services on the further development of the transport networks will be available.

(d) Regional development forecast

The future development of the regions will be forecast in demographic and economic terms. Two basic scenarios will be considered:

- Without development of the transport network (benchmark);
- With development and modernisation of the transport network.

It is universally accepted that, for economies in transition, making economic forecasts is unusually difficult. On the basis of the thorough analysis carried out in the previous parts of the project we will assess the probable development of the regions affected. This process will also include the effect of the Czech Republic joining the EU.

In view of the uncertainties involved, the long-range data will be supplemented by alternative development possibilities, such as the likelihood of possible individual scenarios.

(e) Analysis of the present state of development of the border regions/euro-regions and establishment of a common transport strategy

The analysis will be structured in the same way as for the inland regions.

In the next part, the development of the transport networks in the region and their financing are analysed on the basis of the following scheme:

State of the regional economy	Regional infrastructure	Human resources
Structure of the economy	Housing	Population
Raw material base of industry	Education	Population distribution
Customer structure of regional enterprises	Health services	Employment
Development of competitiveness	Recreation	Regional incomes
Commodity composition	Communications	Car ownership

Once the data have been processed, it will be possible to determine the development of demand for transport services in the region. On the basis of this demand it will then be possible to assess:

- The competitiveness and potential of the individual modes of transport in the region;
- The maintenance and development of the road network in the region;
- The possibilities for the development, continued operation or cutting back of rail services in the region;
- The potential for the integration of transport in the region;
- The contribution of transport to the solution of the unemployment problem;
- The requirements for vehicle renewal.

Answers will be given to all these questions, including details of the financial flows. This will give a comprehensive view of the financial requirements for solving the transport problems of the particular region. At the same time, proposals will be made with regard to the most suitable sources of financing.

4. CONCLUSION

There has recently been a trend towards increasing differentiation between the individual regions and transport is one of the factors which could help to even out their levels of economic development. It should be noted that in the area of regional transport the desired development has not yet been achieved. This is due, in particular, to the fact that the process of administrative reform is not yet complete and there is still no properly approved and, more especially, enforced regional policy. This situation is also reflected in the field of regional transport where as a result of the non-existence of autonomous regional authorities there is also no organisation for solving this question. It can be said that in the field of transport this situation is having particularly unfavourable consequences, since the Ministry of Transport has no partners at the corresponding level and the gap is being filled by the districts or municipalities, as the case may be.

In the Czech Republic the problem of unemployment is starting to become more acute. Meanwhile, it is only possible to note that the worsening situation with respect to transport services in the regions is also contributing significantly to the rising unemployment rate. The mobility of labour is limited, especially in the rural areas with a low population density where, moreover, the unemployment rate is also generally high. The problem of poor regional and interregional labour mobility is one which will have to be solved in the context of the preparations for entering the EU.

The peripheral regions lie mostly on the borders with neighbouring states. It will first be necessary to solve the problem of linking them with the centre of both the country and the region. The accessibility of some border areas will be much improved by the implementation of the road and rail network development plans. As far as the rest are concerned, the problem of their accessibility remains to be solved. Obviously, the economic development of these regions is bound up with the question of transport. As far as the economic structure of the regions and their location relative to the main transport arteries are concerned, it will be necessary to prepare proposals for appropriate transport measures to improve both the accessibility of the region and the transport services within it. We believe that it is necessary to include these questions in a "National Regional Accessibility Programme" which would comprehensively solve the problems associated with the transport network development strategy and the requirements for linkages with the peripheral areas and would eliminate any disparities. Alongside this national programme it will be necessary to implement projects at the regional level involving individual links, junctions and terminals for each mode of transport and, moreover, determine the best way of developing transport in the regions taking into account the transport structure in the neighbouring regions.

We believe that in preparing these projects at the regional level it will be necessary to develop a research programme based on an evaluation of the following areas:

Overall infrastructure development	**Transport infrastructure development**
Objective: To improve the competitiveness of the economy and the quality of life in the region	***Objective: Proposal for the development of transport networks and transport services in the region***
Topic	*Topic*
Identification of regions	Regional identification
Analysis of present state of the regional economy	Analysis of initial state of transport infrastructure for the individual modes in order to prepare an operational transport programme
Regional economic forecast	Forecast and analysis of demand for passenger and goods transport in the region
Demographic projection	Supplementary forecast and analysis of demand for passenger transport in the region
Development of regional GDP	Potential transport supply scenarios, return on investment in an improved transport supply
Cost of raising transport standards in the regions (domestic, international, by modes of transport)	Investment cost development scenarios
Assessment of changes in the territorial and economic structures of the regions since 1989	Analysis of related changes in the demand for transport
Analysis and estimation of the future potential for regional development in terms of EU entry	Regional effects of the improvement in transport parameters – basis for drawing on EU structural funds for regional development
Classification of regional commodities and their dependence on transport	Regional freight transport prospects by commodity group - basis for investment in the goods vehicle fleet, planning the volume and cost of road and rail track maintenance
Analysis of the anticipated development of the regional economy and its impact on the environment	Determination of transport externalities for the purpose of calculating corresponding user charges. Harmonization of conditions of entry to the transport market.

The problem of the accessibility of the peripheral regions is currently being exacerbated by the delay in settling the issues connected with the process of administrative reform, since at present there are no appropriate statutory bodies at the regional level capable of dealing with these questions. However, even when these bodies have been established, it will be necessary to settle a number of issues connected with the role of the State and the role of the regions in determining the strategy for transport network integration at the national and regional levels, investment priorities and the role of the financial institutions and private capital in the implementation of transport projects.

Despite all the obstacles thrown up by a faulty legislative framework, the first signs of improvement are appearing. Preparations are being made for the adoption of the regional development support bill and activities relating to regional transport issues are beginning to be organised in the regions themselves (see the examples mentioned in Chapter 3 above).

PART C. PROSPECTS

The major decisive elements for the future are the enabling of a high-quality connection between the Czech Republic and the European transport network, fulfilment of terms for entrance into the EU and harmonization of construction with an expected growth of traffic intensity in the decisive directions while at the same time reducing damage to the environment.

The transport sphere in the Czech Republic is strongly affected by recent adverse economic developments, resulting in a lack of available funds for financing transport infrastructure. Overcoming the current stage of economic recession represents the critical point towards implementation of transport policy both at the national and regional level.

Without a doubt, the development of the transport situation in the next century will progress in line with the economic performance of the country. Therefore, the volume of transit demand will rise or fall alongside rises or falls in GDP. From the economic prognoses of future development of the national economy are formed prognoses of the transit market and, as result of this, the further development of the transport infrastructure that will be necessary to build up to the required level so as to meet demand, not only in terms of quantity, but also of quality.

Significant expectations are connected with the Czech Republic's prospective membership of the European Union. In order to overcome the current recession, it is necessary to obtain the required financial means or relevant loans. The lack of financial means, which is proving to be very serious, can over time postpone the realisation of priority goals in the development of the transport network to an unacceptably high degree. For this reason is necessary to continue intensively with the harmonization of the Czech Republic's laws on transport with the transport laws of the EU, the resolving of questions linked to the strategy for developing the transport network and the needs linked to outlying regions, and remove possible disproportions. The range of problems linked to completing a concept for regional transport must be included in the "National Programme for the Accessibility of Regions".

A necessary condition for achieving progress in completing a transport concept on all levels is the working out of a single methodology for evaluating these aims both nationally and regionally.

Only in the event that projects and programmes are well prepared and have a joint interest with the European Union can supplementary resources be counted on from the EU structuring funds.

We are convinced that the membership of the Czech Republic in European organisations will be a core element for realising the basic aims of transport strategy for the next century. The principal theses of this strategy are defined as follows:

- To remove the most striking ecological loading brought about by traffic:

  - by removing local congestion, in particular by constructing bypasses of communities and increasing the capacity of the road network on most loaded stretches;
  - by creating economic conditions advantageous for keeping long range and heavy transport on the railway (preservation of existing level of road tax; modest increase in the fuel consumption tax; increase of motorway vignette prices with a progressive increase for heavy lorries; introduction of toll motorways especially on peripheral parts.

- To support public passenger transport as a permanent alternative to individual transport and as a service having not negligible social, ecological and also transport importance.

We expect that over the course of the upcoming century new, high-speed railway lines will be constructed in the Czech Republic, and possibly other systems for high-speed public transport based on magnetic levitation technology as part of the development of a European network.

BIBLIOGRAPHY

Ministry of Transport and Communications of the Czech Republic (1999), *Transport Policy*.

Regional Co-ordination Unit Pardubice (1999), *Regional Development Strategy*.

Ministry of Regional Development of the Czech Republic (1998), *Regional and Structural Analysis of the Czech Republic.*

Ministry of Regional Development of the Czech Republic (1998), *Principles of Regional Politics.*

SUDOP PRAHA a.s. (1999), *Principles of the Regional Transport Development Strategy*.

SUMMARY OF DISCUSSIONS

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INTRODUCTION

The role of the general rapporteur of a conference is to summarise the papers and discussions that took place. It would be possible to provide a literal and chronological account of the Conference, but this would be somewhat tedious for the reader. It would also be possible to go to the other extreme and provide a synopsis of the conference themes. This, however, would not provide information on specific interventions. In the light of the discussions and papers of the Conference, the best solution is that of a hybrid between a simple blow-by-blow account and an abstract summary. In avoiding a verbatim account, the author apologises to all the speakers who are not mentioned by name, but hopes this sacrifice will make for better overall reading. Nonetheless, all speakers and panel members' names are mentioned at the beginning of the report of each session. Furthermore, by eschewing a verbatim account, there is the risk of having missed out on some important statements made by the panel speakers or on interventions from the floor. However, it is hoped that all the main and relevant points have been touched upon and given prominence, either in the account of the debate or in the commentary that is provided.

The Conference was split up into four sessions comprising papers and discussion. Each session took up an entire morning or afternoon. Typically, two or three blocks of papers were presented by the authors, which were followed by interventions made by the official discussants. Then the debate was opened to the floor, with numerous conference attendees making particular comments. Each session consisted of two or more such rounds of paper presentation and discussion. The author has given an arbitrary title for each round to aid the legibility of the report. These titles have less to do with the written content of the papers that were presented and more to do with the issues emanating from the oral presentations and the subsequent debate.

A separate account is given of each session as it developed a particular theme. Within the report of each session there is a short summary of the conference papers presented and the debate that ensued. The account of the papers' presentations concentrates on what each presenter said on the conference floor and not on the contents of the papers, which can be read separately in this bound volume. It should also be borne in mind that the debate was often fragmented and consisted both of points made by the official discussants as well as interventions from the floor. The presenters of the papers had the opportunity to reply to the comments made, but this did not necessarily mean that a cohesive debate took place.

Following the report of each session, there is a subjective commentary from the general rapporteur on the themes that emerged.

Topic 1: "Scenarios, Forecasts and Data Collection: Experience and Prospects"

Chairman:	Eddy Van de Voorde, UFSIA-RUCA and ITMMA, Antwerp (Belgium)
Rapporteurs:	Christian Reynaud, INRETS (France) Dag Bjørnland, Norwegian School of Management, Sandvika (Norway) George Giannopoulos, Aristotle University of Thessaloniki (Greece) Ivan Helcz, Ministry of Transport, Communication and Water Management (Hungary) Werner Brög, Socialdata, Munich (Germany) Toon van der Hoorn, Transport Research Center, Rotterdam (The Netherlands)
Panel Members:	David Banister, University College, London (United Kingdom) Oleg Agapov, Ministry of Transport (Russia)

Part 1: Freight

Freight was the opening theme of the papers presented at the Conference.

The first speaker, George Giannopoulos, of the Aristotle University of Thessaloniki, dealt with the issue of freight forecasting, concluding that the future of freight transport will continue to be road based. During the presentation of his paper, he mentioned that freight follows "cycles of development" and "jumps". However, freight is also affected by particular fashions and transport policies. These are different for demand and supply:

– On the demand side, there are:
  - new production systems, such as "just-in-time", and
  - changes in policies, such as the growth in the capitalistic market forces economic paradigm.

– On the supply side, there are:
  - new technological possibilities, such as the convergence of computing and the Internet in transport telematics, and
  - the construction of new infrastructure, such as the Egnatia Road in northern Greece.

George Giannopoulos mentioned that there are three distinct European transport policies that are being pursued: (i) that of growth; (ii) equity; and (iii) the environment.

George Giannopoulos' view was that road-based freight will continue to be the dominant mode of transport in Europe for at least the next ten years. However, in the decade that will follow, it may be the case that we will see some small growth in Europe of freight transported by rail and by short sea shipping.

According to George Giannopoulos, in the future we will see far more telematics being applied in the transportation of goods in Europe. Furthermore, there will be an increase in multimodal traffic in interurban transportation. Whilst in the urban sphere, we will see the linking of goods movements to sophisticated traffic management systems. In the next ten years, with the growth of road-based freight movements, we will see in parallel road freight telematics taking off. This will have the Internet as its base platform. Goods will be ordered, tracked and paid through the Internet. Logistics will be integrated in the new telematics applications; and end-user satisfaction will be a paramount objective.

The issue of data on which reliable forecasts can be based was focused upon by Dag Bjørnland of the Norwegian School of Management.

Dag Bjørnland concentrated his presentation on only one aspect of his paper, that of creating a country-by-country origin-destination travel matrix for Europe. Dag Bjørnland stressed that there is really very little data to construct such a matrix. To make his matrix, he has had to use already existing data. Up until now, there is no country-by-country origin-destination travel matrix for Europe.

The discussion that followed was opened up by the official discussant, David Banister of University College, London, with three items to act as food for thought:

- There is a conflict between quality and quantity in transportation. Do we transport more? Or do we transport better? The issue of quality versus quantity is also present in proposals regarding improving the management of transport operations;
- We are moving from the "industrial economy" to the "knowledge economy". Such a shift in productive activity has the consequence of diminishing the demand for traffic of heavy goods;
- Society is shifting from a production-line processing to a consumer-based demand; this is typified in the "just-in-time" logistics process for production and transportation of consumer goods.

George Giannopoulos agreed with David Banister on the changing nature of the economy's production process but disagreed with him on the corollary of the diminution of future freight volumes. George Giannopoulos believes instead that there will be growth in demand for freight transport. The other presenter of the afternoon's papers, Dag Bjørnland, supported George Giannopoulos' view. He also believed that in the near future we will see a growth in freight transport.

George Giannopoulos picked up on the first theme presented as "food for thought" by David Banister, that of quality versus quantity. He iterated a common held view that in southern and south-eastern Europe quality is not an issue. There is a large task ahead, that of "catching up" with western Europe through the construction of major transport projects. First, the infrastructure needs to be in place before the issue of quality can be addressed. The only other important issue which needs to be dealt with urgently in the southern and south-eastern European context, is the updating and modernising of the legislative framework.

The second official discussant of the afternoon session was Oleg Agapov of the Russian Ministry of Transport, who gave a view of Russian achievements in the field of freight transport. His main point was that satellite technology will be used in the future to aid international road freight transport. This will be focused on Trans-European Road Corridors II and IX (and will be especially significant on the Berlin-Moscow axis on Corridor II).

The discussion was then opened to the floor. The questions raised were varied and very specific, touching on different aspects of freight transport. Typical examples of these were interventions made by Jack Brown and Roger Vickerman. Jack Brown made the point (that he repeated several times throughout the Conference) that ro-ro is better than lo-lo; and that he had developed a new, efficient system to prove it. Roger Vickerman expressed his concern that, whilst border regions currently serve as transhipment areas and create an economic vitality, with the dissolving of country borders these regions will be turned into economic wastelands.

The debate that followed centred on two themes: the differences between eastern and western European countries and views on the future growth potential of multimodal transport. George Giannopoulos concluded the debate by expressing his view on both themes. First, he expressed his belief that there was a potential for growth in multimodal transportation. Second, regarding the differences between eastern and western European countries as related to transportation, he said that, in the past, eastern European countries relied on their railway network as the basis for their national transport system, which, however, is now inadequate for an emerging market forces-based economic system. The major difficulties these countries face is making that transition.

Part 2: Forecasts and Institutional Transport Policies

The next two papers presented on the first day concentrated on the issues of forecasting and national transport policies. They were by Christian Reynaud of INRETS and Ivan Helcz of the Hungarian Ministry of Transport, Communications and Water Management.

Christian Reynaud followed on from where Dag Bjørnland had left off, that is, on the question of good quality data. According to Christian Reynaud, the issue of good quality data is a general problem in Europe. Its absence should not depress us too much, however, for there are very sophisticated models to overcome the absence of observed data. However, he cautioned against over-reliance on such models (as developed in Germany and the Netherlands). Nonetheless, these models are still too reductive. They are often inadequate for the task and, according to Christian Reynaud, must not be "deified".

In agreement with Dag Bjørnland, Christian Reynaud also emphasized the need for global models from which scenarios can be built. According to him, the only difficult element to forecast is the level of migration. Furthermore, qualitative methods must also not be excluded for they have an important role to play.

Ivan Helcz's presentation, following that of Christian Reynaud, concentrated on the case of Hungary. The main thing that characterises Hungary's economic position is its recent transition from a planned economy to a market-oriented approach. Hungary's overall national economic and political aspiration is to join the European Union.

In Hungary, both passenger and freight transport fell in the 1990s with the decline in the economy. This fall is expected to be reversed in the current decade. The country's priorities now lie in building new infrastructure, especially motorways and bypasses. There is also a need to upgrade other infrastructure, such as the electrification of the railways and the dredging of the Danube north of Budapest to make it more navigable, as it is too shallow in parts. There is also the need to further develop port facilities on this river.

In urban areas, the priorities for the Hungarian Government are parking control and necessary improvements to public transport.

A problem faced by Hungary is that it is crossed by Trans-European Corridors IV, V and VII. These corridors are creating heavy transit flows. The aim of the Government is to reduce the amount of transit crossing the country.

Following the presentation of the two papers, David Banister picked a theme, that of growth. His question was "how could we encourage economic growth but discourage travel and transport?" It was his view that technology could play a role in achieving this goal but it could not be the solution. David Banister was direct in saying that western European countries should both set traffic and pollution reduction targets and meet them.

Christian Reynaud, in replying to David Banister, said that he made no prediction of the future; only that one could investigate better current trends, which are a pointer to the future.

The discussion that ensued was characterised by the twin themes of forecasts and the environment. Questions were raised as to what extent forecasts are possible if they do not accurately forecast future transport policies; and to what extent current trends of increasing transportation are viable, as they are a major cause of the deterioration of the environment.

The view of the speakers to these questions was that environmentalism is a fashion that will pass; and that it is better to abstain from forecasting future policies – so that transport models should assume that there will be no significant changes in policy that affect transportation.

Commentary

It is a prerogative of the rapporteur not only to synthesise what was said and debated in the conference hall but also to interpret it and give it some focus – for often the discussions are somewhat disjointed, with papers and speakers having very particular or highly specific issues they wish to raise. Naturally, this introduces the subjective interpretation of the rapporteur into an otherwise pedestrian and purely factual narrative of events. The author apologises to those who will have made a very different interpretation of the sessions, but feels it a duty to provide readers with some pointers of what was being addressed and pointers as to where the debate was heading, while, nonetheless, aiming to be as objective about the discussions as possible.

A major conflict emerged during this session. On the one hand, there were those who make forecasts using the most scientific methods available and, on the other hand, the social scientists who wish to see a particular environmentally friendly future emerge and who took a negative attitude to the predictions of the future being presented.

In looking at the session's discussions as a whole, three different but interrelated issues coloured the debate. The main theme that links these issues is whether we, as transport professionals, are passive spectators of change or direct participants who can and should affect the future development of our spatial and transport structure. The three issues were:

(i) Do we want greater quantity or quality in transportation?

This issue was initially raised by David Banister and became a key point of discussion. There is a widespread view in the southern and eastern European countries that they lack basic transport infrastructure, especially roads, and that it is imperative that they close the perceived gap between them and the countries of northern Europe. The quality of the infrastructure is not an important issue, neither is the upgrading of the quality of existing transport modes. European Union funds are sought to build new, large projects - mostly, but not exclusively, roads.

These views completely overlook the disadvantages caused by the poor quality of existing infrastructure, its inadequate maintenance, the low level of transport and traffic management and inadequate information systems. This low level of quality not only has a negative impact on the quality of life of the residents of these regions but also a high economic cost, in terms of low productivity and the high cost and unreliability of the transport system.

(ii) Are transport forecasts believable?

There were two camps at the Conference regarding the nature of forecasts. One side saw forecasts, despite all their weaknesses, as being the best tool we have in transport planning. The other side would have liked to see forecasts taking into account changing future policies, which currently they do not. For instance, should models that predict the level of demand of future road transport incorporate a higher cost for petrol, with the possible introduction in the future of a carbon tax? George Giannopoulos predicts a high growth in road-based freight transport in Europe; but this is based on no change in transport policies.

However, will not increasing environmental concern have the effect of shifting transport policies in favour of less polluting modes, i.e. away from road to rail and shipping? Should not forecasts, therefore, reflect such a change in policy? Yet the transport models in use explicitly forecast a decrease in rail freight. Investment policies based on these models clearly would not favour the railways.

A view mentioned by some conference participants, was that one should ignore such arguments, for environmentalism is a fickle fashion and will soon diminish or disappear.

The concern for the environment will most likely increase rather than diminish as people in Europe become more and more concerned about the quality of their life and their health. Increasingly, we are seeing restrictions imposed on unfettered motoring and these are likely to increase. Transport models which fail to recognise this run the risk of forecasting road traffic that will not materialise and thus be the cause of promoting a costly and unwanted oversupply of roads.

(iii) Will there be a growth in transport movements?

Horns were locked at the Conference between those, such as George Giannopoulos, who predict an increase in transport movements (especially road-based movements) and those, such as David Banister, who predict the opposite.

The view of David Banister is that there is a wholesale change in production and the economy in Europe. There is a shift from industrial production to a services economy that increasingly uses information technology and thus creates decreasing volumes of heavy goods traffic. Modern logistics and the application of new technologies should also move us in the same direction.

This view was quite different from those, who, through an analysis of current trends and forecasts, see the exact opposite happening. For them, modern logistics will reduce costs and hence increase the amount carried on Europe's roads.

Both views have their merits. What, however, both perhaps do not address is that it is up to us to shape our future. Through current policies we can determine whether there will be an increase or diminution of transport movements. Perhaps we should be more concerned with transport policy rather than transport forecasting.

Topic 2: "Transforming Economic and Institutional Structures and Technological Trends: Experience and Prospects"

Chairman: (France)	Alain Bonnafous, Laboratoire d'Economie du Transport, Lyons
Rapporteurs:	Wolfgang Schulz, University of Cologne (Germany) Henk van Zuylen, Transport Research Centre (The Netherlands) Jan Burnewicz, University of Gdansk (Poland) Michel Beuthe, Groupe Transport et Mobilité (Belgium) Nils Bruzelius, Consultant, Lund (Sweden)
Panel Members:	Chantal Duchène, Direction Régionale de l'Equipement d'Ile-de-France (France) Sergios Lampropoulos, Egnatia Odos (Greece)

Part 1: Institutions and Finance of Transport

The focus of this session was institutional organisation as it relates to European transport policy. It was recognised at the outset that there is no ideal organisation to discuss all these transport issues in Europe. The European Conference of Ministers of Transport is a good starting point.

The first speaker, Jan Burnewicz of the University of Gdansk, opened the morning session with the remark that a European transport policy is not enough to solve eastern Europe's transport problems. The difference between the European Union countries and those of eastern Europe are very big, both in terms of levels of Gross Domestic Product per capita as well as in rate of growth. He introduced the concept of transport intensity (tonne-kilometre per Gross Domestic Product) and mentioned that whilst it is falling in Poland it remains relatively constant in the European Union countries.

Jan Burnewicz reported that in eastern Europe, and in Poland specifically, it is the infrastructure that is highly problematic. The railways are degraded with substantial underinvestement in their maintenance and there is a lack of modernisation. According to Jan Burnewicz, there is little that can be proposed for immediate improvement. The situation on the roads is also problematic for the same reasons.

Chantal Duchène of the Direction Régionale de l'Equipement d'Ile-de-France, one of the discussants of the session, said that what we should concentrate on was the question, "what are the factors that would improve transportation in eastern Europe?"

The transport problems of eastern Europe are not only economic but also political. It was mentioned from the conference floor that the reforms that were being carried out in Yugoslavia were stopped by NATO bombardment which targeted transport infrastructure. For instance, all the bridges on pan-European corridor X were bombarded and destroyed.

Nils Bruzelius presented the next paper on good practice for the construction and management of roads in a private-public partnership. The first issue he raised was that of good governance of such schemes. To have good governance, they need to have an appointed road manager and be self-financing. He mentioned that there are good examples of road management with road managers outside Europe, such as New Zealand and Namibia. Regarding the self-financing of roads, there are numerous good examples such as Design Build Finance and Operate schemes in the United Kingdom and similar schemes in the State of Utah in the United States.

The point of public-private partnerships is that the risk has to be transferred to the private sector. Thus, on procurement, he stressed, it is imperative that there are penalties for non-compliance. However, in transferring risks from the public sector to the private sector, the risks that are transferred must only be risks that the private sector can manage and not risks related to changes in government policy.

Furthermore, to aid innovation on the part of the contractor, contracts of public-private ventures must be in excess of ten years and must be related to output.

For such projects, payment to the contractor can be either through shadow tolls (as adopted in the United Kingdom) or be based on a fixed fee. The author advocates the fixed fee method as more efficient.

In discussing Nils Bruzelius' paper, Sergios Lampropoulos of Egnatia Odos, asked if the measures advocated by Nils Bruzeliu, were intended for short-distance transport or even for longer-distance transport. He questioned whether international institutions are sufficiently geared up to undertake such projects for long-distance transport. He further questioned the role that banks played within this system for providing the finance for such schemes.

In the discussion that ensued the issue was raised as to what is the appropriate spatial level for the undertaking of such schemes. For instance, Jan Burnewicz stated that short-distance freight should be seen at a national level, not a European one. Nils Bruzelius agreed that at present it is best to focus at the national level for such projects, as it is as yet too ambitious to aim at the international level.

A further question that arose was whether Nils Bruzelius' thesis on roads could not also be applied to the railways or even light rail schemes. Alain Bonnafous, of the Laboratoire d'Economie des Transports in Lyons, suggested that shadow tolling was well suited to private-public railway projects. Nils Bruzelius' view was that certainly this concept could be extended to other transport sectors such as the railways; but regarding shadow tolls, he considered they were not good for roads and also not good for the railways. Nils Bruzelius suggested that where schemes were not commercially viable but were nonetheless socially necessary, there could be an explicit public sector obligation. Such a public sector obligation could be applied to light rail projects or even rural roads. What an explicit public sector obligation does is make policies specific, clear and transparent; which does not happen when there are blanket subsidies.

Chantal Duchène raised the issue of the entanglement of private and public interests. She gave the example of the motorway network in the Ile-de-France Region (the Paris conurbation), where there are two private Design, Build, Finance and Operate sections in an otherwise entirely public sector motorway network. In such cases, the role of the regulator is of paramount importance. However, the job of the regulator is extremely difficult as the private and public interests are greatly intertwined.

The importance of taking on board new approaches to finance and regulation was raised by Andreas Mylonakis, who pointed out that recently the Polish Railways have cut a quarter of all passenger services. He queried whether all other solutions had been investigated, including that of injecting private finance, before taking such drastic action.

Part 2: Transport Externalities

The next paper was on the theme of how to decouple transport growth from economic growth. In environmental terms it would be beneficial to have increased economic growth without increasing transportation, and thus all the externalities that that involves, such as carbon dioxide emissions. Wolfgang Schulz of the University of Cologne, who presented the paper, warned that we have to be aware that there are two quite different approaches to traffic reduction: avoidance and decoupling. Transport avoidance has the effect of reducing economic growth, whilst decoupling is independent of it.

The decoupling concept is not only achievable in the transport sector but can also be applied to industry and other sectors. There are many ways of achieving decoupling, through legal, social and other methods. Wolfgang Schulz's paper, concentrating on the transport sector, identifies two main areas of decoupling: rationalisation, which increases productivity; and new technology, which improves economic efficiency. Transport intensity was the gauge by which decoupling could be measured. However, he advised looking not only at an aggregate level, but also at lower levels. He cited the case of the automotive industry in Germany which has seen a fall in transport intensity regarding its activities, whilst overall it has been increasing.

The validity of the concept of transport intensity was questioned by Roger Vickerman. His main concern was that by using the measure of transport intensity, it leads us to believe in a single indicator, which could be dangerous and misleading. In the United Kingdom, the Standing Advisory Committee on Traffic Road Assessment (SACTRA), of which Roger Vickerman is a member, concluded that the concept of transport intensity had significant policy limitations because of differing weights of different goods and differing spatial structures. The paper presented by Wolfgang Schulz shows how different industries go their own different ways. Thus, can transport intensity be used at an overall level? Roger Vickerman's answer to that question was that, indeed, it was quite unusable. Alain Bonnafous then added that, perhaps instead of tonne/kilometres per Gross Domestic Product, we could just retain the notion of tonne-kilometres and vehicle- or train-kilometres.

Further criticism came from the floor on the concept of transport intensity. The point was made that if one adopted decoupling as presented by Wolfgang Schulz, it would be impossible to influence transport demand. Instead, there are other instruments that could be used to achieve decoupling, such as targeted taxation.

Wolfgang Schulz's reply was that the concept of transport intensity could and should be used. The point he was making by looking at different industrial sectors, was that a desirable transport policy can be achieved not only through the transport sector, but also through industry. Regarding the comments on taxation, Wolfgang Schulz's view was that taxes are always bad in an economic sense.

Yet, if taxation is to be used as a policy instrument, it should not only be applied to the end-user on the road, but should also be applied to industries that have a significant effect on transportation. However, he stressed that we should not only look at instruments in the economic sphere but in other areas as well.

The paper presented by Wolfgang Schulz was followed by a paper that concentrated uniquely on freight transport. Michel Beuthe of the Groupe Transport et Mobilité, in presenting the paper, brought again to the Conference the issue raised by George Giannopoulos the day before, that of estimating the growth of transport freight. However, he concentrated on the negative externalities of freight transport. He arrived at the conclusion that the negative externalities of road haulage were five times greater than for internal water transport, and significantly higher than for rail-based transport. He thus advocated the use of multimodal freight transport.

Chantal Duchène intervened to say that, although many believe in the beneficial effects of multimodal transport, the problem lay in the localisation of multimodal platforms. These, according to Chantal Duchène, inevitably have to be located in or in the vicinity of urban areas. The application of intermodality was also questioned by Dimitrios Tsamboulas. He claimed that policies of intermodal transport do not produce good results when modelled. He left the slight possibility that it may be possible that intermodality could be beneficially applied to short-sea-shipping in linking with other modes.

In the discussion that followed, numerous technical and particular issues were raised regarding transport externalities. These varied between the accurate measurement of accidents on water-based and rail-based transport (that are needed for a good comparative measurement of externalities of different modes), to whether lo-lo or ro-ro were better suited to long-distance or short-distance transport.

The next paper touched numerous times upon the issues raised by the previous one, but focused on the role of technology in dealing with transport's noxious externalities. Henk van Zuylen of the Transport Research Centre in The Netherlands, was positive on the potential of using technology to reduce emissions. However, he claimed it would require international co-operation for it to be effective. He predicted that, nonetheless, the car will still be responsible for 50% to 70% of all transport emissions in the next twenty years.

Next, he touched upon the role of government in curbing emissions. The State could play many roles, such as staying neutral, merely monitoring the situation, or actively interfering. The approaches taken by governments in different countries vary and it is right that they do. According to Henk van Zuylen, what works well in northern Europe may not work in southern Europe. Whatever the approach, the government should get together with all stakeholders and create long-term plans; such long-term plans are necessary for private companies, as they need a stable and predictable environment in which to make long-term decisions.

The debate that followed saw numerous interventions made regarding various aspects of technology and the right measures to quantify transportation. On the technological side, questions were raised as to whether electronic communication suppresses travel (Chantal Duchène), and on the policy side, the point was made that road transport has not been so successful in embracing new technology (Ioannis Frantzeskakis).

Regarding what is the most useful measure to quantify transportation (instead of transport intensity), different views were expounded. A view advocated by more than one speaker was that, regarding freight, value-kilometres were a better measure than tonne-kilometres.

Commentary

A problem with this session was that it lacked a precise focus and touched upon numerous, albeit important, transport issues but dealt with them rather lightly.

Of the issues that were raised, the ones that seemed to have the greatest urgency were those that regarded finance, decoupling transport from economic growth and the problem of dealing with transport externalities. On all three issues, which in themselves cover a vast area of transport research and policy, only particular aspects were focused upon:

(i) Bringing in finance for transport projects

Bringing in private finance to infrastructure projects is generally seen as, if not a necessity, greatly desirable. The session's debate focused on how this should be organised. The view was that organising private financing for schemes that crossed more than one country was fraught with too many difficulties and that privately financed schemes should be based at the national level.

Yet the feeling that surfaced from the conference floor was that it was possible that private finance could be the solution to the state's inability to shore up and pay for new infrastructure, with a notable reference to eastern Europe. This was seen in particular as a possibility for saving the railway systems.

A problem that has yet to be overcome is that the private sector would need the railways to be profitable before it would invest in them. Private finance for new infrastructure cannot be the panacea to the problems of an inefficient transport sector whose woes are varied and often deeply ingrained in the national political and social culture.

(ii) Decoupling transport from economic growth

It is seen as extremely beneficial to be able to have increased economic growth with a stationary or falling level of transport movements. The benefits would be that there would be no increase in external costs such as accidents or greenhouse gases.

There was no disagreement on the principle but there were plenty of voices at the Conference that questioned the possibility of achieving this and even more that queried the indices to be used to measure the level of transport movements.

What would render the debate more interesting and more topical would have been specific proposals for decoupling the economy from transport, or even policies to reduce transport itself.

(iii) Reducing transport externalities

At the Conference there was a predominant approach that the diminution of negative externalities are to be dealt with through the application of new technologies. Nonetheless, there were no precise measures proposed that would seriously have the effect of substantially reducing pollution, accidents, noise or other disbenefits. The debate was similar in nature with the previous issue of decoupling: wishful thinking but lack of policies that can be implemented.

(iv) The role of technology

A leitmotif of the second session was the important role of technology. During the Symposium, there was a call for the circulating of knowledge and technology, notably to promote decoupling but equally the development of the more deprived zones. Some of the speakers saw technology as the panacea to all transport problems. Technology was seen on the one hand as a method for reducing noxious externalities and, on the other, as accompanying economic growth.

Although technological change has obvious effects on transport, the reliance on this change, which has yet to materialise, to achieve future objectives can act as a block in taking real measures in the present. The reliance on the future development of environmentally friendly technology at best may be wishful thinking and at worst a ploy to continue pursuing environmentally unsustainable policies.

Topic 3: "Peripherality and pan-European integration: Experience and Prospects"

Chairman:	Werner Rothengatter, University of Karlsruhe (Germany)
Rapporteurs:	Athanassios Argyris, Aristotle University of Thessaloniki (Greece) Stella Kostopoulou, Aristotle University of Thessaloniki (Greece) Frantisek Hep, Sudop Praha (Czech Republic) Max Herry, Consultant, Vienna (Austria) Pieter Hilferink, Transport Research and Training (Holland) W Suchorzewski, Warsaw University of Technology (Poland)
Panel Members:	Pablo Gasos Casao, Ministry of Development (Spain) Rita Piirainen, Ministry of Transport and Communications (Finland) Laszlo Ruppert, Institute for Transport Science (Hungary)

Part 1: Combating Peripherality in the European Union

The afternoon session started with the definition of the concept of peripherality in Europe. A dual definition was presented: the first being the periphery as distance from the political centre; and the second the difference in quality of life from the core.

Accessibility to the core was the key of the paper presented by Athanassios Argyris and Stella Kostopoulou of the Aristotle University of Thessaloniki. A key question in their paper was "how do networks work in the balance of forces core-periphery: in favour of centralisation or decentralisation?" According to Athanassios Argyris and Stella Kostopoulou, overall, the current Trans European Networks, are of benefit to the centre of Europe by encouraging centralisation. However, whilst they argue that rail projects are aiding the centre, the same is not true for road projects. Thus European structural funds which are earmarked for the development of the periphery, when spent on improving the railways have the opposite effect for which they are designed.

The centre/periphery debate should not be seen just at the European scale - it also operates at the national scale. For example, this is the case with Greece, where the Athens conurbation constitutes the centre. Up until the 1980s the centre grew at the expense of the periphery, to reach 30% of the nation's population and 50% of its Gross Domestic Product.

Athanassios Argyris' and Stella Kostopoulou's recommendation was that the European Union should fund those schemes which indeed aid remote areas. For instance, in Greece the European-funded networks should be planned and located to aid the country's periphery by improving links with the Balkan States (which also happen to form the European Union's boundaries).

This point was emphasized also by Laszlo Ruppert of the Institute for Transport Science in Hungary, who stated that the Gross Domestic Product per capita in Budapest was higher than that of the European Union average. Yet the Gross Domestic Product per capita of Hungary as a whole was far below that of the European Union countries - emphasizing the inequalities that exist within nation states.

Stella Kostopoulou, whilst recognising that it was unclear whether peripheral capital investments were good or bad, nonetheless stated that they were quite necessary for Greece. These investments could help Greece move out of the periphery by becoming a peripheral core not only of the Balkans, but of the entire south-eastern Mediterranean basin.

Rita Piirainen of the Finnish Ministry of Transport and Communications, intervening in the debate, questioned whether in fact Greece is a peripheral country at all. Rita Piirainen stated that the borders of today are the opportunities of the future. Greece is not really in the periphery, as is a country like Finland, for it is in a key strategic location in the Mediterranean (which is also a very large market).

The other official discussant, Pablo Gasos Casao of the Spanish Ministry of Development, took issue with the content of the papers regarding the negative (centralising) effect of the European Commission's cohesion and structural funds. He cited a recent European Commission-funded review by the London School of Economics on the effect of the cohesion funds, which found them to be positive overall.

Numerous interventions were made in the ensuing debate. The theme of all the interventions centred on the European Commission's policy of combating the problems of peripherality through new infrastructure funding. The main points were:

- The European Union's aid to poor regions is through infrastructure projects that require locally matched funding. These funds can be onerous and perhaps could be better used elsewhere.

- Heavy capital investment programmes, favoured by the European Union, could have the effect of reducing labour.

- Some peripheral countries, such as Greece, may be able to solve their problems of peripherality by becoming central (in the Balkans, for instance); but this is not possible for all peripheral countries and cannot be the model for solving problems of peripherality.

- The building of new infrastructure alone will not solve the problems of peripherality. The problems associated with peripherality are not based on the lack of major infrastructure projects but on numerous other issues.

- The building of new infrastructure could even have the converse effect from the desired one, for it is uncertain whether such projects improve accessibility; but they most likely are of benefit to the core and not to the periphery, as they encourage centripetal effects.

– At the national level, the building of new infrastructure very often has the effect of aiding the core of the peripheral country and not its peripheral regions. For instance, the Trans-European Networks bring accessibility to Athens and some mainland regions of Greece, but do little for the peripheral regions, such as the Aegean islands.

Part 2: Modal Share and Transport Forecasts for Eastern Europe

The presentation of the next paper continued on the themes raised by the previous two. Max Herry claimed that, for eastern European countries, trade flows are now greater with the European Union than among themselves. His presentation centred on mode choice in transport in eastern Europe. The war in Yugoslavia has led to a disruption of rail transport and excessive motorisation. In other eastern European countries, rail has fared better but still faces huge difficulties and an overall loss in modal share.

The paper by Pieter Hilferink from the Transport Research and Training in The Netherlands, was based on the results of a European region-to-region transport model. The model created went as far as 2015 with the TINA network completed. The results of the model show that the growth of road-based transport is far greater than that of rail. The inference from these results is that there needs to be a better balance in investment between road and rail.

Nonetheless, if there is to be an increase in rail investment in eastern Europe, eastern European rail companies must agree common standards. Otherwise, according to Jan Simons, such investments will be a waste as through-running will not be substantially improved.

Rita Piirainen pointed out that investments made for accession to the European Union should be co-ordinated amongst the accession countries.

There were also numerous interventions following the presentations of these two papers. In the debate that took place, the theme of the interventions centred on the accuracy of models, especially regarding the TINA network. The main points were:

– Transport models for eastern Europe must take into account the changing national borders of the region.

– Many transport models show that less than 1% of overall eastern European transport will be by internal shipping. This modal split is surprising in view of the important role the Danube and its tributaries play for much of eastern Europe.

– The social dimension is missing in models concerning transport in eastern Europe.

– The data that feeds these transport models must be maintained and updated or otherwise, in a fast-changing region, the models will be soon out of date.

– Pieter Hilferink's model and study show that rail is not the beneficiary of the TINA investments. However, that is contrary to the entire thinking behind the establishment of the TINA network.

Part 3: Environmental Concern in the Periphery

Professor Suchorzewski presented the first of the remaining two papers of the afternoon session. Professor Suchorzewski concentrated on the spatial and transport structure of eastern Europe. He reminded the audience that eastern Europe is quite diverse geographically compared with western Europe. The densities of population and activities are far lower than in the West. Thus, the concept of peripherality can apply to eastern Europe as a whole. Yet even with low densities in eastern Europe, long-distance travel is far lower than in the West.

The last presentation of the day, by Frantisek Hep of Sudop Praha, focused attention on the Czech Republic's transport policy as it relates to the centre-periphery debate. In the Czech Republic there is a dense network of roads and railways, and an adequate supply of public transport in the urban areas. These strengths of the transport system are not, however, available in all the country's regions. It is thus a basic aim of the Czech Republic's national transport policy to reduce inequalities between the regions.

The last paper of the day was followed with a commentary by Haralambos Fokas (the author of the present report). In western Europe, the environment and public health are foremost in policymaking as regards transportation. Yet in the peripheral countries the race to increase motorisation and build new roads makes sure that these issues are dissipated or absent altogether. Thus the papers presented in this Conference make mention of forecasts that purport to show a growth in road traffic of up to 500% in the countries of the periphery. If this became a reality, it would be gravely deleterious for the health of the people in the area – and on a global scale would seriously contribute to the increase in greenhouse gases. This is exacerbated by the European Union's policy of spending money on extensive road projects in the countries of the periphery, such as the Egnatia motorway in northern Greece (which often have the effect of massively destroying the natural environment).

A number of speakers rebutted the view that in the periphery there is a lack of environmental concern. Professor Suchorzewski stated that environmental issues are indeed being taken into account in eastern Europe; and often they are being taken into account too much. Carbon dioxide emissions per capita are much lower in eastern European countries than in the European Union. Frantisek Hep also intervened to say that in the Czech Republic environmental issues have certainly not been forgotten.

Furthermore, Professor Suchorzewski stated that for transport and buildings, carbon dioxide emissions are also increasing in western European countries.

The official discussant, Pablo Gasos Casao, claimed it was not for government or the European Union to regulate the externalities of transport, but that this should be done by market forces. His main concern was how to direct and encourage private capital to help build new transport infrastructure in eastern Europe.

One of the earlier speakers, Athanassios Argyris, also took the opportunity to attack the notion that the environment should have a more important role in transport policymaking. He claimed that the priorities of the countries of the periphery should first be growth and then the environment. He shared his fear that soon the rising tide of environmental concern will block completely all transport development projects. He did, however, concede that building new infrastructure was not synonymous with development.

Frantisek Hep noted the strength of feeling and importance that this issue was creating and asked that the next European Conference of the Ministers of Transport should be concerned with and concentrate on transport externalities.

A longer than average debate followed, with many speakers from the floor having a say, with a variety and diversity of viewpoints. Transport externalities especially, regarding eastern Europe and the role of the European Commission, took centre stage. The main issues can be summarised as follows:

- The accuracy of official data for Gross Domestic Product and car ownership are somewhat dubious in eastern Europe.

- The pricing mechanism can be used as an instrument to internalise road transport externalities. In the future this could be extended to full road pricing.

- Existing roads should be improved before constructing new motorways in eastern Europe.

- Car use in some eastern European countries, such as Poland, is low but car ownership is relatively high. We ought not to combat car ownership but encourage reductions in car use.

- Environmental concerns are high in the planning of new roads in eastern Europe.

- Public participation in transport planning, especially on new projects, is important and should be encouraged. Transport and planning professionals have to be more open with the public.

- A problem in developing rail travel in eastern Europe is the crossing of national borders, as there is often little co-ordination between rail authorities.

Dinos Stasinopoulos of the European Commission's Directorate General 10, also intervened in the debate. In 1995, the European Commission published the seminal Green Paper, "Towards Fair and Efficient Pricing in Transport"[1]. Yet since then, there has been an increasing internationalisation of the transport industry. A revision of the Paper is currently planned. The output of the present Conference will be used in drawing up the new Paper.

The chairperson of the session, Werner Rothergatter, summed up the concerns and main themes of the afternoon's debates. According to Werner Rothergatter, the data and methodologies that are available to us are inadequate to make an assessment of how good new infrastructure investment is in the European periphery. Yet he questioned whether we need new infrastructure anyway. The European Union should aid accession countries not to make the mistakes that the northern European countries have made. It is not clear whether the European Union is fulfilling this role.

Furthermore, Werner Rothergatter stated that the railways have to improve their international connectivity in eastern Europe. Globalisation is inevitable, and if the railways do not adapt they will end up in museums.

Commentary

This session on peripherality saw a lot of sparks flying as the debate heated up and opposed views frequently clashed. Much of the debate was under the shadow of current European Union policy regarding its own peripheral countries and the countries of eastern Europe. The countries of the periphery are asking large amounts of funding to implement new transport infrastructure projects, and many are being built. Thus the debate had as a focus the trans-European networks in dealing with transport and peripherality.

The main themes that emerged from the debate were: the benefits and disbenefits of the European Union's policy in creating and funding new transport infrastructure such as the Trans-European Networks; the role of the train in the European networks; and the role of the environment in transport policies in Europe's peripheral countries. For all these themes there were opposing viewpoints. These can be summarised as follows:

(a) Who benefits from the Trans-European Networks?

There were two quite clearly opposed views at the Conference on this theme:

- A predominant view was that the Trans European Network creates strong centripetal tendencies, where growth and commerce are channelled towards the centre. This occurs both at the European level and the national level, benefiting the capital city but leaving the outer regions neglected. A good example of this was in Greece where the policy of implementing Europe's main rail and road corridors benefits the major cities of the Greek mainland, whilst the islands become even more remote.

  The view was also put forward that instead of developing these networks, what would be more beneficial would be the strengthening of regional links - in order to ensure a development which is not dependent on the international division of labour, to the contrary of trans-European networks. A policy of regional development could also provide better cohesion between regions.

- On the other hand, during the debate, studies were mentioned that purported to show the opposite. Some of the participants in the debate saw European structural funds as a way of moving peripheral countries into a new regional core, such as that of the Balkans.

What, however, was largely missed in the debate was the issue as to whether these large new road or rail projects bring any lasting economic benefits at all, other than a short-lived boom in the construction industry.

(b) Should rail be preferred on the Trans-European Networks?

Similarly with the issue of benefits and disbenefits of the trans-European networks, the issue of modal split created two opposite views:

- One paper presented during this session showed the results of studies that demonstrated that investment in rail was not of benefit to peripheral countries, and another which forecasted that by 2015 the predominant growth of travel in Europe will be by road. This tied in with the views presented in the first session which showed a continuing fall in demand for rail freight (especially in eastern Europe). It is hard to champion investment in rail when its role is forecast to become increasingly marginal in Europe.

- This data was disputed by some of the conference participants who wanted to see a growth in rail not only as a means to economic growth but also that of environmental and social equity.

(c) Are Europe's peripheral countries taking the environment seriously?

The most heated part of the debate centred on the environment. Once again, it created very opposed views:

- A widely-shared view was that the environment is given too much importance in transport planning policymaking. Since in peripheral countries pollution is at lower levels per capita than in the West, giving it prominence only serves to jeopardise the funding and construction of new transport projects, especially new motorways. Peripheral countries should first build comprehensive motorway and high-speed rail networks and then concern themselves with the environment. Environmental concern is a luxury for countries that lack the basic transport infrastructure.

- The opposing view centred on the already degraded environment of many of the eastern and southern European countries. Further road construction not only ruins the landscape but also increases demand for road-based transport, which causes pollution and is incompatible with the agreements signed in Kyoto. Perhaps it would be better to improve the quality of existing infrastructure before embarking on massive new road projects.

These views are wide apart. A European policy regarding its peripheries should not just focus on infrastructure but also on the environment, quality of life and social cohesion.

Final Round Table: "Efficiency, Equity and the Environment in Transport: Experience and Prospects"

Stratos Papadimitriou	Athens Urban Transport Organisation, Athens (Greece)
Ambrosius Baanders	Transport Research Centre AVV (The Netherlands)
Andreas Käfer	Trafico Verkehersplanung (Austria)
Christiane Delepiere-Dramais	Université Libre de Bruxelles, Brussels (Belgium)
Dinos Stasinopoulos	Directorate General 10 of the European Commission (Belgium)
Felix Walter	Ecoplan (Switzerland)
Jan Friedberg	Ministry of Transport (Poland)
Josef Mikulik	Transport Research Centre (Czech Republic)
Knut Østmoe	Institute of Transport Economics (Norway)
Stefan Rommerskirchen	Prognos AG (Switzerland)

Part 1: Environmental and Social Aspects of Transport Policy

The last conference session started with a paper by Felix Walter of Ecoplan, who viewed with some pessimism current transport developments. In 2002 it will be ten years since the Rio Conference and Declaration on Sustainable Development and its resolutions are not being implemented. Felix Walter identified three key problems in meeting the objectives of the Rio Conference:

- We are expecting a high level of growth in road-based freight transport and an increase in aviation;
- The expected and desired decoupling of growth and motorised transport movement is not happening;
- Technology that would allow less environmental damage is improving but its adoption is facing cost problems.

The environmentally unsustainable transport policies are exacerbated by aid programmes to third world countries which are largely geared for new road construction. Money could be better spent on other projects (not transport related) rather than the use that is being currently made.

With such policies, according to Felix Walter, equity is not improved. According to him, solutions leading to less transport can be beneficial to the economy, bring greater equity and be environmentally friendly.

Stefan Rommerskirchen, in presenting his paper, also looked at these themes. His first point was that since we do not have true prices in transport, due to distortions of subsidy and cross-subsidy, market forces cannot operate. It is thus difficult to ascertain improvements or not in efficiency.

His next point regarded equity. He sees three levels of the application of equity criteria in transportation:

- Equity within society;
- Equity between peoples;

- Equity between generations. This is not only applicable to the current differential consumption of transport between generations, but also to the current excessive use of natural resources, leaving little for the future generations.

However, his view was that social policy and transport policy should not be mixed, but kept quite separate.

The next paper also developed some of the themes of the previous papers from the point of view of a candidate country for the European Union. A major problem that is faced, according to the author of the paper, Jan Friedberg of the Polish Ministry of Transport, is that of poverty and lack of know-how. Time is needed for eastern European countries to develop such skills.

Jan Friedberg’s view was that, instead of building big new infrastructure projects, it would be better to try and eliminate bottlenecks through better management of the existing system, such as creating central traffic control systems. However, he too was pessimistic about the future as, in his view, politicians prefer cutting ribbons for large projects and are not too excited by smaller schemes as they are not so spectacular.

Christiane Delepiere-Dramais of the Université Libre de Bruxelles, took a step back in her presentation. According to Christiane Delepiere-Dramais, transport planning has traditionally been dominated by engineers. Yet this domination has now waned and economists have filled that role. Now also geographers are coming into the profession. However, it is sociologists who are still largely missing and who should take a greater role in transport planning.

As regards the environment, Christiane Delepiere-Dramais’ view was that these external costs should be internalised in the pricing of the transport system. Often new schemes are drawn up and implemented in order to alleviate a problem, only to cause a new one. Big new infrastructures may solve a perceived problem but may cause other environmental ones.

Following the papers, there were many voices to support the view raised by Christiane Delepiere-Dramais of the need for a social and environmental input to transport plans. For instance, Nenos Nenopoulos claimed that the human aspect of transportation is often underestimated. Social impact studies should be undertaken prior to any new transport investment. These studies could avoid creating social conflicts and burdening us in the future with high social costs. A particular issue he made reference to is that accessibility for the elderly and the disabled is often missing from transport plans.

Road safety was also raised from the floor as another issue that is largely missing in transport policies.

Many interventions favoured using pricing as a means of achieving environmental and social equity. The environmental costs should be internalised through a user-pays principle. Congestion pricing was offered as a solution for cities.

Nonetheless, there were also dissenting voices from the conference participants. Mention was made that now there is an environmental dictatorship that hinders the progress of transport plans and projects.

Responding to the points that were made from the floor, Felix Walter claimed that all these issues of social and environmental trade-offs are political, and they will remain in the political arena.

Jan Friedberg and Christiane Delepiere-Dramais stressed that there are no easy algorithms for incorporating socio-environmental considerations into transport planning techniques; and that, in making plans for transport, we ought not to forget those individuals with limited mobility and those who do not have access to a car.

Stefan Rommerskirchen cautioned on finding precise ways of determining externalities and not confusing social policy with transport policies.

Part 2: Sustainability

Social and environmental aspects of transport were also the themes of the last five presentations of the Conference. Andreas Käfer, of Trafico Verkehersplanung, presented a paper in which he highlighted the importance of the environment and the way we deal with it. He made the point that politicians are duping citizens by making them feel that current economic progress is compatible with environmental sustainability. However, the conferences of Rio and Kyoto make us realise that this is not the case. According to Andreas Käfer, we need legal binding documents limiting emissions. Currently it is hoped that - either through reduced economic growth and/or effecting widespread modal shift away from the private car to public transport and/or through technological change that maximises the efficiency of engines and reduces pollution - we will be able to achieve these targets. However, Andreas Käfer believes that without legal binding limits, we may never achieve our goals. Furthermore, according to him, transport plans should also involve public participation to be democratic and transparent.

Andreas Käfer also talked about the kind of indicators we use to measure progress and efficiency. Gross Domestic Product is not a good indicator of progress for it neglects two basic dimensions: (i) the social dimension, such as the level of unemployment; and (ii) the environmental dimension, such as the rate of consumption of non-renewable natural resources. It is fashionable to use intermodality as a cure but this, according to Andreas Käfer, is only an empty phrase, for it accounts for less than 5% of all transport movements in Europe.

From a similar standpoint was the presentation of the next paper. Josef Mikulik, of the Transport Research Centre in the Czech Republic, stressed the problem of deaths and mutilation caused by motoring. He cited that there are 1.2 million deaths per year in the world due to traffic accidents. This compares to 0.8 million lives lost due to wars. Transport should be human and environmentally friendly, not the cause of death and destruction. The humanisation of transport should be a key target for Europe in the year 2000.

Knut Østmoe of the Norwegian Institute of Transport Economics, took the points that were raised in the previous papers and related them to Norway's policy of road pricing. He claimed that adding more road capacity in cities did not produce a solution to traffic problems. It only serves to disfigure the spatial layout of the city. Norway's policy of road pricing was an optimal, long-term policy. However, at present in Norway, road pricing revenue can only be used to build new roads. This was clearly a mistaken policy and may soon change. Road pricing should be used for financing public transport and this should be part of a city-wide plan, not a measure in itself. According to Knut Østmoe, good accessibility, rather than increased mobility, should be our target.

The last two presentations regarded the availability of adequate data (Ambrosius Baanders of the Transport Research Centre in Holland) and the European Union's policy in promoting the Trans-European Networks (Dinos Stasinopoulos of the European Commission's Directorate

General 10). Ambrosius Baanders made the point that we cannot have good policies if we do not have good data. Currently, according to Ambrosius Baanders, there is a data crisis where transport data in Europe is either unavailable or of dubious quality.

Dinos Stasinopoulos defended the European Union's policy of promoting the Trans-European Networks. He claimed that a fundamental objective was to encourage the private sector to invest in these. This is occurring as with other European transport projects, such the new airport at Spata, near Athens.

Following the last of the formal presentations, the debate was opened to the floor. Most of the points made regarded issues raised throughout the Conference and were not specific to the last part of the final session. Some of these had been raised in the previous days. The interventions made from the floor did not constitute a debate, but rather points of emphasis on particular issues. Typical of the interventions made were:

- Frantisek Hep implored the European Union to reverse the deterioration of environmental conditions in Europe.

- Werner Brög made a plea for collecting and compiling compatible European transport data.

- There was a demand for a change in European transport policy that promotes infrastructure projects along land routes, such as the Trans-European Network, since they do not meet the needs of Europe's islands. Perhaps it wound be better for the European Union to use policies of taxation and subsidy to help peripheral regions.

- Nenos Nenopoulos asked for the European Conference of Ministers of Transport to put transport data regarding Europe on the World Wide Web for free.

The Conference ended with all the main panel members making a last intervention in response to the points raised by speakers from the floor. Most speakers reiterated what they said in their presentations. Knut Østmoe added something new by asking that environmental action should be taken not only at the European level but also by Member States themselves. According to him, sustainable transport must be a societal goal, but we have to avoid the trap of not taking any personal action and responsibility and expecting someone else to act on our behalf.

The Conference was concluded by Alain Rathery of the European Conference of Ministers of Transport. He gave a personal view of the three days of the Conference, with three salient points that emerged:

- The importance of the protection of the environment. This is to include road safety and the needs of the elderly - themes which will be discussed at the next Council of Ministers of Transport.

- Assessment of transport policies. Already two countries have done this and this is a very positive first move which could be very beneficial to other countries too.

- Data on the Internet. The European Conference of Ministers of Transport is giving a positive example by having a Web site with information and some free publications.

Commentary

The final session of the Conference brought to a head many of the issues which were being discussed in the previous sessions, with transport sustainability being the overall key theme. Many voices were raised concerning the unsustainability of current transport trends, while many speakers outlined the negative effects of road transport: deaths due to accidents, air pollution, greenhouse gasses and global warming and so on. Particular mention was made of equity in transport, where current transport plans ignore the mobility needs of the elderly, the disabled and non-car users. Some speakers stressed the importance of equity in transportation, on a par with environmental considerations. However, there were conflicting indications as to whether equity should be achieved through social policies or also through transport ones.

The planning of transport was seen by a number of speakers to be too engineering led. Social scientists and sociologists in particular were seen as being conspicuously absent from the transport profession. Yet their requirement is greatly needed to overcome the engineers' build-and-build approach to solving transport problems.

The debate had also a very political hue. It was pointed out that it was hypocritical of politicians to sign up to the declarations of Rio and Kyoto but make no attempt to meet the set targets. Instead policies of building more motorways and further encouraging private motoring and the shipment of goods by road, are those pursued by many countries and the European Union through the construction and financing of the Trans-European Road Networks. Yet politicians continue to claim that the current rate and type of economic growth can be environmentally sustainable. The point was reiterated, that instead of grandiose new infrastructures, a greater benefit would arise from improving the management and quality of the existing structure. However, this was seen as unappealing to politicians concerned with cutting ribbons.

However, the environmentalist viewpoint was not shared by all. Mention was made of an environmental dictatorship by those who wish to have a licence to build new infrastructure, no matter what the environmental and social cost.

It is the author's belief that the view shared by many speakers from southern and eastern Europe, that a healthy environment is a luxury which can only be addressed after a new European motorway network has been "completed", can only lead to a costly environmental catastrophe in the future. Policies of promoting new motorways in southern and eastern Europe may also have the effect of increasing inequities. European Transport Ministers could give greater priority to promoting transport accessibility and good management rather than unsustainable, infrastructure-led road programmes.

Since the environment was the big item dividing opinion at this Conference, it seems a very reasonable idea to adopt the point made by Frantisek Hep, to devote the next European Conference of Ministers of Transport to the externalities of transport and, the author would like to add, to sustainability too.

NOTE

1. Commission of the European Communities (1995), Towards Fair and Efficient Pricing in Transport: Policy Options for Internalising the External Costs of Transport in the European Union, Brussels.

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