JOINT TRANSPORT RESEARCH CENTRE

Discussion Paper No. 2009-12
May 2009 (Preliminary version)

Transport Outlook 2009

Globalisation, Crisis and Transport

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TRANSPORT OUTLOOK 2009

GLOBALISATION, CRISIS AND TRANSPORT

Joint Transport Research Centre
of the OECD and the International Transport Forum

Table of Contents

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GLOBALIZATION, CRISIS AND TRANSPORT

1. Introduction

This second ITF Transport Outlook continues building towards a full-fledged Transport Outlook, building upon the first Outlook (JTRC, 2008[1]). The 2008 Outlook investigated the relation between expected GDP evolution and the demand for road transport, pointing out that transport demand and CO2-emissions could well turn out higher than commonly assumed given the projected evolution of GDP, and underlining the potential of improvements of fuel efficiency in controlling CO2-emissions from road transport. These topics were developed further in the "50 by 50 Global Fuel Economy Initiative".[2]

The 2009 Outlook considers two themes that are closely linked to the International Transport Forums's them for the 2009 meeting in Leipzig: Transport for a global economy – Challenges and opportunities in the downturn. First, in Section 2, we focus on the evolution of GDP itself and how this evolution interacts with transport demand and investments in transport infrastructure. The analysis is a first brush at gauging the potential impacts of the economic and financial crisis. Specifically, we consider (a) the impact of the aggregate demand shock on the evolution of global GDP, (b) the need and potential for a rebalancing of global growth patterns, with their implications for trade and transport demand, and (c) the consequences of the widening funding gap for transport infrastructure investments.

Second, in Sections 3 through 5, we discuss projections of the demand for road transport, aviation, and maritime transport. For road transport, more modest global growth leads to slower growth of the vehicle stock and of CO2-emissions, but the basic messages of the 2008 Outlook continue to hold. For aviation, we attempt to disentangle the effects of economic growth and of increased openness of markets on volume growth, and find that the latter is an important growth factor. For maritime transport, the focus is on likely development patterns and how they could be affected by the crisis, and how this does (not) affect recommendations for dealing with expected CO2-emissions.

1. JTRC, 2008, Transport Outlook 2008 – Focussing on CO2 emissions from road vehicles, JTRC Discussion Paper 2008-13 - http://www.internationaltransportforum.org/jtrc/DiscussionPapers/jtrcpapers.html
2. www.50by50campaign.org

2. Towards a new normal?

2.1 Globalization, transport, trade, and growth

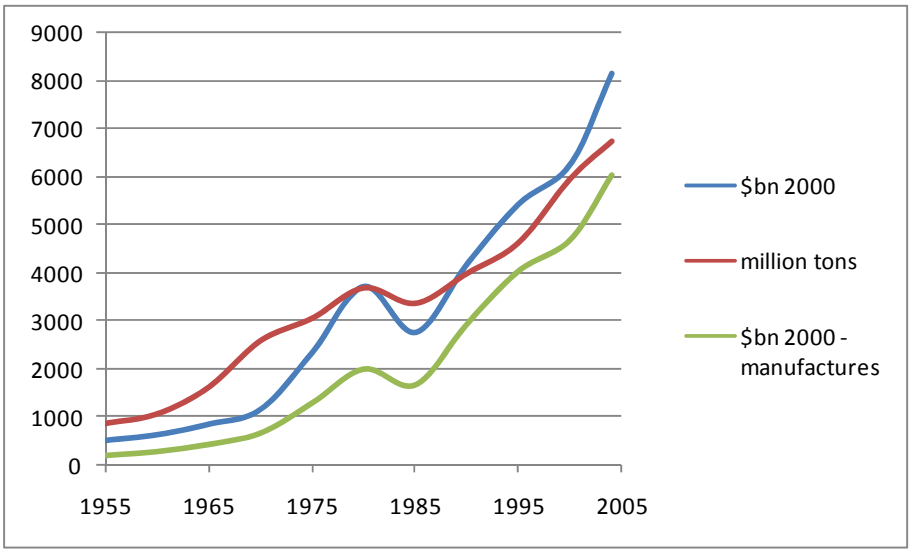
Globalization means geographical dispersion of production and strong reliance on trade. World trade value has increased over 20-fold since 1950, and the share of manufactured products in it has grown from less than 40 percent to over 70 percent today. As Figure 1 shows, growth is particularly fast after 1985.

For this development pattern to succeed, highly performing transport services are required. And while pressing policy problems remain, transport connections between producers and consumers in all but the smallest markets are in place, often at low prices for the quality of service offered. While decisions on where to produce and where to ship are not driven by transport costs alone, lower transport costs (controlling for quality) do contribute to the spatial fragmentation and transport-intensity of production (e.g. Hummels, 2009).

Transport costs depend on technology (e.g. containerization, jet engines), input prices (e.g. fuel and labor), on the relation between demand and capacity[3], and on institutional factors (e.g. border crossing costs). Transport prices depend on costs and on the nature of competition in transport markets. Continued efforts to create conditions for competitive transport markets in a non-restrictive institutional context and with appropriate provision of infrastructure will pay off in terms of smoother functioning of the global economy. Section 4 illustrates the role of policy and competition in stimulating growth in aviation.

3. Data from Containerisation International indicate a decline of the cost of shipping a TEU by about 1% per year from 2004 through 2006 on average in the major tradelines, but costs started rising in 2007 or 2008, before plummeting in the first quarter of 2009 (Beddow, M., Freight Facts, 15 May 2009).

Figure 1. World trade value ($bn 2000, tons) and Manufactures trade ($bn 2000)



Source: Hummels (2009)[4], Table 1-1

2.2 The downturn and the future development of global GDP

The financial and economic crisis that started unfolding in 2008 is severe. The main macroeconomic indicators are in the red for the third quarter of 2008 and are expected to remain there through 2009. The contraction of trade volumes is larger than that of GDP, and volumes in many transport markets shrink by more than trade volumes. In its World Economic Outlook of April 2009, the IMF expects global output to fall by 1.3% in 2009, reverting back to growth of 1.9% in 2010 (global output grew by 5.2% in 2007 and 3.2% in 2008). World trade volumes are expected to decline by 11% in 2009 and increase by 0.6% in 2010 (it grew by 7.2% in 2007 and by 3.3% in 2008).[5]

What is the effect of the current slump on the future development of world GDP? Roughly, three scenarios can be distinguished on how the crisis will affect global growth patterns:

4. Hummels, D., 2009, Globalization and freight transport costs in maritime shipping and aviation, Paper prepared for the International Transport Forum, 26-29 May, Leipzig.
5. IMF,World Economic Outlook – Crisis and recovery, April 2009, Table 1-1; http://www.imf.org/external/pubs/ft/weo/2009/01/index.htm

- The crisis is an "accident", and once the financial system has been repaired, nothing prevents a return to pre-crisis business-as-usual. We call this "Bounce Back".
- The crisis puts and end to pre-crisis globalization patterns, partly because of policy responses to it and partly because of the unsustainability of some aspects of pre-crisis patterns. We label this scenario "Retrenchment".
- Adjustments to pre-crisis patterns imply a weaker outlook for future global GDP growth. The main adjustments concern global trade imbalances and reduced financial leverage. We call this scenario "Adjustment".

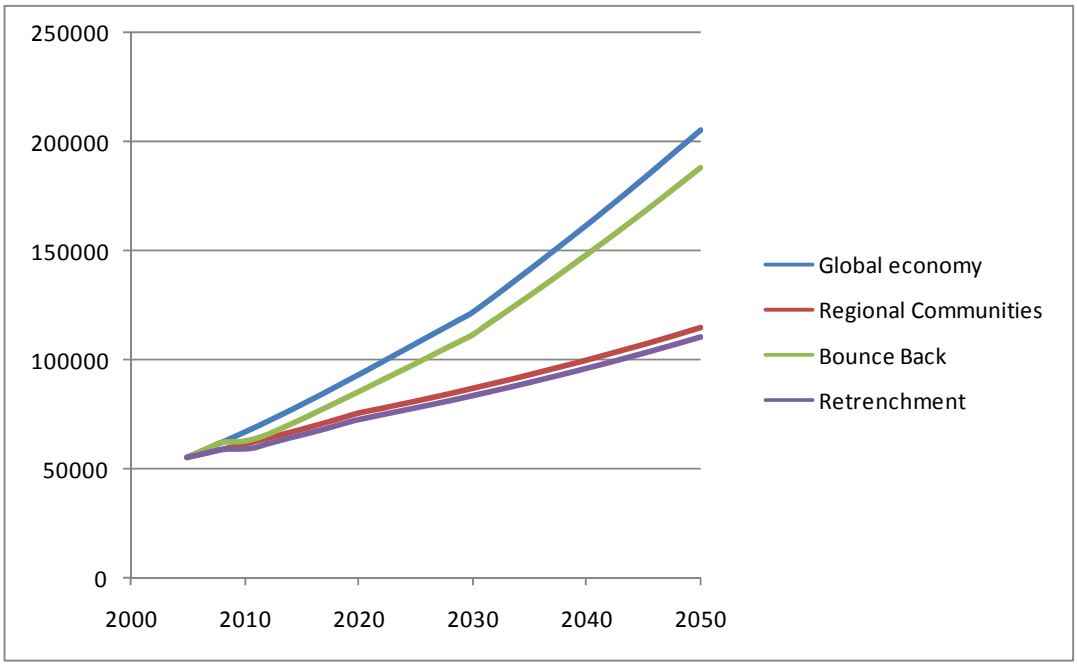
These three scenarios can be translated into the global GDP projections contained in the MoMo-model, on which the ITF Transport Scenarios are built, with the help of the Dutch Scenario Explorer[6]. The Scenario Explorer uses a global general equilibrium model to characterize macroeconomic and transport outcomes for several possible futures. Their "Globalization" scenario assumes continued international cooperation and openness, with governments focusing on efficiency rather than equity. This is similar to our "Global Economy" scenario, which does not account for the impact of the crisis.[7] The "Regional Communities" scenario assumes the opposite, and is similar to our "Retrenchment" case, again except that it does not account for the crisis. The "Adjustment" scenario as such is not contained in the Scenario Explorer.

Figure 2 shows global GDP as resulting from

- "Global economy", i.e. globalization and no crisis,
- "Bounce Back", i.e. globalization and a crisis,
- "Regional Communities", i.e. strongly reduced globalization and no crisis
- "Retrenchment", i.e. strongly reduced globalization and a crisis.

6. Lejour, Arjan (2003) Quantifying four scenarios for Europe, CPB Document 38. http://www.cpb.nl/eng/pub/cpbreeksen/document/38/doc38.pdf
7. Using the Scenario Explorer growth rates with the MoMo starting value for global GDP produces a growth path that is nearly identical to the MoMo growth path.

Figure 2. Global GDP projections with and without globalization and crisis ($ billion)



Source: ITF calculations using the MoMo-model and Scenario Explorer inputs

The "regional communities" scenario puts global GDP on a markedly lower growth path than the "global economy" scenario, illustrating that turning back globalization is costly in terms of foregone economic growth. For the "Retrenchment" and "Bounce Back" scenarios, we gauge the impact of the crisis by setting growth equal to zero in 2009 and 2010[8], and then converge back to rates of the original scenario by 2013 (1/2 of the initial rate in 2011, ¾ in 2012). With continued globalization, the shock implies a sizable gap between the initial scenario and the one with the shock. That gap increases over time, as identical growth rates are applied to lower levels of GDP. The effect of the shock is smaller in the regional communities scenario, simply because the growth rates in that scenario are smaller.

Comparing GDP patterns within the globalization scenarios shows that the effect of the slump is large, with attainment of expected GDP levels delayed by up to 5 years in the long run. A further concern is that the shock triggers responses that imply a change of regime. An extreme case would be a switch from "Globalization" to "Retrenchment". Such a shift makes little difference in the short run (which may

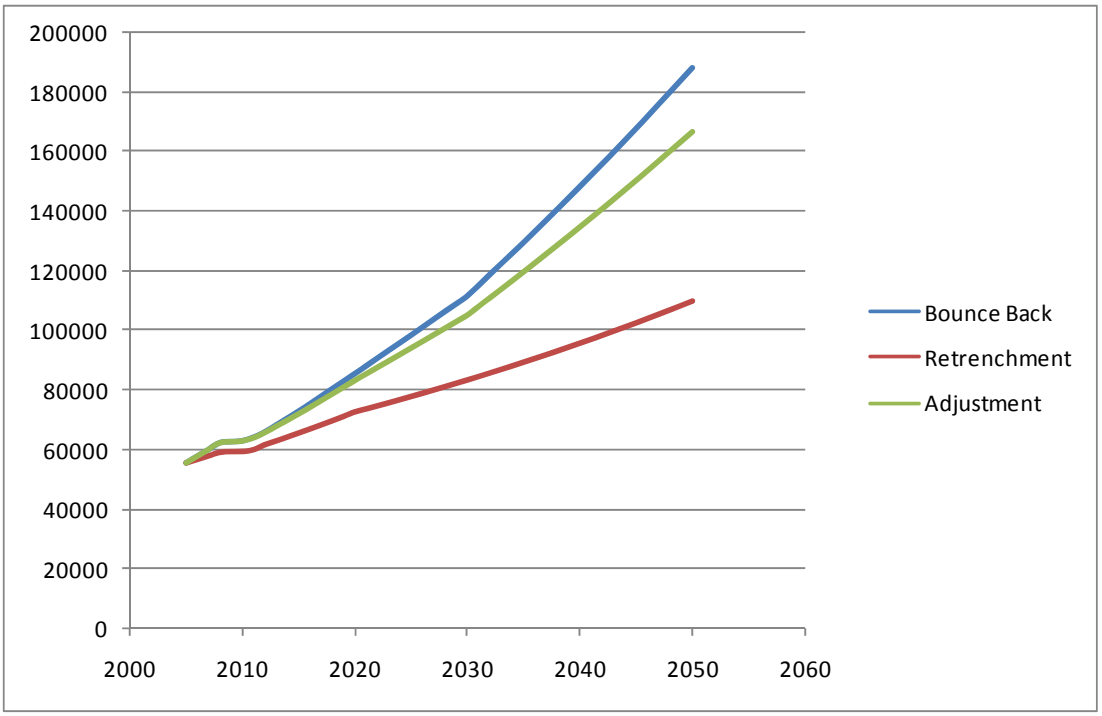
8. These assumptions are more pessimistic than the WEO projections of the first quarter of 2009 (see footnote 5). The IMF notes that the projected recovery is conditional on policies that are not yet implemented.

contribute to its policy appeal), but the long run effects clearly are quite costly in terms of foregone GDP. This simple insight highlights the importance of vigilance to avoid attempts to undo globalization.

However, while globalization entails net benefits, it is far from straightforward that the pre-crisis pattern of globalization can or should be re-established. As is discussed in more detail in Sections 2.3 and 2.4, the extreme trade imbalances and availability of cheap credit are not likely to be sustainable, and restoring some balance may well lead to more modest growth patterns. Another way of seeing this is that, if a return to pre-crisis ways is established, the world economy is headed for another. In this sense, the choice is between a stable and more moderate growth path, and high-paced growth with irregular and severe interruptions through crises (in sum also leading to more moderate growth in the long run).

The "Adjustment"-scenario captures the idea that a number of imbalances in the global economy need to be handled and that this leads to more moderate growth than under "Bounce Back" but higher growth than under "Retrenchment". Quantifying this scenario is more than a little bit challenging. Figure 3 simply puts the global GDP growth-rate at the third quartile of the difference between "Bounce Back" (upper bound) and "Retrenchment" (lower bound), reflecting a judgment that "Adjustment" reduces growth but strongly outperforms "Retrenchment".

Figure 3. Global GDP projections: Globalization, Retrenchment, and Adjustment



Source: ITF calculations using the MoMo model

The future evolution of world GDP is by definition highly uncertain. Figure 3 can be interpreted as putting some structure on that uncertainty, with the extreme scenarios as reasonable bounds, and the Adjustment scenario indicating the vicinity of the most likely outcome. It deserves emphasis that the probability of Adjustment being the outcome depends on policy choices, i.e. a commitment to adjusted globalization.

2.3 Restoring balances?

As indicated in the previous section, some discussions of crisis response policies implicitly assume that the downturn is transitory, and that the role of policy is to take the global economy back to business-as-usual at the lowest possible long run cost. The interruption in global development then delays the growth of global GDP by 5 years or so, clearly a massive cost. However, it is not straightforward that a return to business-as-usual will materialize, for two reasons. First, there is a risk that policies, such as protectionism or excessive restrictions on financial intermediation, prevent pre-crisis types of economic (as opposed to purely financial) interactions from returning. Second, the crisis reflects and may correct global imbalances, most notably – but not exclusively – between the US and China. In 2008, the main trade surplus countries were Germany ($279bn, 7.3% of GDP), Japan ($194bn, 4% of GDP, China ($399 bn, 9.5% of GDP), and the oil exporting countries (holding $813bn). The main deficit countries are the USA, the UK, France, Spain, and Italy.[9]

The crisis itself moderates the imbalances, with dramatic declines in export volumes, particularly from Asian economies. The WTO expects global trade volumes to decline by 9% in 2009. Japan's exports fell by 49% from February 2008 to February 2009. Emerging Eastern European economies face a decline of about 40%. In the US, the decline in trade reflects the sudden rebalancing, with lower exports, but also reduced imports partly helped by lower commodity prices. The US aggregate savings rate was between 6 and 10% after World War II, but declined rapidly after 1998 (the currency crises) to reach about zero in 2007. At present, the savings rate is on the rise. Global rebalancing implies that exporting surplus countries adapt to this situation. There is overcapacity in export terms, which can either be absorbed by domestic demand or by reducing output. While China is undertaking efforts to boost domestic demand (cf. Roach, 2009[10]), such adjustments are difficult to realize and transition costs

9. Numbers taken from US Department of the Treasury – Office of International Affairs, 2009, Report to Congress on international economic and exchange rate policies, April 15 2009
10. Roach, S., 2009, The right call on China, http://www.morganstanley.com/views/gef/archive/2006/20060511-Thu.html

may be high, e.g. in employment terms. This may lead surplus countries to continue pursuing export-oriented growth strategies, with the antecedent continued demand for reliable and liquid investment options for foreign reserves. It is not clear, however, that the US will continue to supply such investment options. Rebalancing requires a coordinated Chinese-American response (e.g. Pettis, 2009[11]).

The "Chimerica" model, roughly meaning that China saves and the US spends, hence is under particular strain. In that model, China and other exporting countries financed US consumption (not so much investment) by using savings from exports to purchase, for example, US Treasury Bills. There are several explanations for the high savings rate in China and other surplus countries. First, national export-oriented growth models have tended to emphasize domestic saving rather than consumption. Second, savings rates in China and some other countries are high because of precautionary saving motives. Households save to finance potential health expenditures, for old age, and to pay for education. Better social protection could weaken these savings motives and boost domestic consumption. Third, high macroeconomic savings also are a response to the currency crises of 1997 and 1998. Countries protect themselves against the risk of capital flight by accumulating foreign reserves. Global holdings of foreign reserves accumulated to $2.0 trillion in 2001 and rose to $6.4 trillion in 2007. The average annual growth rate hence was 26%, but growth was much faster in emerging economies. Advanced economies held 60% of total reserves in 2001, but only 37% in 2007. Emerging Asia held 18% in 2001, and 1/3 in 2008.[12] This savings motive could be weakened if, e.g., the IMF were to provide a good substitute for countries' own efforts to protect against currency crises.

To the extent past growth patterns were inflated by these global imbalances, expectations for future growth need to be moderated. It is also possible that future global development patterns become less trade-intensive than they have been in recent history. This does not mean the end of globalization, nor a continued contraction of trade volumes. Instead, we may be heading for a moderation of globalization, with more moderate but continued growth of global trade. To be clear, the reduced trade-intensity of growth should not be a result of barriers to trade, but a result of exchange rate adaptation and (coordinated) monetary and fiscal policy.

Long run developments other than rebalancing also contribute to such moderation. Hummels (2009)[13] identifies the following factors. First, oil prices are likely to rise again, leading to higher transport costs, in particular for airborne cargo. We note that transport energy prices may also rise due to efforts

11. Pettis, M., 2009, US and China must tame imbalances together, YaleGlobal, 6 January 2009.
12. US Department of the Treasury – Office of International Affairs, 2009, Report to Congress on international economic and exchange rate policies, April 15 2009.
13. Hummels, D., 2009, Globalization and freight transport costs in maritime shipping and aviation, Paper prepared for the International Transport Forum, 26-29 May, Leipzig.

to reduce emissions of greenhouse gases. Second, other channels than trade in merchandise may gain in importance as a means to exploit gains from globalisation, e.g. capital flows, migration, trade in technology (e.g. through FDI).

In short, restoring some global balance affects growth paths of transport volumes. It may therefore affect infrastructure investment decisions. The crisis serves as a warning that economic development patterns are precarious and subject to massive uncertainty, and this needs to be taken into account when deciding on investments in long-lived facilities. For example, while many transport facilities serve multiple purposes, there could be a shift of focus away from international gateways. Also, slower expected growth means that waiting longer before making irreversible investments becomes less costly. The payoff of learning more about future needs becomes larger.

2.4 After the stimulus, a widening funding gap?

The transport sector features large in many stimulus packages. Some countries subsidize replacements of old cars, with clear short term effects on demand. Infrastructure expenditures are increased as well, and given the increasing divergence between needs and available public funds combined with the slow take-off of private investment (the "funding gap"), there may be no shortage of justifiable transport projects.[14] Among these projects, the ones that stimulate demand most deserve priority, such as relatively labor-intensive maintenance and public transport programs, because the overriding policy objective is to stimulate demand now.

Stimulus programs are temporary and contribute to public debt. In the long run, the scarcity of public funds will likely be more severe, so the funding gap widens. Replacing public by private funding has become more difficult as some debt finance has evaporated and competition for equity has intensified with the demise of debt finance. With such increased scarcity of funding, intense competition among all kinds of public and private projects and countries for surplus savings may emerge. In order to avoid a race to the bottom on non-profit aspects (e.g. increased user fees, less strict environmental requirements), international cooperation will be required.

14. As noted in OECD, 2009a, a "crisis does not lend itself to complex investment projects which typically require careful and lengthy planning" (OECD, 2009a, Strategies for aligning stimulus measures with long term growth). The case for including infrastructure projects in stimulus packages strongly rests on the existence of projects that are ready to go and on their short-run effects in boosting demand. It is conceivable that projects to transform to a "greener economy" are not routinely in that class. Avoiding lock-in of undesirable technologies, however, is a valid selection criterion. And devising exit-strategies from stimulus programs is important as well (OECD, 2009b, The road to recovery – Synthesis report of the strategic response).

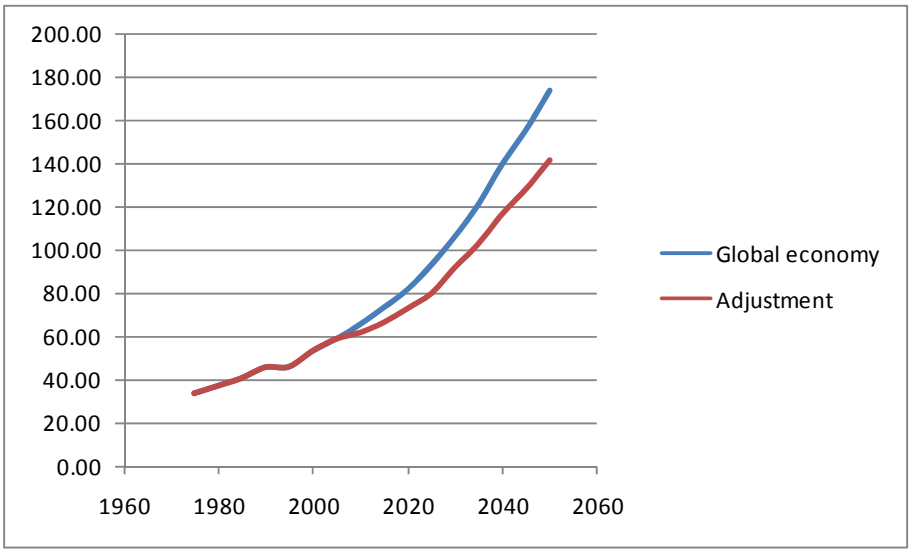
All else equal, increased scarcity of funds means that fewer projects are funded. But transport projects can be designed to increase their attractiveness to private investors, for example by ensuring that projects generate bigger or more reliable flows of revenue. This can be done by limiting competition among transport facilities, or increasing tolls, or reducing project-specific risk by pooling projects, or renumerating investment on the basis of delivery of capacity rather than on the basis of traffic volumes. Some of these approaches carry a cost in the sense that user-benefits are lowered. Other methods of increasing rates of return include broader public backing of project revenue, possibly through reduced tax receipts or increased contribtuions in case of lower than anticipated revenue. In this case, tax-payers rather than users pick up the bill for boosting expected rates of return. Overall, the choice is between investing less or investing more expensively. If expectations on future growth of transport flows are revised downward, investing less or later becomes more attractive. Nevertheless, a wide range of worthwhile projects remains, and it may become harder to fund them.

3. Projections for light-duty vehicles

This section evaluates the impact of more moderate expectations for global GDP-growth on the road sector, in terms of vehicle stocks and CO2-emissions from light-duty vehicles. Figure 4 shows the difference in expected new-vehicle sales, which determines the change in the stock, between the "Global economy" and "Adjustment" scenarios. The relation between GDP and car sales is the same in both scenarios, only the GDP levels differ.[15] Naturally, sales are slower in the Adjustment scenario, but there is no structural change to the growth pattern.

15. The regional distribution of global GDP is the same in both cases as well.

Figure 4. Global new vehicle sales in the "Global economy" and "Adjustment" scenarios, millions per year

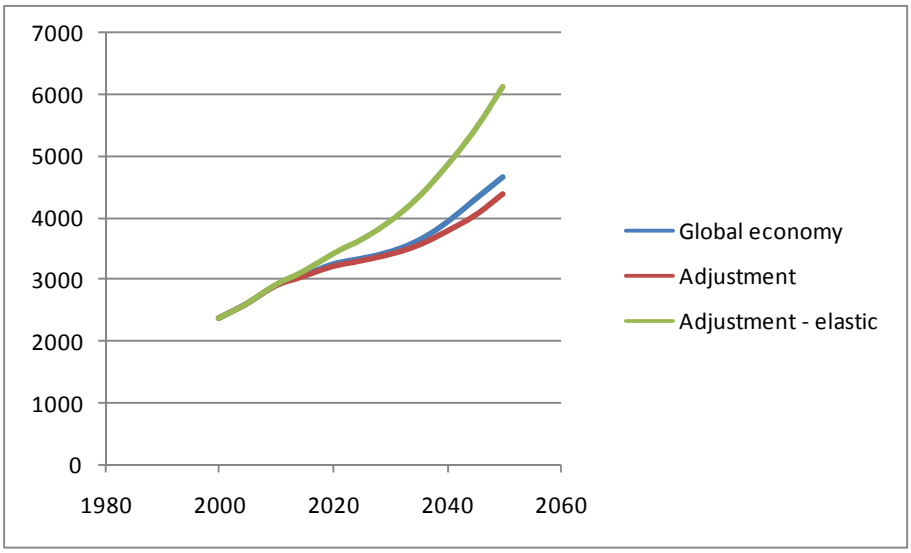


Source: ITF calculations using the IEA MoMo Model Version 2008

Figure 5 shows how differences in the sales and the stock of vehicles translate into differences in emissions of CO2 from light-duty vehicles. Lower sales and stocks translate into less CO2-emissions, as can be seen from comparing the "Global economy" and "Adjustment" scenarios, but here too there is no break in the upward trend of emissions.

The calculation of CO2-emissions in the "Global economy" and "Adjustment" scenarios assumes that the intensity of vehicle use is not dependent on GDP levels. The ITF Outlook 2008 investigated how introducing an elastic response of vehicle use with respect to GDP affects emission paths, finding that emissions end up being considerably higher when GDP elasticities that have been observed in advanced economies in the past are assumed to also apply to emerging economies in the future. Similarly, the "Adjustment + elastic" scenario in Figure 5 shows the impact of an elastic response of vehicle use for the "Adjustment" levels of GDP. The Figure suggests that the potential effects of elastic responses could more than compensate the (limited) slowdown of global growth. This suggests that the insights of the ITF Outlook 2008 on the management of greenhouse gases from light-duty vehicles continue to hold unamended.

Figure 5. World LDV Tank-to-wheel CO2 Emissions (Mt of CO2-equivalent), Global economy and Adjustment without and with elastic usage responses



Source: ITF calculations using the IEA MoMo Model Version 2008

4. Projections for aviation

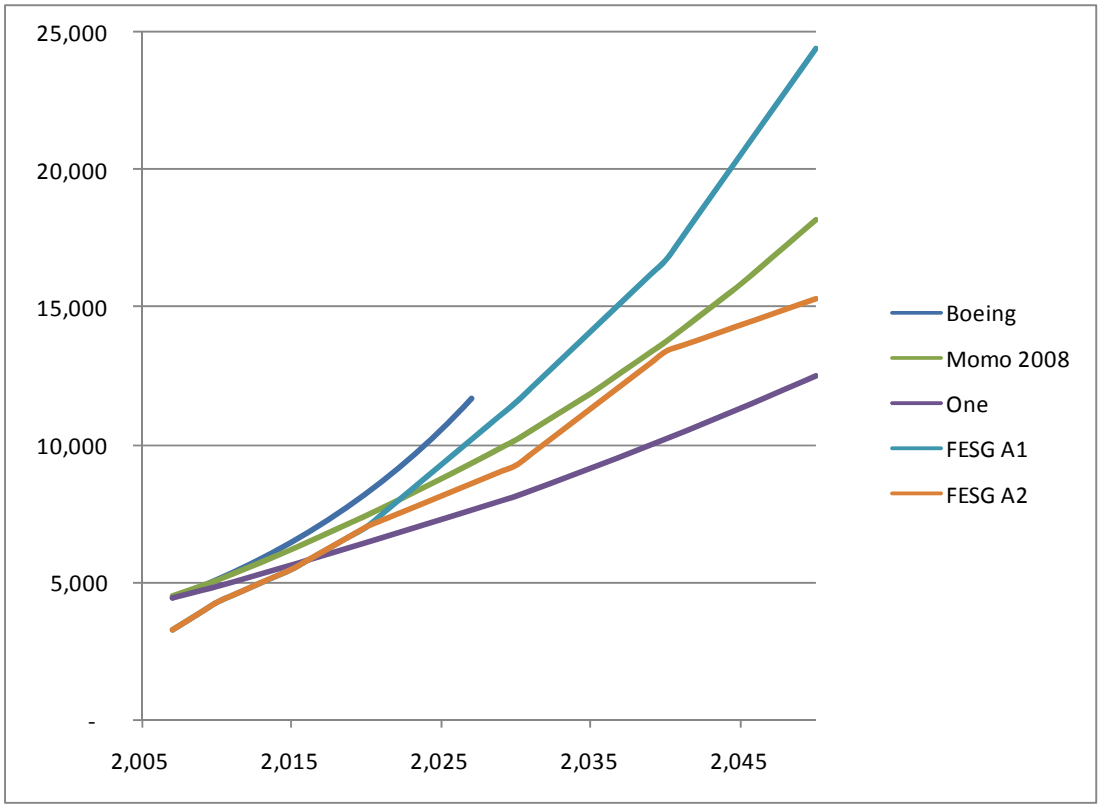
4.1 An overview of projections of world aviation volumes

Figure 6 compares various projections of RPK (revenue passenger kilometre) through 2050:

- "Boeing" shows the Boeing projections through 2027[16]; Airbus projections are strongly similar;
- "Momo 2008" shows the Momo base case for aviation RPK (MoMo is the model used for the ITF Outlook); it is derived from the Boeing forecasts after adapting for different assumptions on GDP growth;
- "One" is a projection constructed using Momo GDP data, Boeing RPK data for 2007, and a GDP elasticity of RPK volumes equal to one, which is lower than in the Boeing and MoMo projections;
- "FESG A1" and "FESG A2" are taken from Owen and Lee (2006)[17], a report for DEFRA on aviation emissions; the difference between A1 and A2 is the assumption on global GDP growth.

16. http://www.boeing.com/commercial/cmo/
17. Owen, B. and D. Lee 2006, Allocation of International Aviation Emissions from Scheduled Air Traffic – Future Cases, 2005 to 2050 (Report 3 of 3), Study on the Allocation of Emissions from International Aviation to the UK

Figure 6. Comparing projections of global revenue passenger kilometres in aviation[18]



Source: see text.

We consider the FESG A1 scenario to be an upper bound. The implied GDP elasticities of RPK demand (using Momo GDP figures) start around 1.3 and increase over time. Especially the increase seems hard to justify. The "One" scenario is a lower bound, with a constant GDP elasticity of one. The reason for choosing a lower elasticity is that (higher) estimated elasticities tend to exceed one but ignore factors like deregulation, openness to trade, etc, so are probably biased upwards (see Oum, 2009[19]). Separately allowing for a positive impact of those factors in the One scenario likely would imply quicker growth until 2030 or so, but the effect would decline over time (Levine, 2009, suggest it takes up to 30

Inventory –CPEG7, Final Report to DEFRA Global Atmosphere Division, Manchester Metropolitan University, United Kingdom.

18. The projections do not include freight; adding freight to get volumes is not straightforward as passengers and freight often share planes. FESG works with fixed ratio's to account for separate freighters. Together with assumptions on occupancy rates (improving slightly over time), and this allows calculating SKO's (seat-kilometres offered), one step closer to calculating emissions.
19. Oum, T.H., 2009, Air transport liberalization and its impacts on airline competition and passenger traffic, paper prepared for the International Transport Forum 2009.

years for the industry to adapt fully to deregulation). The FESG A2 scenario may be considered a reasonable central case. Note that the average growth rate (slope of the curve) for 2030 – 2050 is nearly the same as for the "One" scenario.

It appears likely that aviation will be included in CO_2 emissions trading systems in some regions of the world during the period of this outlook. Research suggests that the impact of incorporating aviation in open trading systems will be to increase the price of carbon as aviation becomes a net buyer of permits.[20] For flights to and from busy airport the economic impact of buying permits is expected to be felt in a reduction of landing right rents, rather than being passed through to ticket prices. The impact of emissions trading on aviation activity levels is thus likely to be modest.

4.2 Accounting for the crisis in projections

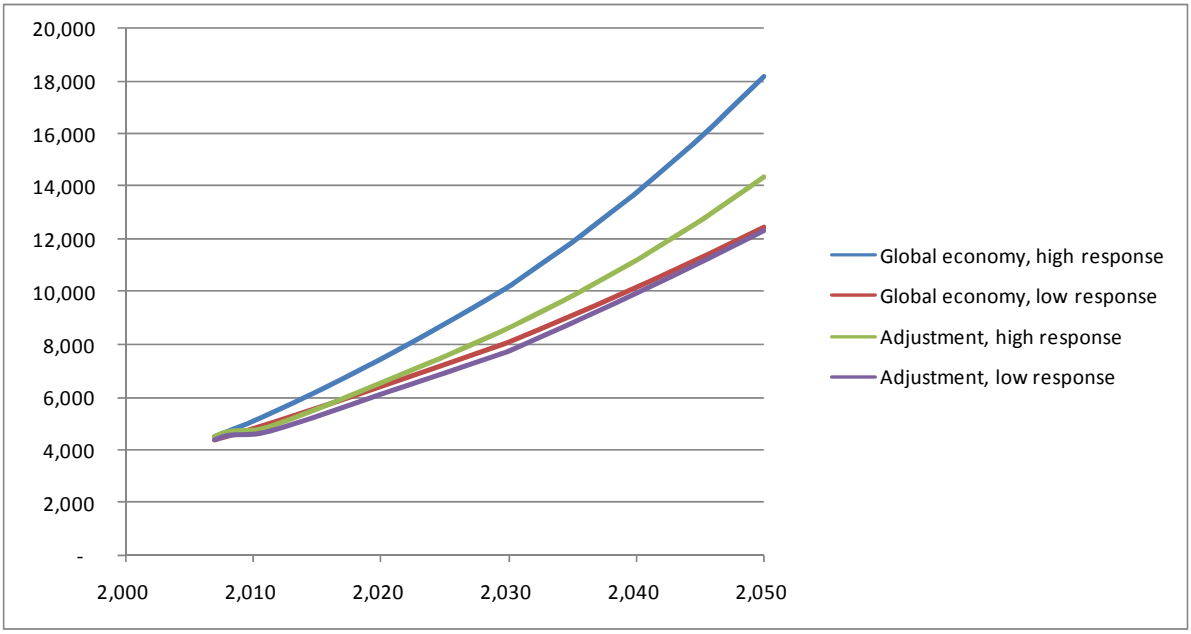
None of the scenarios discussed in Section 4.1 accounts for the current slump. If one assumes that the crisis is transitory and things will return to normal in one or two years, the One scenario can be seen as a roughly downward shifted version of FESG A2. However, the impact of the slump on economic relations is of particular importance for aviation (and for maritime transport). The following expectations for 2009 indicate why: global GDP +0.5% (WEO update 01/09), global trade volume -2.8% (WEO update 01/09)[21], airfreight volumes -13%[22], and passenger traffic -5.7%[23]. The changes in volume are much larger in aviation than in overall GDP. This is partly an aggregation effect, but may also reflect the nature of the crisis: the unsustainability of global imbalances has suddenly become exposed, and the trade flows (transport patterns) associated with these imbalances have imploded accordingly. Since it is not clear that a return to pre-crisis ways is desirable or even feasible, even a return to higher growth paths may imply slower growth in some transport markets, meaning that the big drops may not be completely undone when growth picks up again. That is, the relation between GDP and transport growth may change, with growth becoming less transport-intensive on the aggregate level.

A very rough view of the potential future development of aviation volumes, measured in RPK, is contained in Figure 7. It shows four scenarios that result from different assumptions on the evolution of global GDP, and on how aviation demand responds to increasing GDP. The Global Economy scenario,

20. Kageson, 2009, Making international transport pay its climate bill, paper prepared for the International Transport Forum 2009 ; Forsyth 2009, The impact of climate change policy on competition in the air transport industry, JTRC Discussion Paper 2008-18.
21. The WTO foresees a much larger decline of 9% for 2009 (Press release 554, 23/03/2009).
22. IATA Economics, Industry Financial Forecast table, update 3/2009.
23. Ibid.

discussed in Section 2, abstracts from the current crisis and assumes globalization continues to drive growth as before. The adjustment scenario accounts for the crisis and assumes that globalization continues in a more moderate way, resulting in slower growth. "High response" means, as discussed in Section 4.1, that the elasticity of aviation demand with respect to global GDP is considerably higher than one, so that higher GDP translates into much higher volumes of demand. In the "low response" scenarios, the elasticity of aviation demand with respect to GDP is one. We see the "Adjustment, low response" scenario as the most reasonable one. However, the scenario is conservative in that it ignores the potential for growth in aviation demand from further deregulation in some markets, and adaptation to deregulation in others. The "Adjustment, high response" scenario can be seen as an upper bound of what can be reached with such policy efforts. At any rate, it is clear that a more moderate growth path for GDP translates into slower growth in aviation. If, in addition to slower overall growth, the nature of growth changes in the sense of becoming less trade-intensive, then growth is slowed down further.

Figure 7. Global aviation volumes (RPK) in four scenarios



Source: ITF calculations using the MoMo Model and sources mentioned in text

5. Projections for Maritime Transport

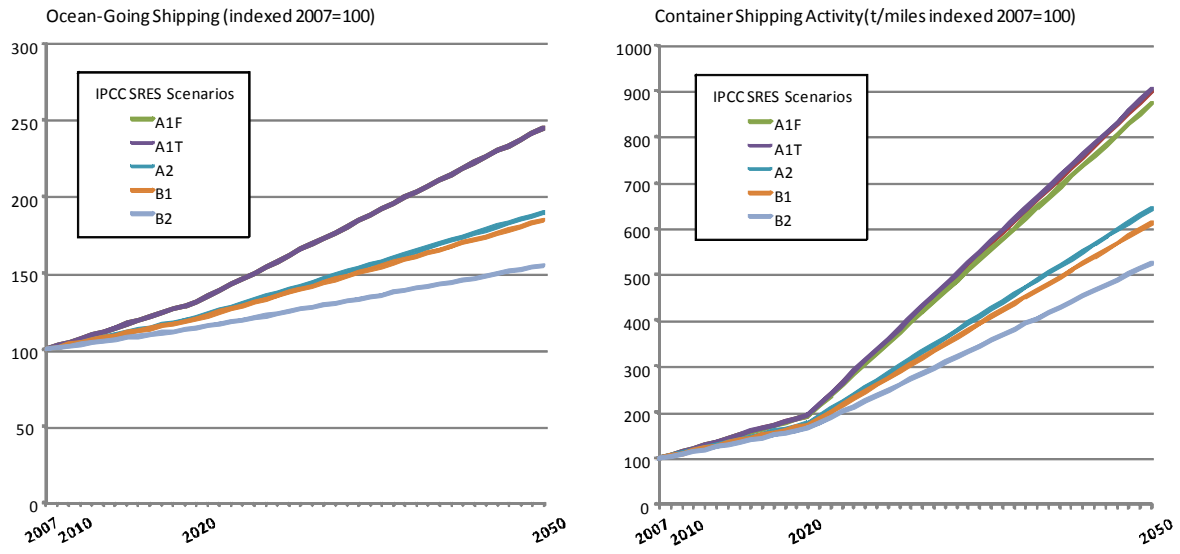
5.1 Projections of world maritime transport activity

Maritime transport activity is based on a multitude of trades, is highly cyclical and tightly linked to international commodity trade and overall economic activity. Insofar as all of these are uncertain, so too are maritime transport activity projections. The most recent of these come from the Japanese Ocean Policy Research Foundation and the International Maritime Organisation (in the context of its re-assessment of CO2 emission trends from international maritime activity). Insofar as the latter takes into account the former, we will focus on the IMO projections in this section.

IMO (Buhaug, Ø, et al, 2008[24]) estimates future fuel use and CO2 emissions from shipping activity for 2020 and 2050[25]. It uses a model based on 3 driving variables (economic activity, transport efficiency and embodied fuel energy) which, in turn, are related to a number of secondary variables e.g. population, regional economic growth, oil prices, technical efficiency improvements, etc.). Macro-economic, energy use and demographic variables are drawn from the IPCC SRES family of scenarios[26] and extrapolations of historic trends are adjusted[27] according to specific factors such as pipeline construction, iron scrap demand and new sea routes that are likely to have an impact on maritime transport demand. These adjustments reduce maritime transport demand projections by up to half of what might otherwise have been expected by extrapolating past GDP-maritime transport activity trends. IMO's central estimates for indexed future activity (indexed to 2007 tonne-miles) are set out in Figure 8.

24. Buhaug, Ø., Corbett, J. J., Endresen, Ø., Eyring, V., Faber, J., Hanayama, S., Lee, D.S., Lee, D., Lindstad, H., Mjelde, A., Pålsson, C., Wanquing, W., Winebrake, J. J., and Yoshida, K., 2008, Updated Study on Greenhouse Gas Emissions from Ships: Phase I Report**,** International Maritime Organization (IMO) London, UK, 1 September 2008.
25. The Japanese Ocean Policy Research Foundation (Ocean Policy Research Foundation, 2008) study estimates future levels of maritime activity and CO2 emissions. While the OPRF and the IMO studies are different in approach and in some of their findings, the (slightly) more recent IMO study has sought to incorporate the findings of the OPRF study and thus will be used as the main basis for discussing future maritime activity and emission trends.
26. The IPCC SRES family of scenarios portray the future along two sets of opposing tendancies; the first is characterised by more focus on economic versus environmental values (A.x vs. B.x) and the other set by greater globalisation versus more regionalisation (x.1 vs. x.2). For more information, see http://sedac.ciesin.columbia.edu/ddc/sres/index.html
27. In fact, the IMO study averages two approaches: one based on extrapolation of past GDP/Activity trends and another, based on the Japan Ocean Policy Research Foundation study that seeks to adjust the extrapolated trends to account for likely changes in the structure of maritime activity.

Figure 8. Indexed Maritime Traffic Forecasts from IMO (tonne miles)



Source: Source: Buhaug, Ø, et al, 2008

IMO projects that overall maritime tonne-miles grow by ~30-46% by 2020 and by ~150-300% by 2050. However, container activity is expected to grow much more vigourously, more closely following past trends: 65-95% by 2020 and 425-800% by 2050. Growth in container movements has important GHG repercussions as the average installed power on container vessels is higher than on most other types of vessels due to higher speed requirements. The upper bound for the growth projections are based on two similar scenarios that are roughly based on greater globalisation, albeit with lower population growth, more income convergence and better energy efficiency than could be expected if recent trends were simply extrapolated. The lower bound of the projections in figure 8 are based on IPCC SRES scenario B2 which is roughly analagous to the "retrenchment" scenario discussed earlier, albeit with reduced material intensity (and thus leading to a significant reduction in maritime trade).

5.2 Accounting for the crisis in projections

The IMO released its report in September 2008 – it does not account for the recession which at that time was only embryonic. As pointed out earlier, the recession has had a much more than proportional impact on trade volumes and thus on maritime transport activity.

This has resulted in an oversupply of capacity on most container trades, the likes of which has not been seen since the early 1980's. In response, vessel owners have idled vessels – in May 2009 almost 10% of the world container fleet capacity was inactive (1.1 million TEU's). Depressed GDP growth forecasts and tight credit markets mean that relatively fewer container (or other) vessels will be ordered over the next few years thus retarding the penetration of the most recent fuel saving designs and technologies after the current backlog of newbuilds are delivered.

As demand for finished goods has retreated, so too has demand for primary commodities such as ores, coal and oil, and intermediate commodities such as steel. This has led to a precipitous drop in demand for bulkers and tankers. Charter-party rates for these vessels have crashed (e.g. the Baltic Dry Index which covers bulk ship charter prices fell nearly 97% from July 2008 to December 2008 before recovering slightly in Q1 2009) effectively removing much of the short-term incentive for ordering new vessels – again, retarding the penetration of fuel saving designs and technologies. Just as with container vessels, owners have laid-up bulk vessels – in April 2009, 314 vessels or approximately 5% of available tonnage of bulk vessels above 10 000 dwt had been idled.

Idling vessels has been an immediate response to the drop in demand but many owners have also sought to scrap their older, less economic vessels. This has not been without consequence on the scrap value for vessels which has dropped from approximately $750/ldt in the summer of 2008 to $250/ldt in May, 2009. The drop in scrap vessel values has an incidence on fleet renewal as owners may wish to now hold on to vessels while waiting for higher scrap values in order to regain some of the residual capital value of their ships. Many ship owners have cancelled newbuild orders – even when this has entailed penalties. Det Norske Veritas estimates that by May 2009 orders for 325 bulk carriers, 47 tankers and 78 container vessels (37 million dwt overall) worldwide have been cancelled.

Clearly, the recession has modified the face of the world fleet. What is unclear is what impact the recession will have on future trade volumes and levels of maritime activity. Already, maritime trades had changed in response to the growth leading up to the summer of 2008. Export-led industrial production and related energy requirements had led China to move from being a net exporter of coal to a net importer. As a knock-on impact, countries that used to source coal from China had to source it from countries further away, leading to a rise in bulk trade expressed in tonne/kilometres. Future demand for bulk commodities in China and elsewhere in the developing world will likely impact trading patterns in the years to come.

How trade patterns are impacted by the recession will also hinge on the way domestic savings and consumption are impacted by the recovery and how these, in turn, affect international trade.Should

households in OECD countries reduce debt and increase savings, consumption of finished goods from developing countries (principally China) might drop – and this would impact container vessel activity. A rebalancing of China-OECD trade flows might relieve imbalances in the trans-Pacific and Asia-Europe container trades—but imbalances are likely to remain albeit at a lower scale. At the same time if savings-rich countries, like China, increase domestic consumption, demand for bulk commodities may increase thus leading to a relative increase in bulk shipping volumes.

A final factor to consider is the impact of the recession on maritime transport energy prices and how this might impact CO2 emissions from the sector. Reduction in maritime activity will likely be accompanied, but not offset, by a slower rate of uptake of fuel efficient technologies and designs due to reduced fleet turnover in the short- to medium-term. Lower oil prices (or at least stable oil prices – if supply of cheap oil wanes over the medium term) as a result of softening demand will further reduce the fuel efficiency imperative for newbuilds while, at the same time, lowering pressure to implement operational fuel savings. Under the current market and regulatory structure of maritime transport, it is not at all clear that CO2 reduction imperatives will in any way replace fuel cost imperatives -- it is therefore highly unlikely that maritime fuel efficiency will increase at a higher rate than has been historically observed for the sector absent additional policies. Overall, the CO2 impact from reduced economic activity will likely more than offset the CO2 impact from slower uptake of fuel efficient designs and practices.

All of these factors point to the importance of targeting CO2 emission reductions from vessel *operation*, and not just *design*. While the proposed *Energy Efficiency Operational Index* currently being discussed at the IMO represents one such measure, if it were made to be voluntary, it may become largely ineffective. Emissions trading or fuel levies, also under discussion at the IMO, may be a more effective approach.

Despite the difficulty in forecasting what future growth will look like, it is clear that the economic downturn of 2008-2009 will postpone forecast growth in maritime trade, resulting in lower activity levels than had been projected by IMO. Barring major structural changes in world trade patterns, the recession will delay maritime activity growth for a few years, without fundamentally changing projected trends. In terms of the forecasts portrayed in Figure 8, a temporary lull in growth followed by slower recovery of container activity and rebalanced trade patterns would result in forecasts somewhere below the most optimistic "globalisation" scenarios (scenarios A1F/A1T) and somewhere above the more regional-based economic growth scenario (A2).

6. Concluding remarks

The current financial and economic crisis is likely to be followed by more moderate global growth. The more moderate growth path is likely to be less trade-intensive than over the past 10-20 years. We expect globalisation to continue to develop but resulting in a somewhat slower rate of growth than over the last decade as a consequence mainly of a rebalancing in US-China trade and financial flows.

This scenario seems likely but is by no means certain. For one thing, protectionist policies in response to the crisis would seriously undermine future growth. Conversely, accelerated liberalisation of transport markets could contribute to higher levels of GDP, for example through open skies for aviation in all markets and through the liberalisation of cabotage in trucking and coastal shipping. This is illustrated by the critical importance of deregulation to the outlook for aviation.

The transport sector provides useful opportunities for stimulus spending. But a stimulus is short-term by definition, and sensible exit strategies are needed. Investments with long-term impacts need careful assessment before they are implementend, so are not necessarily the best candidates for inclusion in stimulus programs. Future transport funding may become even scarcer than it was before the crisis.

If the economic crisis develops as currenly foreseen, with close to zero growth in 2009 and 2010 and then a return to long term historical average growth rates, the overall effect on transport activity will be roughly to delay growth by five years. For climate change policies this is of minor importance. Long term emmisions standards for light duty vehicles, in tandem with appropriate price signals, will have more impact than any other measure, producing the regulatory certainty needed by manufacturers to invest in fuel efficient technology. This certainty is critical even for conventional technology with very short payback. Efficiency standards could address similar market imperfections in aviation and shipping and could reduce emissions from aviation and also maritime shipping more than emissions trading.