International Transport Forum

Implementing Sustainable Urban Travel Policies in China

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INTERNATIONAL TRANSPORT FORUM

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SUMMARY

Urban transport will have a great impact on sustainable development. China is now the leading producer of motorized vehicles, and people have gradually realized that we cannot sustain endless motorization. China has adopted a sustainable development policy for many years, promoting public transport in successive five-year plans.

For many cities the car is now the major source of pollution. Action at the local level is very important, but urban planning and urban transport are still considered to be a local affair by the central government. At the same time, policies established in various departments of the central government have a great impact on local decision making. Because of the segregation of government departments, coordinated policy-making will not arrive quickly. Several cities, including Beijing and Shenzhen, have tried to establish one organization to deal with all functions related to transport construction. In general, however, the local level cannot deal with the complexity of the urban transport problem. A comparison of urban transport in Beijing and Shanghai reveals city-specific factors that influence sustainable urban transport policy.

Subway construction is a high priority in many megacities and large cities. Having learned from the experience of Hong Kong and Japanese cities, high density development around metro, or subway, stations is now widely accepted by local governments. More than ten cities have introduced a bus rapid transit system. Arguments about bus rapid transit construction are very serious. The deficit problem will soon emerge in cities whose metro network is too ambitious. As an isolated project without multi-modal network support, a metro will not be able to easily improve the mobility of a whole city.

Technical standards for development do help city planners deal with high population density and provide fundamental space for public transport, including guaranteed bike paths in many cities. However, the technical standards were published more than ten years ago. We need to revise the technical standards according the sustainable development principle.

With the improvement of urban transport, we also can alleviate the effect of a divided society. Bicycles and e-bikes provide fundamental mobility for people with the lowest incomes, if they are physically capable of using them. The low-fare policy of Beijing, in which a single fare covers even the longest metro journey, has been followed by many cities. While this reduces travel expenses with heavy government subsidy, we must explore a more target-oriented policy.

Well-established legislation protects the rights of disabled persons and great efforts have been made to improve their living conditions, including construction of barrier-free transport, for example in Beijing. With an ageing population that will considerably increase in the near future, China still lacks resources and knowledge. Government must pay great attention to this issue. Some recommendations are suggested:

Strengthening the synchronization of central government with local government on sustainable transport strategy

There is stronger political will from central government to realize the "energy saving, environment friendly" and harmonious society, but local government has more responsibility for urban planning and local transport strategy. Pressured by the demands of economic growth, cities are chasing endless urgent problems one by one and cannot put priority on sustainable development, so more efforts are needed to enhance the capacity of local government. There are also conflicts between government departments, and establishing consensus is a prerequisite to achieving sustainable development.

Implementing the car restriction policy in cities nationwide

Currently car ownership is very low in China, and for most people the car is not an essential tool for living. But if most people establish a lifestyle that depends upon the car, then it will be very difficult to reverse the process. It is better to apply economic measures such auctioning licenses and charging tolls and parking fees to control car ownership or usage. The revenue can be used to improve public transport. This policy must be applied nationwide; otherwise it will be useless or result in conflicts between cities.

Adopting car-less principles in urban planning

In current urban planning practices, land use is shaped by the road network. This implies that more people will use cars as incomes grow. The level of access to public transport should be used as a criterion for granting development permission or for collecting an impact fee from projects which cannot meet the basic requirement. Poly-centric urban forms with high quality public transport links to the employment/activity centers should be encouraged to shorten travel distances, and high quality public transport should be provided as a competent alternative to choosing a car for long distance travel.

Putting top priority on pedestrians and bicycles

In China, because the urban fabric evolved slowly for a long time with the characteristics of mixed use and high density, non-motorized travel still plays an important role. When top priority is given to pedestrians and bike users, the desire to drive a car will decline. A high quality pedestrian environment is also good for encouraging ageing people to take part in outdoor activities.

Guaranteeing equity in transport construction and service provision with a target oriented policy

In the case of Shanghai, even a high quality public transport project like the metro system cannot automatically ensure social equity due to the high fares. A specific policy must be prepared to target all social groups instead of a standardized solution which benefits privileged people in most cases. Public participation must be encouraged in decision making.

Establishing public transport priority development corridors

During urban expansion, public transport priority development corridors should be constructed with metro, bus rapid transit or bus lanes before people have become used to cars to access activities or living space. High density development should be encouraged along this corridor so there will be enough passengers to ensure economic vitality and service quality of the public transport.

1. INTRODUCTION

China is now undergoing rapid urbanization, unprecedented in the world. The urban share of the total population grew from 26.2% in 1990 to 46.7% in 2010. The urban population increased by almost 350 million over the last 30 years. The process is driven mainly by the rapid growth of export-oriented industry and service sectors, and the physical expansion of cities into outlying rural areas, causing on-site conversion of the population from rural to urban.

Due to the higher transport cost from the hinterland area to the coastal region, the increase in affluence and of urban population is concentrated in regions such as the southeastern coastal provinces where there is great development opportunity close to the major seaports. The big cities are growing bigger. For example the population of Shanghai increased from 12.8 million in 1990 to 23.0 million in 2010.

To accommodate the population and economic activities, the urbanized area has expanded. However, such expansion becomes excessive due to distorted incentives. Cities offer discounted or free land to attract foreign direct investment and businesses, and they give land concessions for industrial and real estate development in return for financial gains. Both processes distort the planned land use and transport structure. The expansion of cities lengthens travel distances and encourages a strong desire to drive by car.

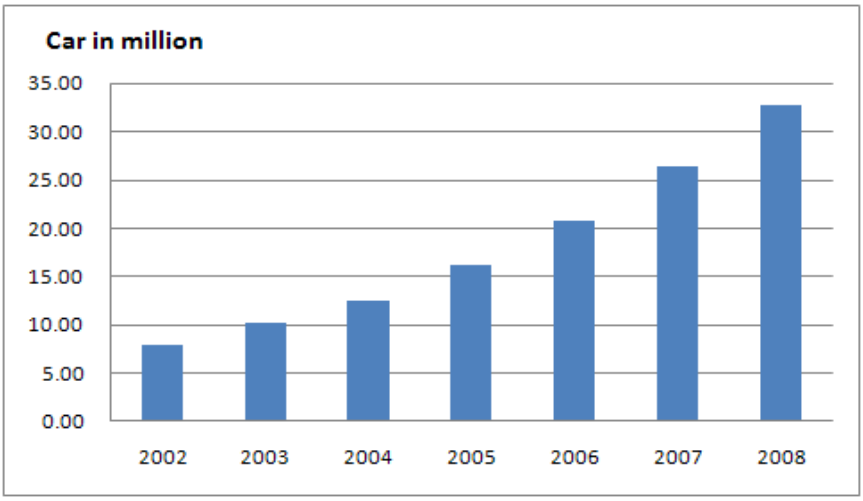
Moreover, the rapid motorization in China (Figure 1) occurred during a crucial period of social transformation characterized by the strong dynamics of globalization, urbanization, fiscal decentralization, and the transition from central planning to a market-based economy. To a great extent, all these factors have shaped the urban transport problems and contributed to the success and failure of urban transport development[i].

China's government designated the automotive industry as one of the pillar industries of the national economy from early 1990s. This was followed by the promulgation of an automotive industrial policy in 1994. The policy made it clear that the development of the automotive industry should rely on the domestic market for private cars. The number of registered cars increased from around one million in 1994 to 7.8 million in 2001, and to 32.7 million in 2008.

The production value from auto manufacturing in 2009 exceeded CNY 3 000 billion (yuan renminbi) or USD 370 billion. Obviously, the automotive industrial policy is a major success in driving the national economic growth and capturing the domestic market. However, automobiles are always associated with the problems of congestion and pollution. Now even in the middle sized cities there is serious congestion, especially during the rush hour. People argue about how many cars can be accommodated in China.

In metropolitan areas and other large cities, the rapid growth of the middle-income class, the aging of the residential population, and the influx of low-income young labourers pose an increasingly diversified range of demands for urban transport services in terms of quality, trip patterns, and affordability. We are facing great challenges to realize a sustainable urban transport strategy in China.

Figure 1. **Car growth in China**



2. INSTITUTIONAL FRAMEWORK

Under the decentralized arrangement, municipal governments take primary responsibility, both functional and fiscal, for urban infrastructure including urban transport. The responsibilities of the national government are limited to the review and approval of urban master plans and large urban transport investment projects (including mass rail transit), setting technical standards and policy guidance and promoting knowledge exchange. However, the rapid economic changes and growth at the local level make it increasingly difficult for the national government to review and approve urban master plans and investment projects. At the city level, there are often several agencies involved in urban transport policy and management. For example, Shanghai has the Urban Planning Bureau and the Urban Construction and Transportation Committee.

The function of urban transport governance in mainland China could be divided into four areas:

- Renewing transport plans.
- Formulating urban transportation policy.
- Adopting new financing strategies and technologies.
- Restructuring the department's organization and institution.

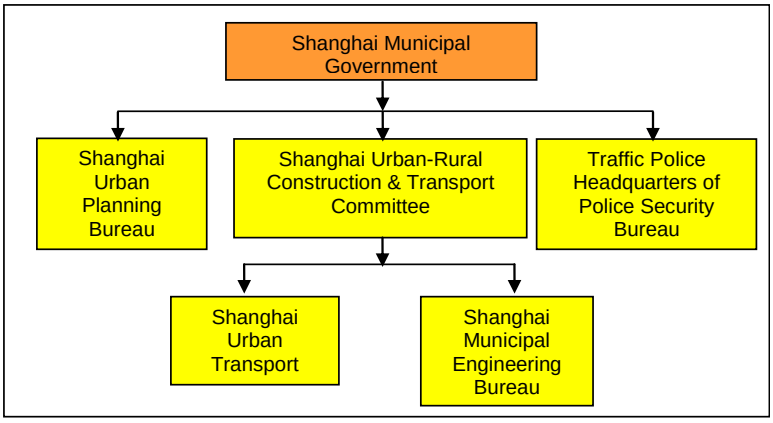
The organization structure and management function of urban transport institutions in China mainland can be classified in three categories (Table 1). In Model A, there are too many agencies to coordinate urban transport planning, which may result in conflicts between different agencies. In some cities, all the departments related to transport are merged together as described in Model C; a single transport commission is responsible all the modes of transport within a city and to other cities. Even in this model differences may arise during internal negotiation between various sections of the transport commission.

Table 1. **Three transport management models in China**

Model types	Model A	Model B	*Model C*
Management system model	Multiple regulations on transportation by urban transport bureau, municipal engineering bureau, urban construction department, police security bureau, etc.	Overall regulation on urban and rural transportation	*General regulation on transportation*
Examples of cites	Kunming, Chengdu, Fuzhou, and Nanning	Shenyang, Harbin and Lanzhou	Beijing, Shenzhen and Wuhan
Main duties	Urban transport bureau: regulations on highway transport, highway construction and water transport. Municipal engineering bureau: regulations for buses and taxis. Construction department: planning and construction of roads.	In addition to highway planning and construction and water transport regulation, the urban transport bureau is also responsible for the overall regulations on highway transport, urban transport, buses and taxis.	The urban transport commission is a department of municipal government responsible for the regulations on transport planning, roadways, highway transport, water transport, public buses, taxis, urban railway, air transport and other transports.

To strengthen urban transport construction in Shanghai (Figure 2, Table 2), especially for the metro and motorways, the Urban Transport Bureau, which is generally responsible for management of public transport and the transport industry, has been merged with Urban-Rural Construction Commission. Usually an urban planning bureau will prepare a master plan and a comprehensive urban transport plan with urban transport strategies and a plan for transport infrastructure construction. The Municipal Engineering Bureau is in charge of road and bridge construction. The Urban Transport Bureau is responsible for regulation and administration of the public transport system.

Figure 2. **Organization structure of transport institutions in Shanghai**



At the national level the administration function for urban public transport has been shifted from the Ministry of Housing and Urban-Rural Construction to the Ministry of Transportation. The National Development and Reform Commission will evaluate the planning of intercity railway and metro lines, and the Ministry of Railway will be responsible for construction and management of intercity rail. Both agencies work closely with the Ministry of Housing and Urban-Rural Construction.

Table 2. **Management function of transport institutions in Shanghai**

Institution		Management function
Shanghai Urban Planning Bureau		• Coordinate various specialized planning including transport planning and urban transport strategy
Shanghai Urban-Rural Construction and Transport Committee	Shanghai Urban Transport Bureau	• Formulate policy guidelines and industry criteria • Formulate public transportation service standards • Nourish the transportation market • Construct, maintain and administer urban roads and bridges
	Shanghai Municipal Engineering Bureau	
Traffic Police Headquarters of Police Security		• Manage road traffic • Promote order and security on public streets • Administer motor vehicles, non-motor vehicles and vehicle drivers • Prevent road traffic accidents

3. POLICY FRAMEWORK

As the urbanization process tends to proceed at a quicker pace in China[1], it is predicted that, as of 2050, China's urbanization level shall exceed 70%, a record that no country in the world has shared[2]. With the soaring economic growth and urbanization process, various pressures from the environment, society and regional development are imposed on China's urban development. How to solve contradictions arising in the urbanization process, especially urban energy consumption and automotive exhaust emissions, while maintaining fast and steady economic growth, has caused great concern in the Chinese government[3].

In 1994, the Government approved and published a white paper on population, environment, and development. It set sustainable development of population, resources, and environment as one of the national policies governing the formulation of medium and long term economic and social development plans and the urban master plans.

The Eleventh Five-Year plan (2006-2010) called for energy consumption per unit of GDP to decrease by 20% or so and total emissions of major pollutants by 10%[4].

The debate on urban transport policy is increasingly covered by the mass media. With rising recognition of the energy and environmental problems (including loss of agricultural land) associated with rapid urban motorization, the national government is trying to find a balanced urban transport strategy.

National leadership also places a new emphasis on people-centered development and balanced urban-rural development. It has long been recognized that to solve the urban transport problem, we must provide an efficient public transport system. Serious attention has been given to public transport by some top government leaders for quite a long time.

1. National Bureau of Statistics of the People's Republic of China, CHINA STATISTICAL YEARBOOK 2007. 2007, Beijing: China Statistics Press. 1028.
2. Sustainable Development Strategy Study Group, Chinese Academy of Sciences, 2003.
3. ZHU, C., Holding an Objective View of the Grim Situation of China's Energy Conservation & Pollution Reduction. Sino-Global Energy, 2007. 5: p. 1-6.
4. JIN, S., WWF starting the China Low-carbon City Development Project. Environmental Protection, 2008. 2A: p. 22.

The Ministry of Construction issued guidelines on public transport development in April 2004. In May 2004, Premier Wen Jiabao made it clear that “giving priority to urban public transport development is a correct line of strategic thinking that suits the reality of China’s urban and transport development.” On September 23, 2005, the State Council issued a document endorsing an opinion by the Ministry of Construction on the priority of urban public transport.

In December 2006, the Ministry of Construction, the National Development and Reform Commission, the Ministry of Finance and the Ministry of Labor and Social Security issued the "Advice on Economic Policy for Priority Development of Urban Public Transport," which clearly states that public transport is an important urban infrastructure in the city. Like education and health care, public transport service is a basic public service provided by government. City government and bus companies have the responsibility to provide affordable, convenient, comfortable and efficient basic transport services for people.

Priority for public transport development policy was listed as one of the main points of the State Council for the first time in 2007, and for the first time public transport development priority was mentioned in the State Council’s official document, “Comprehensive Energy Reduction Work program.” The document said that cities should “speed up the construction of rapid public transport and metro” to reduce energy consumption in urban transport. The function of urban public transport management shifted to the Ministry of Transportation from 2008. Increasing the public transport modal share to 40% for cities with a population over 10 million has been proposed in “Twelfth Five-years urban public transport development outline” by the ministry. The Urban Public Transport Regulation is now considering the proposal[5].

Because of the decentralization of government functions, municipal governments take primary responsibilities for urban transport, and the capacity at the city level is very limited for most cities. Technical standards were needed to guide the planning practice at the city level. The technical standards for urban land use, such as “Classification of Land in Cities and Standards for Land Use of Construction Project[6]” and the strict agriculture land protection policy (such as forbidding detached houses), guarantee relative high housing density, which may contribute to short travel distances. Several items within the state code of Urban Road Transportation Plan and Design Criterion (GB 50220-95) are very important to guarantee space for public transport, bicycles and pedestrians in urban planning and design:

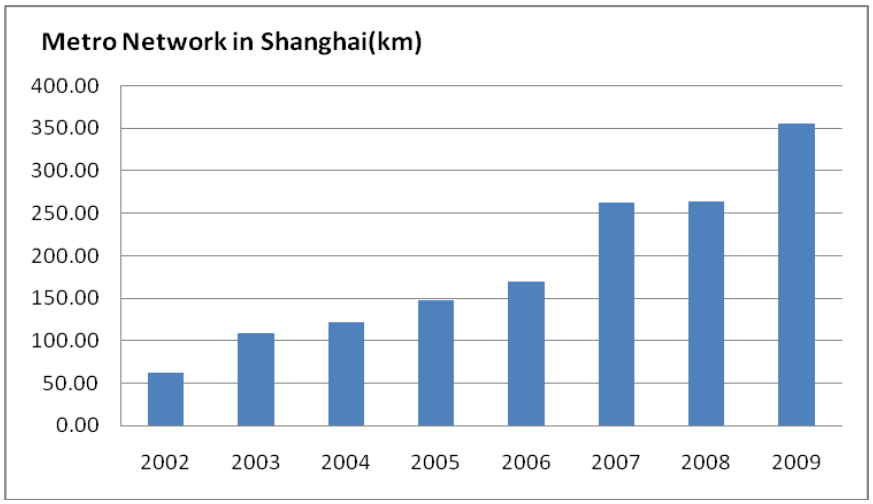
- Facilities in bus stations, vehicle maintenance stations, commutating stations, etc., should match the development scale of public transport, and land for that purpose should be guaranteed in the master plan.
- Segregated bike lanes must be constructed along major urban roads. It is very important for people to ride bicycles safely. In planning, we should establish a network that can assure the continuous movement of bicycles, comprising separate roads for bicycles, paths for bicycles on the sides of arteries, city branch roads and roads in residential areas.
- The bus service coverage rate at radius of 300 meters should not be less than 50% of the city land use area. The bus service coverage rate at radius of 500 meters should not less than 90%.

5. www.gov.cn/gzdt/2010-10/22/content_1728326.htm.
6. The Ministry of Construction of PRC, *Classification of Land in Cities and Standards for Land Use of Construction Project*, March, 1990.

Those requirements are very positive for sustainable development. However in middle 1990s, to improve productivity of public transport service and to reduce the government's financial burden, bus enterprises revised the contract with bus drivers and conductors, whose income is now tied to ticket sales. The market-driven principle in public transport is the major obstacle to adjusting bus networks to improve service in areas of less demand while many bus lines run on major roads. Public transport is also seriously threatened by growing road congestion, long queues at bus stops and the continuing shift to private cars. With the expansion of a city, the road network — instead of the public transport network — is commonly used in urban master plans as an instrument to shape the urban land use.

Local governments now face increasing political pressure to improve mobility for all the people. Beijing is the first city to implement a single low fare for public transport with heavy public subsidies and the first city to run bus rapid transit in China. Shanghai recognized long ago that it is impossible to accommodate the fast motorization in city, and an auction policy for car license plates has been used to control car ownership, despite heavy criticism by car industry lobbies. In the meantime heavy investment has been put on metro construction (Figure 3).

Figure 3. **Metro Network Length in Shanghai**



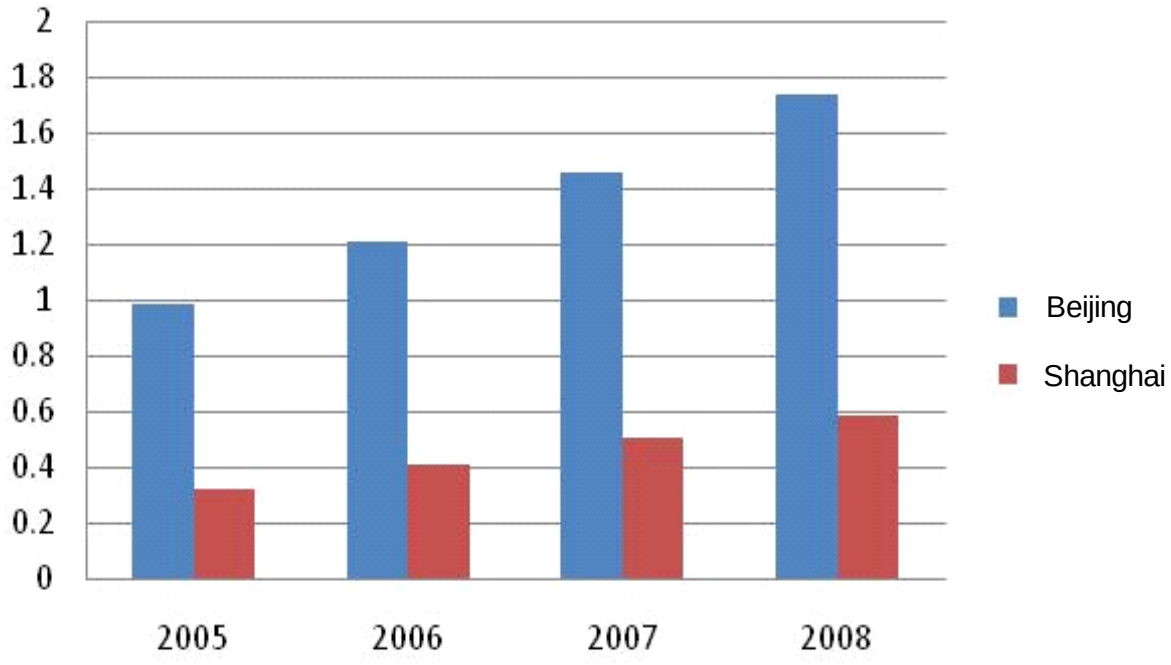
With strong support of local government, Hangzhou is the first city in China to apply public transport priority policy to a public bike renting system. It is now widespread in the city and draws much attention from other Chinese cities trying to pursue a low-carbon city strategy.

Comparing the car ownership of Beijing and Shanghai, it is clear that urban transport strategy at the city level is very important for sustainable development. Private car ownership and use are determined not only by household incomes, but also by city-specific factors such as urban spatial structure, parking space available, availability of alternative transport modes and especially public policy. Beijing and Shanghai are two mega-cities with comparable per capita incomes and population sizes, but Beijing has far more private cars than Shanghai (Figure 4). While land use and transport conditions differ between the two cities, local policy interventions such as tight control of car ownership in Shanghai appear to have helped slow down the growth of private cars there.

The growth of private car ownership in cities will continue to be driven strongly by household income growth, but its pace could be guided by local public policies. Controls on car density will also provide local governments with time to develop high quality public transport systems. A coordinated regional policy is also very important. Although Shanghai has tight control of car

ownership, the areas surrounding Shanghai have no limits to car ownership, and many cars bearing license plates from other provinces can be seen driving in Shanghai. Shanghai has been forced to expend the motorways to surrounding provinces to accommodate the growing car/truck traffic between Shanghai and other cities.

Figure 4. **Private cars in Beijing and Shanghai (million)**



4. INTEGRATION OF URBAN TRAVEL AND LAND USE POLICY

Urban planning legislation has been established since 1989. All the land in urban areas is owned by local governments, so that cities can plan for both land use and transport infrastructure on a large scale. The urban planning process is supposed to provide a blueprint for sustainable urban transport development. Generally the development direction and land use will be studied. Regional transport infrastructure is the major concern in master plans, and specific sections on urban transport strategy and infrastructure include plans for:

- The road network.
- Public transport network, facilities, terminals, etc.
- Parking spaces.

Construction of the road network will have a high priority in the plan. After the master plan has been approved or while it is being prepared, urban transport planning with a detailed travel survey will be conducted to verify and refine the urban transport strategy and the capacity of transport infrastructure based on the master plan's projection of land use patterns and population. For example in Guangzhou the Refined Metro Network Plan with a 750 km metro network and Refined Road Network Plan was prepared in 2008, after the approval of the Revised Guangzhou City Master Plan (2001-2010) in 2005 by State Council.

In the largest cities, plans for rapid public transport will be prepared, especially for the metro system but also for bus rapid transit. Because of the high construction and operation cost of metros, a city needs permission from the National Development and Reform Commission. From the experience of transit-oriented development in Hong Kong and Japan, high density development around metro stations within a radius of 1 500 meters is encouraged[7]. The Nine Cloud project, located at Zhongshan Park Station of Metro Line 3 in Shanghai (Figure 5), occupied an area of 2.59 km^2. Because the developers provided a connection between Metro Line 3 and Metro Line 2, they received an incentive to increase the development density to a floor area ratio (FAR) of 8.04 from the original FAR of 6.7. Now the project is a prosperous sub-center in Shanghai.

Figure 5. **The Location of Nine Cloud Project in Shanghai**

Each city is now asked to provide public transport service in areas of urban expansion and improve the service in the built-up area of the city. Many medium sized cities are preparing a public transport plan to implement the strategy mentioned in master plan. The authority responsible for public transport service will take this plan as a reference for:

- Land allocation from the government for public transport facilities such as bus stations, terminals and maintenance yards.
- Definition of the public transport corridor for new bus lines and stops.
- Requests for subsidies from government budgets.

According to the Code for Planning and Design on Urban Residential Areas[8], we still emphasize the concept of the neighborhood unit to provide residential areas with basic public service facilities such as a vegetable market, primary school and health care service. This regulation can shorten the travel distance to basic services accessible by non-motorized transport.

7. Shanghai Urban Planning Bureau, Technical specification for regulatory detailed plan of Shanghai. Dec. 2010.
8. The Ministry of Construction of PRC, *Code for Planning and Design on Urban Residential Areas*, March, 2002.

According to the Code, the layout of residential areas can be divided into residential district, residential quarter and residential clusters, as well as independent clusters (Table 3).

Table 3. **Population of residential areas**

	Residential District	Residential Quarter	Residential Cluster
Households	10 000-15 000	2 000- 4 000	300-700
Population	30 000-50 000	7 000-15 000	1 000-3 000

The construction of public buildings in residential areas should be in accordance with the population and the facilities must be incorporated into planning, built and put into use at the same time as residential buildings. In urbanized areas, the ground floor is allocated for shops and small offices.

Table 4. **Residential Public Service Facilities Standard (m^2) per 1 000 residents**

	Residential District		Residential Quarter		Residential Cluster	
	Building Area	**Land Area**	**Building Area**	**Land Area**	**Building Area**	**Land Area**
Total	1 668-3 293 2 228-4 213	2 172-5 559 2 762-6 329	968-2 397 1 338-2 977	1 091-3 935 1 491-4 585	362-856 703-1 356	*488-1 058* 868-*1 578*
Education	600-1200	1 000-2 400	330-1 200	708-2 400	160-400	*300-500*
Hospital	78-198 178-398	138-378 298-548	38-98	78-228	6-20	*12-40*
Culture and Entertainment	125-245	225-645	45-75	65-105	18-24	*40-60*
Commercial	708-910	600-940	450-570	100-600	150-370	100-400
Community Service	59-464	76-668	59-292	76-328	19-32	*16-28*
Financial	20-30 60-80	25-50	16-22	22-34	-	-
Infrastructure	40-150 460-820	70-360 500-960	30-140 400-720	50-140 450-760	9-10 350-510	*20-30* *400-550*
Administration	*46-96*	*37-72*	-	-	-	-

The index provides a basic criterion for designing urban residential areas (Table 4). Meanwhile, real estate development enterprises will also make their decisions on household types and facility distribution according to market demands. However, during the actual process of development, because the local government cannot always provide a beautiful, healthy and green environment, some residential districts will be enclosed by walls, thus resulting in a super street block which is less accessible by non-motorized transport. The distance to bus stops will be greater than the acceptable walking distance, and the result will be more private motorized trips[9].

However, the master plan has weaknesses. The first problem is that usually the master plan is too ambitious, covering a wide range of subjects related to urban development with limited information available on performance. There little analysis of the vision to be realized. For example, the vision to make the urban public transport system a backbone of development has been stated in almost each city's master plan, but even now, the transport modal split by bus is only 10-20% on average. Some cities have increased the modal share of public transport at the cost of walking and bicycling. More road space is allocated to accommodate motorized modes of transport. More attention has been put on efficiency than on sustainable development in urban planning.

9. Pan, H. X., Q. Shen, and M. Zhang. 2009. Influence of Urban Form on Travel Behavior in Four Neighborhoods of Shanghai. Forthcoming in *Urban Studies*, Vol. 46, No. 2, pp. 274-294.

The second challenge facing most large cities in China is how to overcome the inherent rigidity of the urban master plan to provide the necessary flexibility for meeting the rapidly growing demand for urban services. Currently, the process produces a 20-year urban master plan and a number of associated sectional plans for a planning area defined by jurisdiction. But many unanticipated events arrive to impact the implementation of the master plan, such as population growth, national economic development strategy and regional transport infrastructure. For example, Guangzhou must adjust its well-planned metro network to connect it to the high speed train station, which the national railway authority decided to locate far from Guangzhou city. The local government can also adjust the master plan through short-term construction plans. Because the short-term construction plan gives less consideration to coherence with sustainable development goals, it will be very difficult to organize a green transport system.

The policy of giving priority to urban public transport can only be applied to a central city or a planned urban area. Transport planning beyond the planned urban area is always dominated by a highway network to link towns or lower tier settlements. With the growth in income for people in the urban periphery, motorization is much faster than in the central part of the city. One survey shows that people living close to the city center have a high proportion of trips by bicycle and on foot and consume less energy for transport[10].

5. ENVIRONMENTAL PROTECTION

Regarding environmental protection, the Air Pollution Control Act was passed in 1987 and revised in 1995 and 2000. Even before 1983, motor vehicle emission standards has been promulgated. In 2000, Phase 1 of national vehicle emission standards was implemented. Phase III emission standards have been implemented since 2007. In urban planning we must follow the “State Ambient Air Quality Standard” (GB3095-1996) when assigning air quality standards according to the planned land use.

The Air Protection Act provides that "The State encourages and supports the production and use of high-quality fuel, to reduce the harmful substances in air pollution." In 2000 China began to implement lead-free gasoline. At present, China has a motor vehicle inspection system. In 2009, 99.09 million motorized vehicles were inspected, accounting for about 58% of the vehicle fleet[11].

In January 2009, the Ministry of Finance and Administration of Taxation issued a "Purchasing Tax Reduction for the Car with Less Than 1.6L Displacement Notice." In 2008 the State Council issued "The State Council on Further Strengthening the Fuel-Efficient and Energy-Saving Work," which proposed "to encourage use of environmentally friendly vehicles with low fuel consumption, energy-saving and clean energy vehicles, to reduce the consumption tax rate for low-emission passenger vehicles, to increase the consumption tax rate for passenger cars with large displacement, and further expand the consumption tax rate gap between different small and large cars." However, there is no local urban planning and transport policy to support this national policy to encourage smaller cars.

10. Peter Nass. Residential Location, Travel, and Energy Use in Hangzhou Metropolitan Area. The Journal of Transport and Land Use Vol.3 No.3. pp. 27-59 doi: 10.5198/jtlu.v3i3.98.
11. China Ministry of Environment Protection, China Vehicle Emission Control Annual Report, 2010.

Along with the rapid urbanization and motorization, motorized vehicle emissions have created serious environmental problems, especially air and noise pollution. Pollution created by urban transport not only has a high economic and environment cost, but also threatens public health. Environmental monitoring in 2009 showed that one third of the 113 national key environmental protection cities cannot meet the urban air quality standards. Urban air pollution reflects the complex characteristics of both burning coal and motorized vehicle exhaust in many cities. In some cities acid rain and photochemical smog and other air pollution problems have occurred frequently, and many of these problems are related to motorized vehicle emissions of nitrogen oxides, particulate matter and other pollutants.

The source of air pollution in Shanghai is a combination of oil and soot. Through the adjustment of the energy source structure, soot is controlled effectively, but the pollution by tailpipe emission in the center city is still serious. The pollutant is mainly the NOx discharged by the motor vehicles. In 2009, the average density of nitrogen dioxide in the city was 0.053 mg per cubic meter, which had decreased by 0.002 mg per cubic meters compared with 2005. The average density of particulates in urban areas decreased by 0.006 mg per cubic meter in the same period of time (Table 5). Beijing air quality has also improved (Table 6).

Table 5. **Air quality in Shanghai**

Year	NO^2 (mg /m³)			PM (mg /m³)	SO^2 (mg /m³)		
	City proper	Suburban	Whole city	City proper	City proper	Suburban	Whole city
2005	0.061	0.049	0.055	0.088	0.061	0.031	0.043
2006	0.055	-	0.057	0.086	0.051	-	0.051
2007	0.061	0.051	0.056	0.089	0.058	0.055	0.056
2008	0.062	0.049	0.056	0.085	0.056	0.048	0.051
2009	0.057	0.046	0.053	0.082	0.038	0.038	0.035

Source: Shanghai environmental protection bureau.

Table 6. **Air quality in Beijing**

Year	NO^2 (mg /m³)	PM (mg /m³)	SO^2 (mg /m³)
2000	0.071	0.161	0.071
2003	0.072	0.141	0.061
2005	0.066	0.142	0.050
2009	0.053	0.121	0.034

Source: Beijing environmental protection bureau.

To improve air quality, some measures and polices have been pursued in Shanghai and other cities, including:

- Strict environmental standards for new cars. Phase IV emission standards have been applied.
- Pollution inspections. Strict street inspections and yearly inspections are desirable.
- Clean fuel for public transportation, including taxi fleets that should be renewed.
- Traffic management regulating traffic flow, and license auctions to control traffic volume, reducing congestion in central cities and reducing mobile pollution.
- Preferential public transportation development. In Beijing and Shanghai the planned metro networks cover more than 1 000 km. More than ten cities in China, including Hangzhou, Xiamen, Jinan and Guangzhou, have established bus rapid transit systems

after the first such line opened in Beijing in 2005. Good metro networks can encourage the transfer from private mode to public transportation with park and ride facilities near metro stations.

- Strict control of motorcycles. Shanghai and many other cities prohibit them to reduce the traffic noise and improve safety.
- Green license policy, implemented in Shanghai to eliminate heavy pollution from motorized vehicles in the city center.
- Public bike systems connected to metro stations to provide “last kilometer” transport in suburban Shanghai, Hangzhou, Wuhan and other cities.
- Bike networks in Hangzhou, Shanghai and other cities.
- Parking control at destinations, with higher rates in the city center or where public transport accessibility is high.

6. SOCIAL EQUITY ISSUES IN TRANSPORT

Improvements in urban transport facilities greatly enhance mobility, with a two-fold effect: Urban transport construction plays a positive role in enlarging the opportunity of urban employment and living activities, but without adequate policy it can also lead to social segregation.

Despite the rapid growth in private cars, the majority of urban households are car-less. Their mobility needs have been seriously under-served by the established practice that commits so many available resources to meeting the demand for automobile mobility. Even now the non-motorized modal split in transport is still very high (Table 7).

Table 7. **Modal Split in Shanghai (%)**

Year	Walking	Non-motor Vehicle	Public Transport	Private Motor Vehicle
2005	27.0	30.0	24.5	18.4
2006	26.9	30.0	24.4	18.7
2007	26.9	29.9	23.8	19.4
2008	26.7	29.4	24.4	19.4
2009	26.2	28.6	25.2	20.0

Thanks to the availability of bikes and the high density of development, low income people can still have basic mobility. In Shangyu City, a survey in 2009 shows that 40.8% of low income people travel by bike, while 29.6% of high income people travel by car (Table 8).

Table 8. **Modal split by income group in Shangyu City (2009**)

	Walking	Bike	Bus	Car	Other
Low	37.6%	40.8%	14.1%	6.1%	1.5%
Middle	22.5%	44.7%	13.0%	19.0%	0.9%
High	54.1%	11.5%	2.7%	29.6%	2.2%

In recent years, Shanghai's city center is undergoing large scale urban redevelopment. Many people have been relocated to the urban periphery to leave the space in the city center for transport infrastructure or commercial property development for the service industry. Low income people cannot choose where to live. They have to stay where the government relocation building is located. Travel time is increased much more for people forced to move to relocation housing in the urban periphery than for those who can select their apartment (Table 9).

Table 9. **Travel time after moving**

	Self-selection	Forced to move
Increased travel time (min)	17.9	51.9

Due to the developed road system and insufficient public transport, rich people with private cars have enjoyed the benefits of road investment that should have been enjoyed by all society. Travel time for medium- and low-income people in periphery areas has failed to dramatically improve.

Table 10. **Travel time from the periphery areas to the central area of city**

Item	Number of respondents	< 30 minutes	% of total	30-60 minutes	% of total	> 60 minutes	% of total
High-income	93	60	64.5%	27	29.0%	6	6.5%
Middle-income	280	111	39.6%	110	39.3%	59	21.1%
Low-income	319	110	34.5%	123	38.5%	86	27.0%

Source: 2006 Questionnaire on Travel of Urban Residents in Shanghai

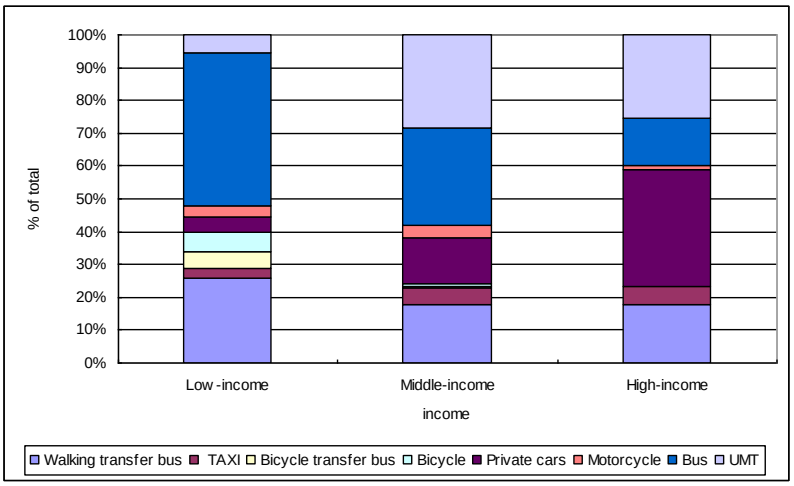
The "2006 Questionnaire on Travel of Urban Residents in Shanghai" selected three periphery residential areas including Xinzhuang, Sanlin and Jiangqiao. Analysis shows that 64.5% of high-income respondents spend less than 30 minutes in a trip to the central area and only 6.5% of them spend more than 60 minutes. About 40% of medium-income respondents spend less than 30 minutes in a trip and another 40% spend 30-60 minutes. However, 38.5% of low-income respondents spend 30-60 minutes in a trip and 27% spend more than 60 minutes (Table 10).

This analysis also shows that 36% of high-income respondents mainly travel by car and 26% by metro. They seldom ride bicycles. For medium-income respondents, 18% choose to walk, 29.5% by bus and 28.3% by metro. For low-income respondents, 72.4% choose to walk and take buses, and they seldom take taxis or metro because of the expense. The minimum two-way metro tickets cost 17.7% of the daily income for low income people (Figure 6).

Government has made great efforts to improve transport systems and accessibility of periphery areas, but such efforts may be more beneficial to those with higher incomes than those with lower incomes. In Beijing, because of the low-fare policy, travel expense for low-income people is much lower than in Shanghai.

In the largest cities and metropolitan areas, the number of migrant workers has grown to 20-40% of the total population. Their transport needs receive little attention. No city has analyzed their travel patterns in the planning process. Ironically, the practice favoring cars also fails to satisfy the longer-term mobility needs of the car-owning population. The freedom of mobility enjoyed by them is short-lived, and many motorists find themselves frequently sitting in gridlock during the peak travel hours. With a well-equipped motorway system in Beijing, people are still despairing of the frequent traffic congestion. Gridlock reduces mobility for all people using roads.

Figure 6. **Travel Mode from periphery areas to the central area of city**



Source: 2006 Questionnaire on Travel of Urban Residents in Shanghai

Recently several urban transport policies have been applied in different cities to address development of urban-rural integration, high travel cost and non-motorized travel. Previously, the policy of public transport priority has been applied only within the built up area of a city. Public transport in periphery areas is still far from developed, with problems like insufficient bus lines, long waiting times, crowded buses, early ending of operation in the evening, improper station locations, etc. When better public transport service is provided for the disadvantaged living in suburban areas, convenient mobility can be ensured for the residents. With the policy of urban-rural integration, most cities have extended public transport to suburban areas, linking each village with a bus line since 2005.

To reduce travel expense and attract the people to use public transport, from January 1, 2007, Beijing has begun to implement a transit priority strategy. Bus passes have been cancelled. The fare of a public transport ticket, CNY 0.4, is 40% of the original fare, and students have an 80% discount for public transport. Beijing's low-fare public transport reform triggered a storm of low-cost public transport. Shanghai, Tianjin, Chongqing, Nanjing, Jinan, Hangzhou and other cities said they would increase efforts to support public transport. By the end of June 2007, the city of Shanghai had implemented preferential ticket prices for transfer on all the 396 bus lines within the inner ring, and now this policy has been applied to all the public transport in Shanghai.

There are about 10 million bicycles in Shanghai. Most low income people still can afford a bike However, bicycle lanes have been reduced, which forced bicycle riders to ride on sidewalks, in potential conflict with pedestrians. Enormous investments on urban transport facilities are car-oriented rather than human-oriented, so that the interests and rights of bicycle riders have been seriously affected. In order to change this situation, "Research on Non-motorized Vehicle Transport Planning in Central City of Shanghai" was conducted in June 2006. In Beijing, authorities have declared they will eliminate any obstacle to bike use.

The local people's representative congress is a platform for local people to express their opinions and complaints about urban transport. In Shanghai, for example, the bike path along the middle ring road in Shanghai was provided by the mayor as a result of opinions expressed at a people's representative congress

7. ACCESSIBILITY FOR PEOPLE WITH REDUCED MOBILITY

According to survey data in 2006, there are 82.96 million disabled people, or 6.34% of the total population. The disabled population by category is listed in Table 11.

Table 11. **Disabled population by category**

Category	Population (million)	% of all disabled
Visual	12.33	14.86
Hearing	20.04	24.16
Speech	1.27	1.53
Physical	24.12	29.07
Intellectual	5.54	6.68
Mental	6.14	7.40
Multiple	13.52	16.30

A report on the demographics of an ageing society from the National Ageing Work Committee shows that China is adding 5.96 million people to the elderly population each year. By 2020 the elderly population will be 248 million, of whom 12.3% will be over 80 years old. In 2050, the total elderly population will reach 400 million, 21.78% of whom will be older than 80. With the improvement of living standards and health conditions, the percentage of disabled people due to ageing is increasing.

Barrier-free transport is a prerequisite for the disabled, the elderly and other special groups to participate in social life. It is also benefit for all society and is an important symbol of social civilization and progress.

In 1986, the Ministry of Construction, the Ministry of Civil Affairs, and the China Foundation for Disabled Persons jointly produced China's first norms for barrier-free facilities, "Specification to Facilitate People with Disabilities in the Urban Roads and Buildings Design." The Protection of Disabled Persons law was issued in 1990 to safeguard the legitimate rights and interests of disabled persons, and protect the right of persons with disabilities to an equal and full participation in social life, material and cultural achievements. It stated that specifications should be implemented so that urban roads and buildings are accessible to disabled people.

Huge achievements have been made in barrier-free facility construction. In Shanghai for example, 25 150 barrier-free projects have been implemented in public buildings, and paths for the blind with a total length of 2 034.8 km were constructed from 2003 to 2007. All the new metro lines are accessible to disabled people and a special service program in the metro is prepared for them on request.

In 2004, Beijing introduced the "Barrier-Free Facilities Construction and Management Regulations," which state that barrier-free facilities must be provided in new road construction or expansion and the renovation of roads. All existing roads must meet the “Specification for Urban Roads and Buildings Accessible Design.” This is the first local legislation in mainland China on construction and management of barrier-free facilities.

During 2005-2006, Beijing Municipal Government and relevant departments compiled the “Barrier-Free Facilities Construction and Renovation Planning Guidance” to coordinate various norms and standards related to construction and renovation work on barrier-free facilities. Based on this guideline, “Detailed Instruction on Barrier-Free Facilities Construction and Renovation” has been prepared by ten government departments.

In the first half of 2010, the Beijing Municipal Planning Commission and the Beijing Quality and Technical Supervision jointly issued "Urban Rail Transit Barrier-Free Design Guideline," which sets the technical standards for design and acceptance inspection of new metro lines.

In 2010, there are 140 lifts and 120 accessible platforms in 123 stations of eight metro lines. Each station has at least has one access for wheelchairs. Relevant departments have also developed "Wheelchair-Bound Disabled Passenger Service Specifications," "Visually Handicapped Passenger Service Standards," "Physically Disabled Wheelchair Passenger Service Specifications," "Deaf Passenger Service Standards" and other technical specifications for making services accessible to disabled persons. Services can be reserved be telephone. In addition, passengers can easily query the Beijing Metro official website providing information of barrier-free facilities at each station, (Figure 7).

Figure 7. **Website Barrier-free information of Beijing Metro**

In order to meet the individual needs of persons with wheelchairs in Beijing, the city established a barrier-free taxi service with 70 uniquely marked taxis in May 2008. People in the central city can reserve the service two hours in advance, and in the suburban area one day in advance. Fares are the same as for normal taxis.

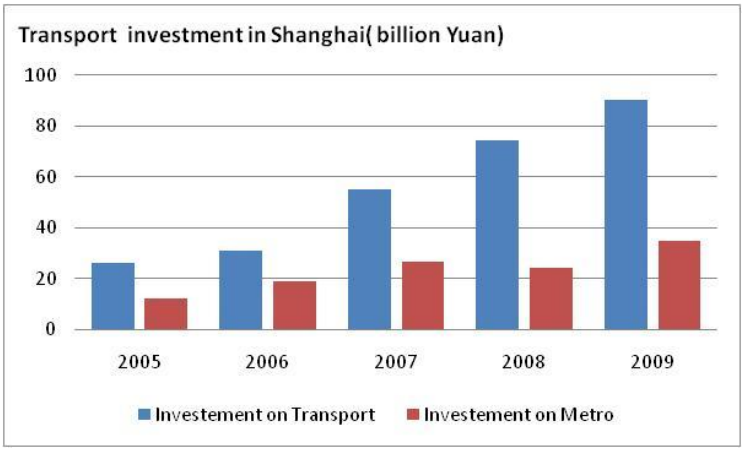
During the 2008 Olympic and Paralympic Games, Beijing launched dozens of barrier-free bus lines, each line equipped with 20-30 barrier-free buses. Road-side facilities also improved around bus stops, with paths for the blind, Braille stop signs and wheelchair waiting positions. Ten accessible bus lines were retained as permanent lines after the Games. As the end of August 2010, a total of 3 600 accessible buses have been put into operation in Beijing, accounting for 16.6% of the total number of buses. Beijing now has the largest barrier-free bus fleet in China. China's first barrier-free public transportation hub was the zoo transit hub built in Beijing in August 2010. Shanghai only has 30 barrier-free buses in five bus lines. In Shanghai it is nearly impossible for disabled people to use the bus service because people cannot know when the barrier-free bus will arrive. We must now pay great attention in barrier-free transport construction in China. There is much to do in this field.

In November 2007, the Ministry of Construction, the Ministry of Civil Affairs, the National Committee on Ageing and the China Disabled Persons Federation jointly launched a national demonstration activity for barrier-free city construction in 100 cities, which includes barrier-free construction management, urban road construction and renovation, public buildings, construction and reconstruction of special facilities, barrier-free residential quarters, barrier-free residential construction, accessible public transport and information for disabled people. This event highlights the importance of accessibility to public transport in urban areas for disabled people. In 2008 the revised Disabled People Protection Law clearly states the importance of an accessible environment for disabled people in construction of facilities, information exchange and accessibility planning.

8. PUBLIC TRANSPORT FINANCE

The cost of providing an urban transport infrastructure to carry the increasing traffic is high. Urban transport investment in Beijing and Shanghai, for instance, accounted for 5% of each municipality's GDP. Significant capital investment has been made to expand the capacity of transport infrastructure, especially the road network. In Shanghai the proportion of metro investment has been diminishing as a percentage of overall transport investment (Figure 8).

Figure 8. **Transport Investment in Shanghai**



Explosive urban growth has increased demand for urban transport services, and decentralization has shifted much of the responsibility for providing these services to local government. Local government has to raise money, mainly through off-budget funds, which include borrowing through city-owned infrastructure investment companies, imposing surcharges, accepting donations and granting land concessions. Land concessions are a major source of off-budget revenue for urban transport, especially for metro construction, but they are not a sustainable source of revenue.

Metro systems have the highest fixed costs. Therefore, metro in mainland China is usually treated as a social benefit, and most systems are publicly owned by local governments. Beginning in 2001, the funding source and strategy for metros in China become more diversified. Table 12 illustrates the different financial methods and funding sources for metro in some Chinese cities.

Shanghai

The rail-based public transport system is constructed with government investment, with 42% of financing from revenue and 58% from bank loans. It is operated by Shentong Rail Co., and Line 1 is a joint-stock company.

Beijing

The Beijing Metro Line 4 (BJL4) was built through a public-private partnership between the Beijing Capital Group, Beijing Infrastructure Investment Co. Ltd. and Hong Kong MTR Corp. This project marked mainland China's first public-private partnership for the development and operation of a metro system. Under a 30-year operating franchise, the build-operate-transfer contract allows Hong Kong MTR Corp. to integrate its expertise in the construction and operation of the metro.

Shenzhen

Phase 1 of Shenzhen Metro Line 4 was entirely built by local government. Phase 2 will be 100% funded by Hong Kong MTR Corp. as an investment. For this project, MTR has established a subsidiary company in Shenzhen, MTR Corp. (Shenzhen) Ltd., to undertake the project management. This project is the first application in mainland China of the rail and property management business model.

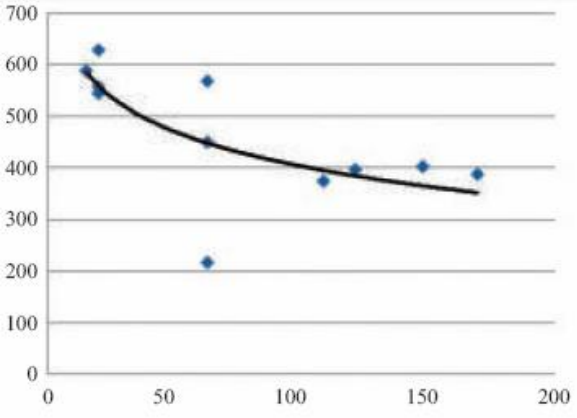
Table 12. **Summary of financial methods and financial sources for metro construction in China**

Cities		Financial Method	Financial Source
Beijing	Line 1, 2	Public owned	Local government
	Line 4	Public-Private Partnership	Beijing Infrastructure Investment Co. Ltd.: 2% Beijing Capital Group: 49% Hong Kong MTR Corp.: 49%
	Line 9	DBFO	Government: 70%, private entity: 30%
	Line Olympic	BT	Built by China Railway and bought by local government
Shanghai	Line 1	Consortium Loan	City government and foreign investment
	Line 2	Consortium Loan	Foreign loan: 1/3, city government: 1/3, local government: 1/3
	Line 3	Consortium Loan	Foreign investment: 18.7%, local bank loan 49%, government direct investment: 32%
Guangzhou	Line 1	Consortium Loan	Foreign loan, local bank loan, government direct investment
	Line 2	Consortium Loan	Government: 60.35% ; commercial bank: 39.65%
Shenzhen	Line 4 (Phase 1)	Public owned	Government: 70%, commercial bank: 30%

Because of high construction and operation cost, an over ambitious metro network may result in heavy financial burden on government. With the increasing of the metro network size (Figure 9), the number of passengers carried per kilometre is declining[12].

12. Pan Haixiao. (2008. Urban Rail and Sustainable Development. Urban Transport. 2008(4). Pp. 35-39.

Figure 9. **Network size and passengers per kilometer (Shanghai metro)**
y-axis: network length in km, x-axis: 10 000 passengers/km



Before 2007 there was very limited government financial support for surface public transport. In Shanghai the subsidy to surface public transport had not increased for 10 years until 2007. In December 2006 the Ministry of Construction, Development and Reform Commission, the Ministry of Finance and the Ministry of Labor and Social Security issued the "Advice on Economic Policy for Priority Development of Urban Public Transport," which says that more investment and financial support should be provided to public transport in several ways:

Increasing government financial input

- Government investment should be the mainstay of urban public transport. The public finance system should support urban public transport development, and urban public transport investment, compensation and subsidy mechanisms should be improved.
- Local governments should increase their funding for urban public transport infrastructure. More attachment fees of urban public utilities, infrastructure fees and other government funds should be devoted to urban public transport.
- Diversification of investment should be encouraged.

Establishing subsidy mechanism for low fares

- A low fare urban public transportation policy to attract maximum passenger use and improve the efficiency of urban public transport should be encouraged.
- According to the Price Act and other relevant laws, an urban public transport fare management system should be established. Urban public transport enterprises must take into account both economic and social benefits when setting fares and considering the operating costs of urban public transport.
- City government should subsidize low fares and free fares for the elderly and disabled if they causes losses for a public transport enterprise.
- Increasing costs of urban public transport due to the impact of oil price adjustments should be subsidized by the central government.

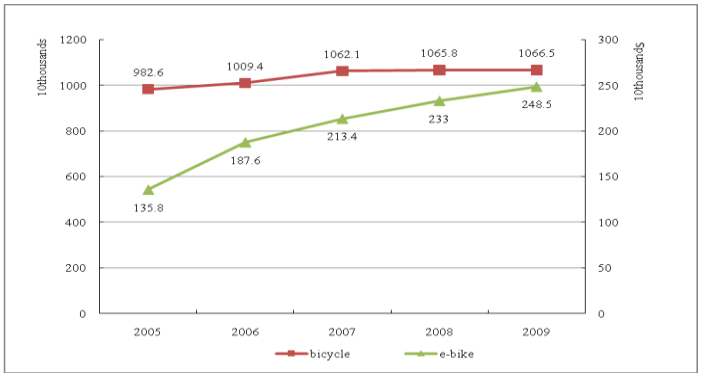
Establishing a cost assessment system

- Subsidies should be based on a standardized evaluation system about cost and performance. Following this advice, many cities have allocated huge budgets to subsidize public transport. In 2010, Beijing spent CNY 12.8 billion13 to support the low-fare public transport policy. When public transport is too crowded, there is no attractiveness for a car driver to use it.

9. NON-MOTORIZED TRANSPORT

Mainland China used to be the country of bicycles, and there are many even now. The total number of bicycles in mainland China is about 600 million.[14] In recent years, number of e-bikes has largely increased in mainland China cities. E-bikes account for 70% of traffic on bike lanes of some major roads in Shanghai. It can be observed from Figure 10 that the number of bicycles has grown slowly since 2005, increasing 8.5% from 9.826 million to 10.665 million, while the number of e-bikes rose by 83%, from 135 800 to 248 500.

Figure 10. **Bikes and E-bikes in Shanghai**



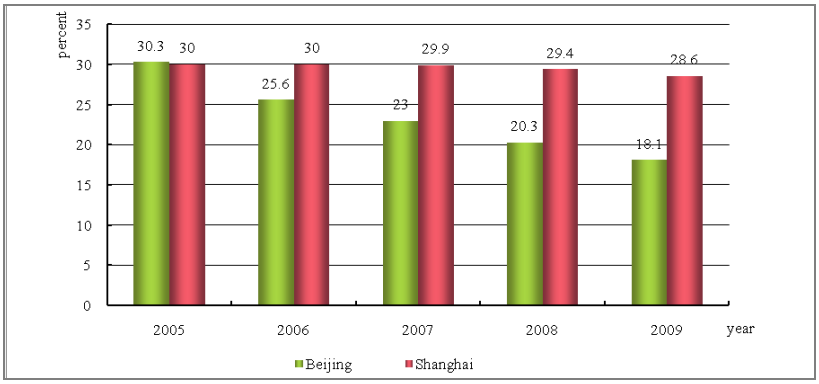
Walking and cycling account for about half of all trips in Chinese urban areas, and they receive some funding for infrastructure provision. For decades, roads in many Chinese cities generally provided separate facilities for walking and cycling. Most Chinese cities provide pavements, crosswalks, bike lanes, and special traffic signals for pedestrians and cyclists. One of the main reasons is that the Urban Road Transport Plan and Design Code (GB 50220—95) requires pavements which bicycles can also use to be built on main roads and subsidiary roads.

Pedestrians and cyclists continue to account for a high percentage of total travel in China. However, in recent years the automobile industry has greatly developed in mainland China, which has posed a challenge to development of bicycle transport. In many cities the modal split for bicycles has dropped by a big margin[15]. Since 2000, many Chinese cities have begun restricting bikes on key arteries and central city streets. The large volume of relatively slow-moving bicycles in every Chinese city is viewed by government officials as a major source of

13. Chinese 163 news, 2010.
14. http://northtiger.bokee.com/3613786.html
15. John Pucher, Zhong-Ren Peng, Neha Mittal, Yi Zhu and Nisha Korattyswaroopam, Urban Transport Trends and Policies in China and India: Impacts of Rapid Economic Growth. Transport Reviews, Vol. 27, No. 4, 379–410, July, 2007.

road congestion, since bicycles get in the way of faster-moving motorized vehicles, especially at intersections. Based on the illusion of a statement regarding the dominating role of public transport with the supposed policy of public transport priority in urban transport planning, many cities throughout China have begun to restrict or prohibit bicycles on busy roads during peak travel times, especially in the central city. Moreover, several cities have cancelled previous plans for new bike lane and bicycle streets. In Guangzhou and Shenzhen, bicycle travel has dropped sharply. The cities of Shanghai and Nanjing have even established official goals of reducing the bicycle share of trips to about half their current share.

Figure 11. **Modal split by bike & e-bike**



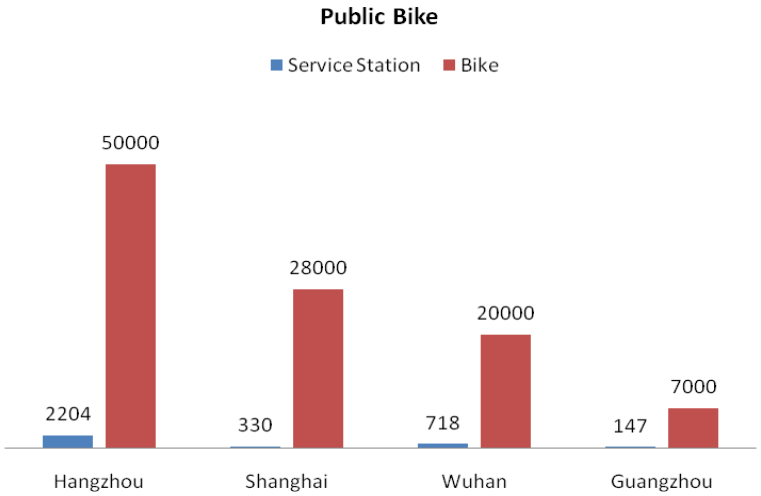
From Figure 11, it can be seen that in Shanghai the modal split for bicycles has declined slowly, while in Beijing it has rapidly dropped from 30.3% in 2005 to 18.1% in 2009. The main reason is the great increase in the number of automobiles, and much space previously used for bikes has been devoted to car traffic lanes or parking space, thus having a negative effect on bicycle transport. Separate bike facilities that are being built are mainly intended to get bicycles off the roads and out of the way of motor vehicles.

New transport policy guidelines issued by the central government in 2006 seem to suggest a new, more hopeful direction. They recommend that local governments encourage bicycle transport by preserving and improving bike facilities. With the rise of progressive concepts of low-carbon cities and green transport, some Chinese mainland cities have put great emphasis on bicycle transport and have begun building specific bicycle lanes. For example, Shanghai has planned a specific non-motorized transport network. Beijing has planned to establish two bicycle demonstration zones which will have dense bicycle networks and specific bicycle parking around bus stations and metro stations, in order to increase ratio of bicycle riding[16].

Hangzhou was the first city in China to establish a public bike system with the strong support of local government. Currently, many cities in mainland China want to introduce public bike programs (Figure 12). Cities that have implemented or prepare to introduce public bike programs include Beijing, Shanghai, Hangzhou, Wuhan, Jinan, Changzhou and Sonya. Among them, Hangzhou has the largest scale in public bikes. Most of the projects were financed by local government. For example in Hangzhou several hundred million yuan was invested in public bike system. In Shanghai the public-private partnership model was followed with the cooperation of a professional bike company and local government.

16.China News, 2010.

Figure 12. **Public Bikes in Several Chinese Cities**



Mainland China has clearly defined in Urban Road Transport Plan and Design Code (GB 50220—95) that the design of pedestrian transportation system in city should satisfy the requirements of pedestrians, ensure traffic security and the continuity of pedestrian voyages. The planning of pavements, pedestrian bridges, pedestrian metros, shopping malls, urban river bank pavement or shady pavements should be tightly connected with the pedestrian system connecting to bus stations, passenger terminal squares, and public transport interchange. The whole should form an intact urban pedestrian system. Construction of pedestrian systems has gradually received much attention in mainland China, especially in large and medium-sized cities such as Shanghai, Chongqing, Wuhan and Xiamen, all of which have begun planning non-motorized transport systems or specific pedestrian systems and are building pedestrian lanes or pedestrian zones. In 2001, in *White Paper of Shanghai Urban Transport Development*, the Shanghai government first formally declared that importance should be attached to non-motorized transport.

10. RECOMMENDATION

The challenges ahead to implement sustainable urban transport policy will be tremendous. China is undergoing rapid and simultaneous urbanization, motorization and industrialization, a process that no other country has experienced. We cannot sustain endless motorization in China. If the current fast motorization continues, and we are still trying to adapt cities to accept more cars without proper public policy intervention, it will result in a wide road network, distorted land use structure and less control on car use. Endless motorization will soon result in fast exhaustion of fossil fuels, clean air and valuable farmland and space, and will promote the widening of social inequality. Living in the dense urban environment will be more harmful to health due to pollution from cars. Tailpipe gas emissions are now a major source of pollution in cities.

The concept of sustainable development had been widely talked about in China but has not yet been effectively translated into actions in urban transport. For many cities, we may miss the best opportunities to implement sustainable urban transport strategy. Some recommendations are proposed here:

Strengthening the synchronization of central government with local government on sustainable transport strategy

There is stronger political will from central government to realize the "energy saving, environment friendly" and harmonious society, but local government has more responsibility for urban planning and local transport strategy. Pressured by the demands of economic growth, cities are chasing endless urgent problems one by one and cannot put priority on sustainable development, so more efforts are needed to enhance the capacity of local government. There are also conflicts between government departments, and establishing consensus is a prerequisite to achieving sustainable development.

Implementing the car restriction policy in cities nationwide

Currently car ownership is very low in China, and for most people the car is not an essential tool for living. But if most people establish a lifestyle that depends upon the car, then it will be very difficult to reverse the process. It is better to apply economic measures such auctioning licenses and charging tolls and parking fees to control car ownership or usage. The revenue can be used to improve public transport. This policy must be applied nationwide; otherwise it will be useless or result in conflicts between cities.

Adopting car-less principles in urban planning

In current urban planning practices, land use is shaped by the road network. This implies that more people will use cars as incomes grow. The level of access to public transport should be used as a criterion for granting development permission or for collecting an impact fee from projects which cannot meet the basic requirement. Poly-centric urban forms with high quality public transport links to the employment/activity centers should be encouraged to shorten travel distances, and high quality public transport should be provided as a competent alternative to choosing a car for long distance travel.

Putting top priority on pedestrians and bicycles

In China, because the urban fabric evolved slowly for a long time with the characteristics of mixed use and high density, non-motorized travel still plays an important role. When top priority is given to pedestrians and bike users, the desire to drive a car will decline. A high quality pedestrian environment is also good for encouraging ageing people to take part in outdoor activities.

Guaranteeing equity in transport construction and service provision with a target oriented policy

In the case of Shanghai, even a high quality public transport project like the metro system cannot automatically ensure social equity due to the high fares. A specific policy must be prepared to target all social groups instead of a standardized solution which benefits privileged people in most cases. Public participation must be encouraged in decision making.

Establishing public transport priority development corridors

During urban expansion, public transport priority development corridors should be constructed with metro, bus rapid transit or bus lanes before people have become used to cars to access activities or living space. High density development should be encouraged along this corridor so there will be enough passengers to ensure economic vitality and service quality of the public transport.

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