

# Practices and Policies of Green Urban Transport in China

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## Abstract

*China faces serious challenges as a result of rapid urbanisation and motorisation. Congestion and environmental impact have become major concerns. In this crucial setting, this paper looks at the practices of green urban transport in China and offers a possible interpretation of the green development of urban transport. Finally, it proposes the approach and some policy recommendations to steer urban transport towards green development.*

## Introduction

Over the past three decades, while urban transport has made great contributions for fast urban socio-economic development, it also poses challenges such as congestion, air pollution, energy security, as well as safety.

**Green transport is a category of sustainable transport which uses human power, animal power, public transportation, smart design, and renewable energy.**

According to evaluations, the cost of congestion is 250 billion RMB, equivalent to 2% of China's GDP in 2003 (Qiu 2007). Worldwide, transport systems account for between 20% and 25% of carbon dioxide emission (World Energy Council 2007). Greenhouse gas emissions from transport have been increasing at a faster rate than any other energy consumption sector (IPCC 2007), but until now, less climate

change mitigation gains have been made in the transport sector. In China, the statistics from the Ministry of Environment Protection show that at city level, in 2005, the national average proportion of vehicular emission in urban air pollution is more than 70%; the motorised vehicle has become the biggest emission source in Chinese cities. Therefore, it is urgent to implement green development of urban transport in China.

Green transport is a category of sustainable transport which uses human power, animal power, public transportation, smart design, and renewable energy (Ecospeed 2008). Chris Bradshaw, who started the first pedestrian advocacy group in America, defined a Green Transport Hierarchy, in which he ranked the modes of passenger transport based on how environmentally friendly each mode is (Bradshaw 2009). In this hierarchy, walking was ranked the greenest, followed by cycling,

public transport, car sharing, and finally private car. This classification of green transport is also suitable for China.

## Practices of Green Urban Transport in China

Compared with European cities, public transport lags far behind in China. With the economic development and increasing affluence, car ownership will continue to experience unprecedented growth, putting incredible pressures on the urban transport systems. Therefore, to achieve green development, comprehensive urban transport measures have been implemented in China.

**Transit Oriented Development (TOD) is the creation of compact, walkable communities centred around mass transit systems, making it possible to live a higher quality life without complete dependence on a car for mobility and survival.**

### Urban planning

The pattern of travel demand is affected by the way we use land. For a long time, Chinese cities have followed ring type (*Figure 1*), single centre development patterns, which are unfavourable to public transport development. Transit Oriented Development (TOD) is the creation of compact, walkable communities centred around mass transit systems (Wikipedia 2007), making it possible to live a higher quality life without complete dependence on a car for mobility and survival. Lately, TOD has been gradually accepted in the urban transport planning for cities such as Beijing, Shanghai,

Shenzhen, Guangzhou, etc. It has shown obvious effects on green development of urban transport.

*Figure 1: Chengdu: 2nd Ring Road Project*



### Smooth Traffic Project

Since 2000, the *Smooth Traffic Project* has been initiated among the 36 Central cities in China. Ten years later, other cities joined the project. Both the transport infrastructure and capacity have been greatly improved, the service quality has also been improved obviously, which laid a good foundation for the green development of urban transport today. To maintain the developments, the management concept should be updated, and the management efficiency should be improved continuously.

### Public transport priority development

Under the central directive on *Public Transport Priority Development*, in combination with local actual circumstances, many cities issued local policies to promote public transport priority development. Thus, the capacity of public transport is increased obviously. For example, in 2006, Beijing issued *Opinions on the Development of Public Transport*

Figure 2: BRT in Beijing



Figure 3: LRT in Beijing



*Priority.* The public transport system has been developed, with urban rail system as the backbone, bus as the body, other transport modes as the supplement. The public transport modal share increased from 28% in 2002 to 37% in 2008; citizens enjoy quick, convenient and substantial public transport services. In addition, municipal governments of Shanghai, Shenzhen, Guangzhou, etc., have formulated administrative provisions for giving priority to public transport and made great progress, such as with urban rail and bus rapid transit (BRT) systems (Figure 2 and Figure 3).

### Action plan for green urban transport

Some city authorities have made action plans for green urban transport. After the Green Olympics, Beijing began to implement the

*Action Plan for Green, People-oriented and High-tech Urban Transport (2009 – 2015).* By 2015, the public transport modal share will be improved to 50% in the central area. The rail system will be up to 561 km. Beijing will pilot some electric vehicle demonstrations, and more than 5,000 new energy vehicles will be put into operation. Furthermore, to form a new green system, Beijing will develop cycling. Some measures will be taken, such as, planning non-motorised transport (NMT) zones, free bicycle rental and convenient transfers to public transport by cycling, etc.

Shanghai has launched a *Green-Commuting Project* and created the *Green Transport Strategy* to ensure smooth traffic flow and a greener environment during the 2010 World Expo. The *Strategy* encourages both residents and visitors to choose greener modes of transport. They have also made a green commuting plan for some enterprise employees and developed a WebGIS-based transport carbon calculator for them.

In addition, to improve urban public transport, more than one hundred cities join the *Public Transport Week & Car-Free Days Action* in September annually; the concept of Green Commuting has gradually penetrated into the lives of Chinese citizens.

### Non Motorised Transport (NMT)

NMT includes cycling and walking and is the greenest transport mode. Bicycles not only could be a viable alternative to car journeys for many short trips, but also serve as collection

and distribution means for the public transport system.

- **Bicycle travel**

NMT is the most important component of urban transport in most Chinese cities. According to statistics, the bicycle modal share accounts for 36% to 50% of total travel volume in different cities, and walking modal share is about one-third, on average, far above that of public transport (Jiang and Jiang 2008). However, with rapid urbanisation and motorisation, both cycling and walking are becoming more difficult because of vehicle oriented road network planning. More driveways are broadened, while walkways are encroached by roadside parking or street vendors, which greatly dampen the enthusiasm of both cyclists and pedestrians. In Beijing, the bicycle modal share was up to 62.7% in 1986, but reduced sharply to 38.5% in 2000, 30.3% in 2005, and 20% in 2008.

*Figure 4: Free bicycle rental in Beijing*



To ease the shrinking modal share, bicycle rental has entered the agenda of city government. Governments of Hangzhou, Beijing, Wuhan, etc., have initiated policies, including financial

investment, for bicycle travel by setting up free-of-charge bicycle rental nonlocal access systems, which create a new channel for improving cycling. Bicycle travel will even be included in the *Beijing Overall Transport Plan* in 2010. Two free bicycle rental demonstrations are being piloted in Beijing (Figure 4). A few cities are also developing connections between bicycle networks and public transport.

**With rapid urbanisation and motorisation, both cycling and walking are becoming more difficult because of vehicle oriented road network planning.**

- **Walking**

Walking shows its advantages for meeting the increasing travel demand from trade, shopping and leisure activities. Recently, pedestrianised streets were constructed all over China, fully embodying the people oriented concept. For example, in the *Overall Planning of Shenzhen (2007 – 2020)*, publicised at the end of 2008, in addition to implementing “Public Transport Priority”, NMT was also advocated, with “Walking Priority” written in the plan. This is a correction of transport planning concepts in Shenzhen and is a notable progress in China.

### ***Transport Demand Management (TDM)***

TDM can restrict motor vehicle use through effective guidance of transport demand, and is an important way for developed countries

to realise green transportation. In recent years, China has tried some measures and accumulated certain experience in TDM.

- **License plate quota auction system**

The car license plate quota auction system is to restrict vehicle ownership growth. The main measures are to suppress the desire to purchase a vehicle by levying high tax.

Shanghai is the only city in China that carries out this system which effectively suppresses car ownership growth. In 2007, average daily increment of motor vehicles in Shanghai was 380, about one-third of Beijing's 1,050 daily average. At a news conference in January 2008, Wu Yi, the Deputy Director General of Shanghai Municipal Transport Bureau said, "in the past 13 years after the policy implementation, about 1.5 million motor vehicles have been reduced in Shanghai." So we can say that the system implemented in Shanghai achieves notable effect on the green development of urban transport.

**Small charging differences among different parking places cannot relieve urban parking problems notably. Shenzhen's case shows that synchronous implementation of relevant supporting policies is required to achieve better effect.**

- **Parking charges**

Differentiated parking charges could shift some commuters from private vehicles to public transport. Existing parking charge

is cheap in the cities, and without certain area and time difference. A few cities, such as, Beijing and Shanghai, began to introduce charges according to area and time. But small charging differences among different parking places cannot relieve urban parking problems notably. Shenzhen has shown that synchronous implementation of relevant supporting policies is required to achieve better effect, for example, increased road parking prices, setting time limits for parking on the street, heavy penalties for exceeding the time limit, etc.

- **Travel restriction measures for cars**

After the 2008 Olympic Games, to relieve traffic jam and improve air quality, Beijing began to implement *No Driving, One Day Per Week*, and reduced about 800,000 motor vehicles per day in the whole city. The policy is that vehicles with certain licence plate tail numbers will not be driven on certain days. Thus, 30% of government vehicles stay off the roads. Statistics show that although the number of motor vehicles in February 2009 still increased greatly compared with November 2007, the traffic jam index decreased from 'moderate' to 'slight'; the duration of jams in work days also decreased from 7 hours 45 minutes to 2 hours 30 minutes. 'Restriction' has notably improved traffic status and air quality in Beijing.

Based on its good effects, Beijing decided to continue the measure with a little change, after a half year trial.

**Beijing began to implement No Driving, One Day Per Week, and reduced about 800,000 motor vehicles per day in the whole city.**

- **Other economic instruments**

Since 2008, in order to expand domestic demand and promote reasonable consumption of automotives, China implemented some economic instruments, while concurrently introducing measures to reduce transport emissions.

- i Consumption tax adjustments

From 1<sup>st</sup> September 2008, the Ministry of Finance adjusted vehicle consumption tax. The tax rate of large passenger cars, 3.0 litres to 4.0 litres, was increased from 15% to 25%, while tax for cars above 4.0 litres was raised from 20% to 40%. On the other hand, the consumption tax rate of small passenger cars, those below 1.0 litre, was reduced from 3% to 1%. This seems to have achieved its primary effect. In 2008, passenger cars 1.6 litres and below accounted for 61.5% of annual vehicle sales, and sales increased up to 18%, far higher than the increment for the overall vehicle market.

- ii The Adjustment and Vitalisation Plan for Auto Industry

This plan released by the State Council specified that, from January 20 to December 31 2009, the vehicle purchase tax for passenger cars 1.6 litres and

below would be reduced from 10% to 5%, to encourage the consumption of smaller vehicles.

- iii Fuel tax

The State Council implemented a fuel tax from 2009. Gasoline consumption tax increased RMB 0.8 per litre, diesel consumption tax increased RMB 0.7 per litre, and the unit tax amount of other fuels increased correspondingly. The fuel tax embodies the principle of more payment for more use, less payment for less use, thus promoting social equity and enhancing the competitive power of small vehicles. It changes the consumption pattern in the domestic automotive market, promotes automotive enterprises to improve car technology, and drives the healthy development of industrial chains in the vehicle industry.

### **Alternative Fuel Vehicle (AFV) Action**

Diversifying fuel supply for vehicles is necessary to save fossile fuels. So more cities in China are encouraged to choose AFV, including hybrid vehicles and electric vehicles.

- **Clean Vehicle Action**

Since 1999, the *Clean Vehicle Programme* has been initiated in 12 large cities in China. There were 153,000 LPG or CNG vehicles and 486 gas stations available in the 12 cities in 2002, and 250,000 LPG or CNG vehicles and 712 gas stations available in 19 cities by 2004 (Wang 2005). After ten

years of development, the quality of AFV has improved and now more AFV are used in over 100 cities, which also promotes the development of other relevant industries.

- **Electric Vehicle Action**

Since the *Ninth Five-Year Plan (1996–2000)*, China has focused on the development of electric vehicles with fruitful results. The *Safety Requirements for Hybrid Electric Vehicles* states standards which began to be implemented from 2005, and is a turning point for electric vehicles, from research to industrialisation. In March 2009, the State Council publicised the *Adjustment and Vitalisation Plan for the Auto Industry*, putting forward the goal that the sales volume of new energy vehicles from 2009 to 2011 should account for about 5% of the total sales volume of passenger cars. It also mentioned that China will allocate RMB 10 billion to support the development of new energy vehicles, etc., (Jiang and Jiang 2008).

In 2008, the Ministry of Science and Technology and the Ministry of Finance jointly initiated the electric vehicle demonstration project, *Ten-Cities, Thousand*

*Units*. 13 cities, including Beijing, Wuhan and Shanghai, were preliminarily selected for using electric vehicles in public transport, taxis, etc. (Figure 5). It is planned to popularise 60,000 new energy vehicles all over China by 2012, of which hybrid vehicles account for above 95%. The project’s launch ceremony in Wuhan in January 2009 marked a fresh era of new energy vehicle industrialisation in China. The higher cost of new energy vehicles will be subsidised by the Central and local governments.

Figure 5: Electric Bus in Beijing



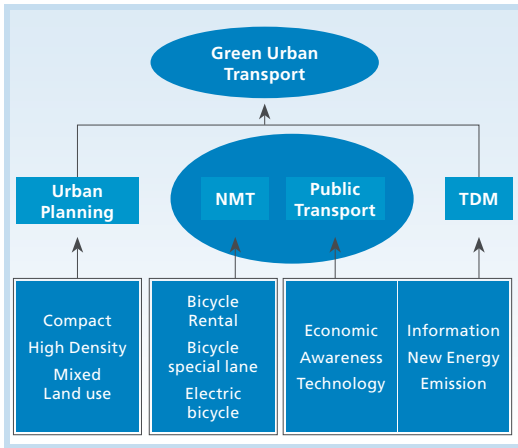
### Vehicular emission control

In order to improve air quality, stricter emission standards for vehicles have been implemented. In 2007, China implemented GUO 3 emission standard for light vehicles, which is equivalent to Euro 3. GUO 4 emission standard will be

Table 1: Emission standard implementation in China, Beijing, Shanghai and EU

Year	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
China						GUO 1			GUO 2			GUO 3			GUO 4	
Beijing					GUO 1			GUO 2			GUO 3			GUO 4		
Shanghai					GUO 1			GUO 2			GUO 3			GUO 4		
EU	Euro 1	Euro 2				Euro 3				Euro 4				Euro 5		

Figure 6: Approach to achieving green urban transport



implemented in 2010, which is equivalent to Euro 4. Some cities, such as, Beijing and Shanghai, have begun to implement GUO 4 (Table 1). The emission standard gap between China and European countries is becoming smaller. At the same time, the fuel quality is improved and the sulfur content in vehicular fuels is reduced. In Beijing, the environment tax for vehicles will be levied according to the different emission levels, which will promote the development of clean urban transport as well.

**The higher cost of new energy vehicles will be subsidised by the Central and local governments.**

## Approach to Achieving Green Urban Transport

With a large population and limited fossil fuel resources, China has to build a green transport system comprising “Urban public transport & NMT” (Figure 6). The figure shows the main factors and their interrelation that influence

green urban transport. Firstly, through urban planning, some travel by motorised modes can be reduced effectively. Secondly, some private car commuters must shift to more environmental friendly modes such as public transport and NMT. Thirdly, the energy efficiency of transport modes and vehicle technology should be continually improved.

## Policy recommendations

Based on the approach, Chinese transport authorities should move away from the idea of “Vehicle-orientation” in urban transport planning, focus mainly on public transport improvement, manage urban road space better and guide the reasonable use of private cars, as the key elements in the green urban transport strategy. Policies that encourage people to take public transport or NMT can bring these benefits too, while enhancing the local environment and supporting healthier lifestyles.

Firstly, China should optimise the urban transport layout by integrating urban and transport planning based on TOD, develop “compact” communities and cities in multi-functional areas, so as to reduce redundant transport trips from the source. Specifically, for new developments, we should construct compact, intensive small towns along Mass Transit stations of rail or BRT systems.

Secondly, to improve urban public transport, the *Legislation for Urban Public Transport* should be unveiled as soon as possible. The transport authority should set up a special fund for urban public transport, regulate public



fares and subsidy compensation mechanisms, strengthen planning integration, guarantee land use for public transport facilities and launch the action plan to improve the quality of public transport services.

Thirdly, more TDM should be used in most big cities, to balance travel demand and supply well, especially in traffic congested cities. For urban taxis, a good information platform should be developed to improve the loading rate and reduce empty running. On the other hand, governments should take the lead to encourage the use of energy efficient and low emission vehicles, and raise the awareness of the public to choose green transport modes.

Fourthly, city governments should encourage bicycle rental, develop scientific bicycle-renting businesses, make plans for urban bicycling lanes, extend the special lanes for bicycles and

footpaths and set up high-speed pedestrian systems in downtowns to provide convenience for travellers.

Last but not least, to improve overall transport efficiency, better coordination and integration of different transport services will improve the attractiveness and convenience of public transport. For example, we are keen to promote the use of smart ticketing which allows passengers to move seamlessly between different modes.

By 2030, with the concept of people orientation, China will have a more advanced public transport system that gives a network of paths connecting people safely, and mainly by public transport and NMT, with the places they want to reach. And it will undeniably be a highly efficient and low carbon urban transport system.

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