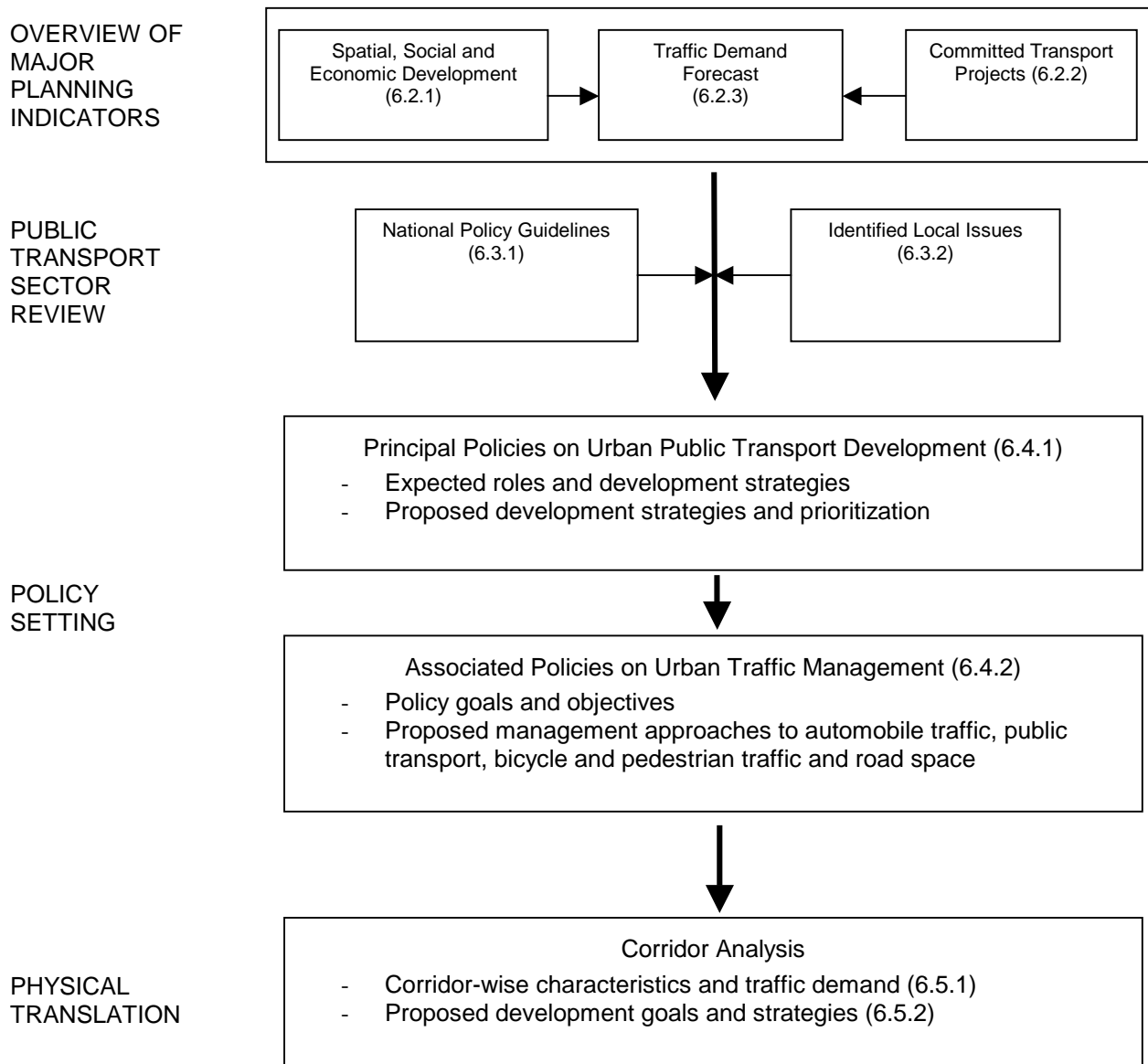


6 POLICY DEVELOPMENT FOR PUBLIC TRANSPORT SYSTEM

6.1 Introduction

This chapter aims to develop an adequate policy framework for Chengdu’s public urban transport system. For this purpose, major planning indicators were summarized and reviewed. The present public transport sector was also reviewed in light of national policy development and local issues. In prioritizing public transport on limited road space, an associated traffic management policy was formulated, covering automobile, bicycle and pedestrian. The proposed policies were translated into corridors to prepare necessary projects and programs in subsequent chapters. Figure 6.1.1 indicates the overall framework for policy development in the Study.

Figure 6.1.1 Policy Development Framework for Chengdu’s Urban Public Transportation System



Note: Figures in parentheses indicate the section numbers in the report.

6.2 Overview of Major Planning Indicators

This section provides a background on public transport system planning, including spatial and economic development trend, committed transport projects and implication from the traffic demand forecast in the study.

These planning indicators envision that Chengdu City will enjoy substantial economic growth in sharp contrast to moderate population growth. There is abundant land to be newly urbanized within the Outer Ring Road while land use is clearly designated including city proper which needs considerable land conversion for urban renewal.

6.2.1 Spatial, Social and Economic Development

Spatial Development

Based on the Chengdu City General Plan (1995-2020), a foreseeable urban structure can be outlined as follows:

- City Region (3,260km²) – This consists of Chengdu urban area and seven satellite cities, namely Dawan, Longquan, Liucheng, Guihu, Pixian, Dongsheng, and Huayang. The seven satellite cities play an important role in secondary industrial development. Industries will be transferred from the city center to the satellite cities gradually and the establishment of large-scale industries should be prohibited. Development should focus on both hilly and flat lands in the south and east of the city. In the south, the Shiyang-Huayang high technology industry district is located along Renmin Nan-Lu. In the east, the Honghe-Longquan industry district is located along Old Cheng-Yu Highway.
- Future Urban Area (inside the Outer Ring Road: 598km²) – The area will be fully urbanized, from being a monocentric urban structure to a polycentric one.
- City Proper (inside the 1st Ring Road, 28km²) – This will become the prime area for large-scale financial, commercial, cultural, information and service facilities, and the existing industrial enterprises will be transferred to the Outer Ring Road zone. Population in this area will be reduced from about 800,000 people to 700,000 people in 2010, and ultimately to a level of 500,000 people.
- Ring Road Urban Belt (between the 1st Ring Road and the 3rd Ring Road, 128km²) – Favorable land uses are residential area, educational/research/science center, traffic pivot, and material collection and distribution area. The establishment of large-scale industrial enterprises, except some high technology industrial firms, will be restricted.
- Outer Ring Road Zone (between the 3rd Ring Road and the Outer Ring Road, 442km²) – Development in this area basically consists of existing towns and industrial zone.

- **Public Facilities Network** – Necessary public facilities will be established in various areas in the city according to hierarchy, that is, the city will have one city proper, two subcenters, 20 large district centers, and residential centers. One subcenter will be located between the extension of Renmin Nan-Lu and the 3rd Ring Road, while the other will be along the Old Cheng-Yu Highway in Honghe district.

Socio-economic Development

The Chengdu City General Plan (1995-2020) sets certain socio-economic targets, as listed below and shown in Table 6.2.1.

- Population will increase from 3,090,000 to 3,500,000 people (1.13 times);
- Population inside the 1st Ring Road will decrease by 100,000 people, and population outside the 1st Ring Road will increase by 500,000 people, especially in the southeast and south;
- GDP will increase from RMB 62,500 million to RMB 143,000 million (2.29 times);
- The share of the primary industry to total GDP will go down, while the shares of the secondary and the tertiary industries will go up; and
- Per capita GDP will increase from RMB 20,222 to RMB 40,850 (2.12 times).

Table 6.2.1 Future Socio-economic Development Framework

		Year 2000	Year 2005	Year 2010
Population (000)	Registered Population	2,620.0 (100)	2,730.0 (104)	2,880.0 (110)
	Temporary Population	470.0 (100)	560.0 (119)	620.0 (132)
	Total	3,090.0 (100)	3,290.0 (106)	3,500.0 (113)
GDP (RMB, billion) ¹	Primary industry	0.9 (100)	0.6 (62)	0.4 (43)
	Secondary industry	27.9 (100)	41.1 (147)	60.2 (215)
	Tertiary industry	33.7 (100)	52.8 (157)	82.4 (244)
	Total	62.5 (100)	94.5 (151)	143.0 (229)
Per Capita GDP (unit:RMB) ¹		20,222 (100)	28,734 (144)	40,850 (212)

¹ City Proper
Source: JICA Study Team

6.2.2 Committed Transport Projects

Arterial Roads

In Chengdu traffic congestion and other negative traffic phenomena may not be mainly attributed to delayed infrastructure development. The city administration has paid continuous efforts in road development in accordance with the long-term road development plan toward the year 2020 and its implementation program until 2010. In the coming decade, the following road projects will be completed on schedule:

- during the early 2000s: 3rd Ring Road, Outer Ring Road, other primary roads within the 3rd Ring Road
- until 2000: Cheng-Nan Highway (funded by central and provincial governments) and construction/reconstruction of secondary roads between the 3rd and Outer ring roads

Subway Network

As described in Chapter 3, Chengdu City has a plan to introduce a subway system. Although the overall network plan (five routes, 109.55km in total) done by the Chengdu Engineering Design Institute has not been approved at any administrative level yet, consensus building has already been done among the parties concerned. For instance, some large station sites have been acquired or fenced in to prevent illegal occupants.

The subway network covering the whole city will probably be developed by 2030. Among these routes, priority is given to Line 1 or the north-south line (north of the 3rd Ring Road-Century Plaza, 17.85km). Taking into account the project viability, local enthusiasm and the progress in consensus building and official approval procedure, the Study anticipates that Line 1 will be open to traffic by 2010. In this connection, bus services along the corridor will have to change before and after the start of subway services.

6.2.3 Summary of Traffic Demand Forecast

In summary, the traffic demand forecast in Chapter 5 indicates that the expansion of economic levels will inevitably increase the traffic flow rate (the amount of trips per person) and popularize motorized private transport. As shown in Table 6.2.2, the current number of daily trips per person is 2.6, which will increase by 12% by 2010. The total number of trips of citizens within the study area will increase to 10,091 thousand (1.27 times that of 2000).

The bicycle is the most commonly used mode of individual transport but is expected to be gradually replaced by motorcycles and cars as income levels improve. If the future volume of motorcycles and cars is projected based on their current ownership ratios at all income levels and the projected economic improvement, it is estimated that the number

of motorcycles would go up twice or so its current level, and that of cars will increase by about three folds. On the other hand, the number of bicycles will go down by about 15%.

Table 6.2.2 Projected Traffic Demand

	Year 1987*	Year 2000**	Year 2010**	2010/2000
Population (000)	1,820	3,090	3,500	1.13
Number of trips (000)	-	7,923	10,091	1.27
Individual Transportation Mode (000)				
Bicycle	-	1,997	1,700	0.85
Motorcycle	-	166	320	1.92
Automobile	-	134	400	2.99

Notes *: Old city administrative area of the year 1987 (95km²), **: Area of this study (586 km²)

Table 6.2.3 presents the projected modal shares. If bus services were maintained in the same level as now (Do-Nothing state), the modal share of the automobile would increase from 17% to 25% because of the increase in its popularity. The bicycle's share will decrease with expanding average travel distance, because of the expansion of the city wherein new inhabitants live in border districts. The number of trips by public transport will also increase, but the modal share remains stable because of the lower speed caused by the increasing number of automobiles. The situation of public transport will slightly improve – the average speed will increase from 12.0km per hour to 12.4km per hour, and the average congestion rate will decrease from 0.43 to 0.39.

If buses travel fast and bus transfer time in the whole region is reduced to once only, the modal share will increase by a large margin, from 14% to 27%. The subway will play an important role in city traffic. Until 2010, buses will continue to have a principal part in city traffic and the demand for transport will increase significantly. Compared to the do-nothing situation, the average congestion rate will decrease to 0.25 and the average speed of buses will increase after improvement of bus services has taken place.

To optimize the efficiency of public transport in city traffic, its fleet should be increased and the space allotted to it widened. In particular, measures should be taken to enhance the speed of buses.

Table 6.2.3 Change in Modal Share of Transport Modes

Means of Transportation	Year 2000	(%)			
		Year 2010 (Do-Nothing state)		Year 2010 (the public services have been improved)	
		No subway	With subway	No subway	With subway
On foot	19.6	20.2	20.2	20.2	20.2
Bicycle ¹	49.2	40.2	36.5	33.1	33.1
Automobile ²	16.9	25.1	22.4	19.3	19.3
Buses ³	10.2	14.5	13.6	27.4	23.1
Subway	-	-	7.3	-	4.3
Total	100.0	100.0	100.0	100.0	100.0

Note: The number of trips does not include those that occur within a zone.

¹ Bicycle: includes bicycle, tricycle and motorcycle.

² Automobile: includes car, taxi and freight car.

³ Buses: include common public bus and mini bus.

6.3 Roles of the Public Transport System

6.3.1 National Policy Guidelines

Urban transport is one of the basic demands of modern society. Thus, urban transport is one of the areas with heavy government intervention. Governments intervene to solve urban transportation problems to meet the increasing demand. But interventions vary by government and many of them are changing and are sensitive to public, business and political opinion.

The Chinese government has some experience in urban transport planning, construction, management, regulation, and policy-making. To set out an adequate transport policy framework for Chengdu, this Study needs to know such experience and policy direction.

This section details the historical background of the existing urban transport administration, institutional framework for urban public transport, and reform and development of state-owned bus enterprises based on Chinese transport officials' papers¹ and local information.

History of Urban Transport Administration in China

China's urban transport administration is closely related to the overall economic management system. Its development can be divided into three periods: the planned economy period, the planned commodity economy period and the socialist market economy period.

Planned Economy Period (1949-78): During this period, from the founding of the Peoples' Republic of China in 1949 to the beginning of reform and the open-door policy in 1978, China's urban transport administration was built upon the model of a centrally planned economy. Therefore, urban transport administration was highly centralized and the municipal government had very little autonomy. Major issues, such as selecting investment projects, financing construction projects, making annual plans and formulating price policy/taxation for the transport sector, were all under the control of the central government. In addition, governments were directly involved in the operation of public transport operations. Municipal governments were in charge of urban transport enterprises, including transport design institutes, road construction companies, maintenance companies, and public transport companies. They also directly controlled the revenue and expenditure of these enterprises. This system led to the sluggish growth of the urban transport sector in China because: (a) the lack of autonomy discouraged local governments from taking initiatives; and (b) heavy government intervention at the

¹ "Municipal Transport Management: A Domestic Viewpoint" written by Wu Yong and Wang Jianqing (Ministry of Construction), 1995 and "The Reform and Development of China's Urban Public transport enterprises", written by Wang Jinxia (CAUPD) and Zhang Kuifu (Ministry of Construction), 1995.

enterprise level prevented the urban transport sector from operating as an independent commercial entity, leading to gross inefficiency.

Planned Commodity Economy Period (1978-1993): Beginning 1978, China started to reform and adopted the open-door policy. The reformation period can be divided into two. The first period explained here, is the planned commodity economy from 1978 to 1993. During this time, reform of the urban management system was mainly based on the principles of a planned market economy. To solve the problem of mixed government and enterprise functions and to break the monopoly of state-owned enterprises in the urban transport industry, China formulated a policy based on the principle of “unified planning and unified management”, and various forms of operation with state-owned enterprises playing the dominant role, complemented by collectively and privately owned enterprises. The policy of separating the Government from construction and maintenance companies in financial matters was also implemented in urban road development. As a result, government intervention was gradually reduced during this period. Also, enterprises had been left alone, to a large degree, to operate by themselves. Central and provincial governments had also gradually granted more autonomy to municipalities in, for example, deciding on investments and establishing institutions. In addition, with reforms in public finance and taxation, a new tax on urban construction and maintenance was imposed. The tax revenue, collected by the municipal government, was earmarked for urban public facilities including urban transport. The People’s Congress also granted local governments (provincial governments and some large cities) power to make local laws and policies. This enabled local governments, who had a better knowledge of their communities, to make laws in line with national laws and policies and to regulate the financing of transport projects and management of the transport system.

Socialist Market Economy Period (1994 to date): In the document “Decision on the Establishment of a Socialist Market Economy System, 1993” the Central Committee of the Chinese Communist Party gave out directives about a socialist market economy in China. The government has since embarked on a series of reforms in administration, public finance, taxation, price system, and so on. The administrative reform is based on directives given by the Eighth People’s Congress. The main idea is to separate the function of the Government from that of the enterprise, to streamline the administration and enterprises and to increase efficiency to meet the demand of establishing a socialist market economy. Following these principles, governments at all levels have engaged in administrative reform. The same is happening in the urban transport management system.

Institutional Framework for Urban Public Transport

Due to the traditional division of administrative functions among governmental departments and channels of investment, different governmental departments in China currently administer road transport, railway, civil aviation, pipeline transport, and postal services and telecommunications. Urban public transport is classified as a subsector of

the “social services sector” instead of “the transport sector”. Together with water supply and drainage, roads, bridges, residential gas and heating supply, urban passenger transport is defined as urban public utilities.

According to the “Sector Classification and Codes of the National Economy”, which was revised and promulgated by the National Statistics Bureau in 1994, the urban public transport subsector is classified and coded as follows:

- K. Social service sector
- 75. The public infrastructure and facilities service sector
- 751. The inter-city public transport sector, including the management and operation of urban public bus, trolley bus, taxi, metro, funicular, rail, cable car, ferry, etc.

Since the replacement of the planned economy management model, the Central Government no longer has grants and subsidies for the construction and operation of urban public transport, including metros. Its investment channels are basically not related to the road transport sector and depend entirely on local government finance. A small portion of the urban construction and maintenance tax has become the main financial resource.

With the development of the urban economy, the size of cities grew; the planned areas and administered areas also became larger. The geographic coverage of urban public transport service increased accordingly. The routes from city center to its near and far suburb areas as well as its satellite towns expanded rapidly. Most urban public buses operated in the busy city proper; a small number of them operated on longer routes, which overlapped with inter-city buses.

Reform and Development of State-owned Bus Enterprises (SOE)

China’s urban public transport enterprises were originally developed during the period of a highly centralized and planned economic system. In the “Notice of the State Council’s Approval and Distribution of the Working Report on the Urban Public Transport Reform by the Ministry of Urban and Rural Construction and Environment Protection” (State Document, No. 59, 1985), the Central Government initially intended to incorporate a market mechanism into urban public transport enterprises. Since then it has issued various reform policies mainly on organizational structure, public funding and operational permit. Parallel actions have been made in every Chinese city including Chengdu. Such efforts and achievements are assessed particularly from Chengdu’s viewpoint, as follows:

(1) Organizational Reform

- 1) *Overstaffing and SOE inefficiency*: In the present system, relevant transport

institutions of cities have two functions. One, as a social regulator they must provide public transport service continually, limit marketing and look after the public's welfare. Two, as owners of public transport enterprises they must seek the largest profit and income.

However, transport institutions cannot fulfill both functions. The enormous deficit of state-owned transport enterprises is evidence of this. According to 1993 statistics before the institutional reform of state-owned enterprises, inasmuch as public transportation service provided by state-owned enterprises met 75% of the total national public transportation demand (on the basis of passenger data), 75% of these SOEs operated on a loss.

- 2) ***Improvement in SOE productivity:*** To improve SOE productivity, Beijing and some other big cities first organized the driver and conductor of every bus into a team and the team signed a contract with the SOE. All the fare revenue goes to the SOE and the team gets a fixed income as stipulated in the contract. If the team's performance surpasses the contract's standard, their income will increase based on the extra revenue and distributed within the team by the team members themselves. The contract standard is decided according to fare income, fuel consumption, etc., so every city's standard is different. This method has achieved some effect, so it was adopted by most SOEs. But there are still many problems, such as lack of rules to stimulate employers' initiatives to systematize service and unclear relation between excellent performance and reduction in subsidy.
- 3) ***Breaking up of SOEs based on route operation rights:*** Other areas have adopted this method since Shanghai introduced it in 1995. When the company is broken up, corporatization is necessary. The company is not responsible in providing the entire fund; employees and private shareholders contribute to it. Here, route operation rights are usually the most valuable assets of investors. The relationship between profit and loss becomes clear when an SOE is broken up into smaller companies. Checking the relation between costs and incomes and contributing factors, when profit or loss increases, becomes manageable.
- 4) ***Joint venture operation with a foreign company:*** This method intends to improve bus services by infusing foreign capital and adopting new management know-how. In this case, a foreign investor provides the necessary capital and part of or the whole bus fleet. When losses occur, however, it is not clear which side must shoulder the deficit. Business is not clearly segregated from administration. Bus tariff is not adjusted according to market economy. Under such circumstances, when the business profits or loses, this sometimes reflects administrative intention.

Chengdu's public transport enterprises have reorganized and restructured themselves according to 2), 3) and 4).

(2) Market Access

- 1) ***Policy for private sector involvement:*** Under a planned economy system, urban transportation is the most important part of local administration as manifested in state-owned public transport enterprises. In the late 1980s, transportation demand in cities increased, with passengers preferring the highly convenient public transport. But local governments and SOEs themselves could not meet the demand, so private capital and minibus services were introduced and adopted. However, the relevant private-capital-absorption policy was not universally applicable in all areas, so the participants were mainly minibus owners.
- 2) ***Lease of bus operation right:*** The Ministry of Construction released the “Resolutions on Lease and Transfer of Operation Rights of Urban Public Passenger Transport” in 1993, demonstrating that the Government, which is the owner of the city’s public transportation, is allowing the right for operation of public transportation to be leased for a certain period of time. In this announcement, leaseholders are also allowed to transfer the right for operation to other enterprises within a certain time. Leaseholders must meet the requirement issued by the local government regarding relevant capital and other essential qualifications. Meanwhile, the local Construction Committee is responsible for making plans relevant to the right for operation and turning them over to leaseholders. Moreover, this announcement allows the creation of an urban public transportation market and details the relation between the transport administrative body and participating enterprises.
- 3) ***Introduction of bus route licensing system:*** The Ministry of Construction promulgated the “Directives on the Franchising of Urban Bus and Trolley Bus Services.” It states that relevant local institutions work out a business environment suitable for the market structure by choosing, through bidding or nomination, only qualified bus operators for the right to operate on certain routes or in some areas. This emphasizes the need for reform state-owned public transport enterprises and, simultaneously, allows all business enterprises to enter into the urban public transportation business under a unified, planned operation. In subsequent government policies, local administration is considered not only as the maker of urban transportation plans but as owner of public transportation.

In Chengdu, the separation of public transport administration and SOEs is not complete. At the same time, the market is not yet ready for urban public transport enterprises providing competitive service.

(3) Financial Support

When state-owned public transport enterprises began to carry out organizational reforms in 1994, the public financial statement indicated that the average operational

deficit of one bus was RMB 9,304 yearly, and the amount used to cover this deficit was RMB 26,800 yearly, which was sourced from the Government. This financial support was a heavy burden on local governments. However, the service could not be stopped. Hence, in the 1990s, some methods were employed in releasing public transportation operational subsidy. Below are five of the methods listed in order of their application timing.

- 1) State-owned public transport enterprises submit their preceding year's financial report and current year's operation plan for relevant agencies' review, after which the Finance Department determines the amount of subsidy for the preceding year.
- 2) The relevant local government department determines the amount of unit subsidy by vehicle-kilometer, then releases it based on actual operational accomplishment.
- 3) The relevant local government department determines the amount of unit subsidy by person-kilometer, then releases it based on actual operational accomplishment. The reason for the shift from vehicle/kilometer to person/kilometer is to stimulate the enterprises' initiative to attract more passengers.
- 4) The relevant local government department determines the amount of subsidy every number of years (usually three). Once the amount is determined, it will not change regardless of income and expense of the SOE. This method helps public transport enterprises to realize, in the short term, income increase from fare and cost reduction.
- 5) The relevant local government department releases the subsidy based on bus route or unit of operating area. To improve service level, the bus administration analyzes the actual transportation demand and the enterprise's income and expense in a certain area.

The present measure taken by Chengdu is the first method. As for a newly formed joint venture company, the adopted financial support policy such as tax reduction is similar to method 4. The Sichuan Provincial Construction Committee regulates method 2, i.e., at RMB 0.50/vehicle-km.

6.3.2 Identified Local Issues

(1) Transport Administration Does Not Respond to Changes in Urban Structure

In Chengdu, the Public Utilities Bureau regulates traffic within the city proper, while the Transportation Bureau regulates traffic in districts outside of the city. With the expansion of the city, urban traffic has extended to the outskirts. This problem occurs between the 3rd Ring Road and the Outer Ring Road. The Public Utilities Bureau has formulated a plan to establish 13 bus stations along the 3rd Ring Road, which will serve as bus junctions in the outskirts and buses in the city. However, Huayang,

Xingdu, Wenjiang, Longquan, and Pixian have developed into satellite cities and the flow of ridership in the bus routes between these areas and the city will increase by 30,000 people. Since the responsibility of carrying passengers will lag behind the development of the city, the administrative region should be defined again. Inhabitants living at the city's peripheries will suffer the consequences of transportation administration that does not adapt to changes in urban structure.

(2) Deficit Management of State-owned Public Transportation Companies

The financial report of the Chengdu Public Transportation Company in 1998 shows that its income is equal to about 75% of its expenses. Subsidies make up for the deficit. This means that the total income cannot cover operation costs. The deficit will become larger with increasing demand and expansion of public transport enterprises. The deficit will increase in proportion to the number of running buses and distances. If the deficit will continue to be covered by subsidies, the amount of subsidies will increase by a large margin in the next 10 years. It is thus obvious that institutional reforms must be undertaken.

(3) Lower Service Quality in Public Transport

Public transport facilities, to be effective, should meet the following conditions: speed, frequency, punctuality, comfort, and density of service network. These conditions, except for the last, will be negatively affected by increasing traffic. The increase in the number of taxis and cars will particularly lead to the decreased service quality in public transport. In the future, when the planned subway construction begins, the lower service quality in public transport will become more prominent compared with the current situation. The problems concerning public transport are as follows:

- **Travel Speed** – The current travel speed is above 15km per hour on average, except in some special roads where the speed is lower than 10km per hour. This situation becomes more serious inside the Inner Ring Road and on radial roads. In the future, the average speed within the Inner Ring Road will decrease to the level of 8km per hour due to increasing car traffic.
- **Frequency** – Bus frequency varies by route, but it remains at a certain level (about 10 buses in a single direction during rush hour on main routes). Congested roads, however, sometimes make passengers wait for a long time. In addition, there is no specific time of bus arrival at bus stops and major bus stations. Likewise, operations are restricted from 6 a.m. to 8 p.m. for most routes, making it unsuitable as the principal public transport means in a big city.
- **Road Network** – The revision in bus routes is being carried out. Since passenger demand was not considered during the planning stage, the routes were not

established in districts where transportation are most needed and the routes in the countryside are very limited.

- Buses – Although new models of buses are introduced continuously, many old buses and those in bad condition are still being used. As of May 2000, buses aged over 10 years accounts for about 10% of the total number of buses. Continued use of aging buses is not effective in providing comfortable and safe services, and adversely affects the environment. On the average, air-conditioned buses account for 17% of the total buses.
- Improvement of Bus Stops and Major Bus Stations – Many bus stops are located along the carriageway, and this badly impedes traffic flow because of the absence of exclusive lanes for bus stops. After improvement, some bus stops are provided with waiting sheds, which also serve as venue for advertising/propaganda boards. However, most bus stops just have a number plate attached to a pole to show the bus routes. It is observed that sometimes different roads have different bus stop names even in the same intersections. Conversely, several bus stops in different locations have the same name. This makes it very difficult to clarify the connections of all bus routes when transfer is necessary.
- Parking Lots – Buses are likely to park on-street near starting points at night-time which may hinder road traffic. It is necessary to secure enough off-street parking lots. Its additional benefit is easy vehicle maintenance and repair before and after operation.
- Bus Fare – The current bus fare is mostly RMB 1 (RMB 2 for air-conditioned and tourist buses). This fare is reasonable, but it will become a burden for some passengers who need to change buses. It is better for them to buy a monthly ticket costing RMB 35. Chengdu citizens can purchase monthly tickets at designated ticket booths at the end of every month, i.e., from the 25th to the last day.
- One-man Bus Operation – Although this is intended as a cost-saving measure, in Chengdu, this caused some operational problems such as slow alighting and boarding of passengers and lack of chance/time to give change.

(4) Issues in Road Network and Traffic Management in Public Transport Development

The existing problems in road network and traffic management have been discussed in Chapter 3. The relevant tasks that need further discussion are as follows:

- Provision of exclusive lanes with little effect on automobile and bicycle traffic
- Improvement of bus stop facilities
- Improvement of intersections.

(5) Increased Traffic Accidents

With the increase in traffic volume, the incidence of traffic accidents also increases, posing a serious social problem. Accidents are caused by mixed traffic consisting of conventional bicycles, an increasing number of automobiles and other transport means of different sizes. They frequently occur at intersections. It is very important to enhance traffic safety, so comprehensive measures to deal with traffic accidents should be considered, including traffic management at intersections and carriageways, safety-related facilities and safety education among drivers.

(6) Deterioration of the Natural Environment

Pollution from bus exhaust poses a threat to the environment. To reduce this threat, CNG (compressed natural gas which causes little harm to the environment) bus should be preferred when buying new buses to replace old fleet.

As of May 2000, the number of buses using CNG is 24% of the total fleet owned by Chengdu Transport Company. The NO_x emission of CNG engines is 1/5 that of the common bus engine, and black smoke is 0. It is necessary to add CNG stations with developing stable technology and renovating engine performance.

Therefore, in formulating policies, more attention should be paid to the environment, especially the following aspects which should be discussed thoroughly to suit the features of Chengdu.

- Reduction of air and noise pollution caused by buses;
- Maintenance of adequate vehicle travel speed to avoid excessive emission.
- Monitoring of residents' health conditions particularly those living along heavy-traffic roads.

6.4 Policy Setting

This section discusses adequate policies to guide Chengdu's urban public transportation system. In every planning aspect, the necessity of urban public transport is examined and then desirable development strategies are proposed in 6.4.1. Although urban public transport is prioritized in Chengdu, it does not restrict other modes such as pedestrian, bicycle, motorcycle, car, and truck. Each mode has a distinct role and often it is supplemented with public transport. To optimize road space and other resources such as public funding, associated traffic management policies are worked out in line with urban public transport policies stated in 6.4.2.

6.4.1 Principal Policies on Urban Public Transport Development

Expected Roles of Public Transport

The primary role of the public transport system is to provide secure, punctual, comfortable, economical, and efficient services to attract more passengers and reduce private transport and to make full use of roads and relieve congestion, which is part of the theoretical benefit of public transport.

Table 6.4.1 outlines the relation between means and location in public transport. As mass transit modes, railway and bus are dominant on heavily trafficked radial roads and in the CBD. On the other hand, minibuses and taxi meet small but uneconomical demand, particularly within the CBD, where diverse public transport services are necessary to support robust economic activities.

Table 6.4.1 Expected Roles of Public Transport

Means of Transportation Service Area		Mass Transportation			Middle to Small Transportation	Individual Transportation		On Foot
		Railway	Busway	Buses	Minibuses	Taxis	Tricycles	
Main Routes	Radial Routes	◎	◎	○	△	—	—	—
	Circle Routes	△	○	◎	○	△	—	—
Branch Routes	Main Routes	—	—	○	◎	○	—	—
	Other Routes	—	—	—	○	△	○	○
District	Center	○	○	◎	◎	◎	○	◎
	Outskirts	—	—	○	○	○	○	○

Notes: ◎ Very important role, ○ Important role, △ Auxiliary role, _ Limited or negligible role

Necessity of Public Transport Development

(1) Establish a Public Transport System Suitable to the Development of the City

At present, city development focuses on the city center. In the future, a multilevel, dispersed city development should be developed which, to a large extent, includes the city center, secondary city center, development center in the border region, and satellite cities outside the region. The planning year of 2010 in the Study is considered an intermediate year in achieving the ultimate urban structure. To realize the smooth transformation of the city and enhance the economic level of its residents, the traffic flow in developing districts and between the city and these areas should be smoothened. A highly efficient public transport system should perform this important function when the demand for transportation increases.

(2) Provide Various High-quality Public Transport Services

Compared to the expanding traffic demand in the city, the expansion of traffic space is limited. In the long run, making full use of transport facilities is more important

than establishing more transport facilities. The public transport system (urban railways, subways, public buses) has an advantage over other transportation modes (bicycles, automobiles, cars) in space utilization. Therefore, the public transport system should provide high-quality and wide-ranging services to stimulate the shift from private to public transport based on economic level. To achieve this, the speed, frequency, safety, and comfort of public transport should be improved and noise and exhaust pollution controlled.

(3) Provide Larger Capacity Vehicles and Longer Services

The population within the study area will increase by 410,000 people in 2010. Because of high commercialization of land exploitation within the 1st Ring Road, there are less people at night. The municipal government is taking some measures to encourage migration from within the Inner Ring Road region to the border, thereby reducing the population by 100,000 people in 2010. The population in the border will increase at night as employment opportunities increase. However, the rate of increase in employment opportunities cannot catch up with that of population, so the people who live in the border but work in the city center will increase, which makes travel distances longer.

One assumption in the Study shows that future public transport demand would double provided buses and subways supply high-quality services. Since bicycle is not suitable for longer travel, public transport will have to compete with private vehicles to share in the emerging long-distance commuting traffic.

(4) Demand Transport Enterprises to be Financially Independent

Until now, the financial condition of the public transport system remains in deficit and dependent on subsidies provided by the municipality. Like any other enterprise, the public transport enterprise cannot provide high-quality service without a sound financial system. Because bus services are limited by inadequate subsidies, they cannot improve the quality of the bus fleet and their running frequency. The improvement of this financial condition is a prerequisite to attain the first four goals discussed in the foregoing sections.

(5) Enhance Traffic Safety

Traffic safety will decrease with the increase in traffic volume. On main transport routes, there are roads with and without bicycle lanes and roads for mixed traffic. At intersections, traffic jams often occur because of a mixed traffic of automobiles, buses and bicycles. It is obvious that traffic accidents will sometimes occur so appropriate measures should be taken to ensure a safe environment for public transport and passengers.

(6) Preserve the City Environment

The greater the demand for public transport, the greater the number of buses. Necessary measures should be taken to minimize the negative effects on the natural environment caused by increasing number of public transport, especially air pollution, noise and vibration.

Proposed Development Strategy

(1) Prepare Plan for the Transition Period from Bus-based to Rail-based Public Transport System

In the long run, the Chengdu public transport system will focus on the subway network. In 2030, the subway network will be completed. The period from 2000 to 2030 will be a transition period to develop a public transport system consisting mainly of railways and buses. Buses will become the main public transport for a certain period and then will provide some auxiliary services. It is projected that only the subway's Line 1 will be completed before 2010, so the main component of the public transport is still buses until 2010. In formulating the plans to improve public transport by 2010, however, the subway network should be taken into account. It is planned that high-quality services will be provided after the completion of the subway, which will encourage citizens to travel by subway instead of other public transportation. Future transport demand will shift to subways to make subway transportation stable. Therefore, we should take the subway network into account when making long-term plans for public transport and establishment of major bus stations.

(2) Prioritize Bus Transport on Trunk Roads

It is difficult to enhance the speed and enlarge the capacity of bus services because of the mixed traffic of automobiles and bicycles. Hence, it is necessary to prioritize buses on main routes and maintain, even improve, bus services to ensure adequate traveling space, punctuality, high trip frequency, and high speed. These measures are feasible and should be applied on main routes where demand for public transportation is concentrated.

(3) Reorganize Bus Route Network

With the development of the border region, a significant part of the population will migrate to the edge of the city, resulting in changes in public transport and bus routes to meet the demand. The following sections will discuss the strategy of introducing market economy principles in the field of public transport. The rearrangement of routes naturally follows the business way of transport operators who do not establish new routes in regions with little demand. The transport

administration should thus direct transport operators to establish routes to a dispersed city development. In the short term, building main routes from the border to the city center, routes in the secondary city center and in each core area should be encouraged.

(4) Introduce a Market Economy Principle

Currently, transport administration assigns bus operators on specific routes with limited competition. When assigned bus operators suffer from operational deficit, most of them are compensated in the form of either subsidy or tax exemption. Since bus operators are mostly public-owned, the segregation of administration from business is quite difficult. Under such circumstances, little incentives work to reduce operational loss and improve service. The central government decided to transform the existing monopolized bus business into a competitive and transparent one. Specifically, the government adopted a route licensing system through bidding. Although there is still uncertainty about system alternatives, after any change in business environment, bus services will have to be managed under the principles of a market economy, resulting in better or cheaper services.

(5) Optimize Cost-sharing in Public Transport

The costs of public transport should be transferred to users/beneficiaries. Since almost all the people are beneficiaries, the costs could be covered by taxes if specific beneficiaries cannot be identified. Expenses will be minimized due to competition. Costs, on the other hand, will increase if the principle of demand and supply is used. For example, Chengdu prescribes that the number of taxis should be 500 units. The bid for each taxi is RMB 300,000. Therefore, Chengdu municipality generates RMB 150 million in cash every year. Taxi passengers will shoulder some of the costs of public transport.

(6) Enhance Traffic Safety and Environmental Protection

When giving buses the priority to use roads, the convenience and safety of bicycle traffic should also be considered. The bicycle serves as the main transport now and will continue to play a major role in traffic although its importance will decrease in the future. It is, however, more susceptible to accidents and proper safety programs should be put in place.

The strategy to protect the environment is to popularize the use of the CNG engine. This can be used in buses and taxis.

Table 6.4.2 Public Transport System Development Strategy

Issue	Short-term Strategy	Medium- to Long-term Strategy
System Development	<ul style="list-style-type: none"> • Focusing on bus transport 	<ul style="list-style-type: none"> • Focusing on subway and bus
Networking	<ul style="list-style-type: none"> • Strengthening trunk routes (CBD-suburbs) • Adding routes in poorly serviced areas 	<ul style="list-style-type: none"> • Providing dense connection between CBD and subcenters and between CBD/subcenters and satellite towns • Developing feeder bus routes serving subway
Terminal Development	<ul style="list-style-type: none"> • Transferring inter-city bus terminals to around the 3rd Ring Road 	<ul style="list-style-type: none"> • Developing subway stations to facilitate intermodal connection • Constructing new terminals associated with urban development
Road Space Management	<ul style="list-style-type: none"> • Prioritizing bus transport 	<ul style="list-style-type: none"> • Segregating bicycles from buses and cars
Business Environment	<ul style="list-style-type: none"> • Shifting to route licensing system 	<ul style="list-style-type: none"> • Developing a competitive and transparent business environment
Cost Recovery	<ul style="list-style-type: none"> • Reducing operational deficit (or subsidy) 	<ul style="list-style-type: none"> • Establishing a beneficiary's pay principle
Environmental Protection	<ul style="list-style-type: none"> • Converting to CNG engine 	<ul style="list-style-type: none"> • Increasing subway's role in urban transport

Prioritization

The preceding strategies are discussed in greater detail in the following sections. They are divided into two aspects, namely: (1) the improvement of hardware (infrastructure and facility) and (2) the improvement of software (institutional reform).

(1) Hardware Improvement

- Introduction of Exclusive Bus Lanes and Bus Priority Lanes – Preferential lanes for buses should be introduced on roads with high traffic demand to keep the speed of buses within certain standards and to increase their capacity.
- Introduction of Exclusive Bicycle Lanes – Bicycle lanes should be separated from automobile lanes to avoid the adverse effects on bicycle traffic caused by the introduction of exclusive bus lanes and bus priority lanes.
- Establishment of Bus Transfer Facilities – A complicated public road transport network causes inconvenience. Having transport centers serving as bus transfer facilities will simplify the network and control the operations of public transport. Parts of these facilities will connect with the main subway stations of the subway network.
- Establishment of Inter-city Bus Terminals – Long-distance passenger transport stations will be located at the city's border (the region around the 3rd Ring Road) to prohibit long-distance passenger buses from entering the city. These stations can also be used as bus terminals, which cannot be set up in the city. Some

stations are located near the terminal point of subways to connect the city transport system to other cities.

- Improvement of Intersections – Transport facilities such as signals should be improved to promote smooth and more efficient traffic flow. Cloverleaf interchanges can be established in congested intersections that cannot be improved by signalization alone.
- Promotion of CNG Engine Use – Buses and taxis are currently using CNG engines. To push forward this trend, more CNG service stations should be established. Measures for bus and taxi companies and CNG service stations to support the shift to CNG use (e.g, by ensuring the loads, providing subsidies and reducing taxes) should be adopted.

(2) Software Improvement

- Privatization of Public Transport – Privatization should be carried out to realize better public transport services under the principle of a market economy.
- Improvement of Fare System – Public transport companies can regulate the fare within a certain range. The Public Utilities Bureau will approve applications for fare changes without any special causes.
- Rationalization of Public Transport Routes – Under the principle of market economy, newly established and improved routes are applied for and served by transport operators. The Public Utilities Bureau’s function of guiding the plans to improve the road network should be abandoned. Instead it should accept applications of service suppliers and approve these applications based on common criteria, such as safety, and to ensure bus services in areas that require them.
- Expansion of the Jurisdiction of Urban Transport Administration -- The “wall” between the Public Utilities Bureau and the Transportation Bureau should be removed, and an organization should be established to plan for and carry out a comprehensive traffic management in a wider city area. With this reform, a new organization will principally guide the development of private-owned transport enterprises to keep pace with the city’s development.

Table 6.4.3 shows the relationship between the major measures and the strategies to improve the public transport system.

Table 6.4.3 Relationship of Major Measures and Strategies for Improvement

	Major Measures and Improvement Strategies	Prepare Transition Plan from Bus to Rail	Prioritize Bus Transport on Trunk Roads	Reorganize Bus Route Network	Introduce a Market Economy Principle	Optimize Cost-sharing in Public Transport	Enhance Traffic Safety and Environmental Protection
Hardware Improvement	Introduction of exclusive bus lanes and bus priority lanes	○	○	○			○
	Introduction of exclusive bicycle lanes	○	○				○
	Establishment of bus transfer facilities	○		○			
	Establishment of inter-city bus terminals	○		○			
	Improvement of intersections	○	○				○
	Promotion of CNG engine use						○
Software Improvement	Privatization of public transport			○	○	○	
	Improvement of fare system			○	○	○	
	Rationalization of public transport routes	○		○	○		
	Expansion of the jurisdiction of urban transport administration	○		○			

Note: “○” indicates that there is a relation between the specific measure and strategy.

6.4.2 Associated Policies on Urban Traffic Management

Policy Goals and Objectives

In Chengdu, there are many ongoing discussions about traffic management strategies to relieve traffic congestion and ensure traffic safety. In the following sections, the strategies necessary to improve bus transport will be discussed. These include those dealing with automobile transport, public transport, other problems concerned with bicycles and pedestrians, and various alternative strategies. The traffic management plan is not only an important part of urban transportation policies but is also an indispensable factor in solving the problems in each city and in promoting efficient urban transportation. Various traffic management policies should complement economic activities, land-use policy and requirements of the urban environment.

With the development of the economy, automobiles will play an important role in social life, thus traffic and other urban environment will worsen. Hence, under the study's objective of strengthening public urban transport, the traffic management policy should prescribe desirable rules to optimize limited public space (such as roads) and enhance efficiency to develop the urban transportation system. With economic development, the number of people's trips will increase, the city's development will improve and motorization will develop by a large margin. On the other hand, bicycles will still have an important place in all kinds of traffic. To improve the convenience and comfort of the public transport system including buses and to build an attractive urban traffic system, the following problems should be discussed:

- Dealing with a large number of bicycle traffic;
- Improving traffic signals and giving buses preferential use;
- Expanding the space for pedestrians in connection with public transport;
- Controlling automobile traffic; and
- Redistributing road space.

Different transport agencies with different attitudes should cooperate in carrying out the proposed traffic management policies, so it is necessary that they have a common understanding of the policies. Special issues have been discussed in four parts: (1) those dealing with automobile traffic; (2) with bicycle; (3) with pedestrian traffic; and (4) those dealing with road space.

Approach to Vehicular Traffic

With economic development and increased personal incomes, the number of privately owned automobiles will increase rapidly. It is projected that the number of automobiles owned by private individuals will increase to more than 2.3 times it is now. As discussed in Chapter 5, the rate of automobile ownership per 1,000 population is 17.9 in the whole Chengdu City and 44.5 in the city proper, a little higher than the average rate of 37.1 in developing countries (based on data provided by the World Bank). Ownership rates in developed countries are beyond 500, with the highest rate in Japan. The current rate in Chengdu is less than one tenth of developed countries, so the development potential is very great as the city's economy develops.

Table 6.4.4 Automobile Ownership in Chengdu

(unit: '000)

	Freight Car	Bus	Car	Population (000 people)	Automobiles per 1000 Residents	Remarks/Notes
Whole Chengdu	77.7	7.7	180.2	10,035.6	17.9	As of 1999
5 Districts in the City Proper	37.0	4.7	112.5	2,427.2	44.5	As of 2000
Japan					560.0	As of 1998
Developing Countries					37.1	1996 figures provided by the World Bank

**Table 6.4.5 Schemes to Control Automobile Transport
and Their Applicability in Chengdu**

Scheme to Control Automobile Transport	Necessity and Urgency in Chengdu City	
(1) Control the ownership of automobiles		
• Strengthen limit on drivers' license	☆	Low rate of obtaining driver's license
• Limit the number of owned automobiles	☆	Small number of individuals
• Impose tax on ownership	☆	
• Strengthen regulation on garages	☆☆☆	Optimize limited public space
• Introduce allocation system of new automobiles	☆	Small number of privately owned vehicles
(2) Regulate automobile use		
• Limit the speed	☆☆	These are efficient ways of relieving mixed transportation in the city center and protecting the environment. Combined with renovation of pedestrian space (to be further explored).
• Limit the volume of traffic	☆☆	
• Introduce the traffic zone system	☆☆	
• Limit number of license plates	☆	Private cars are rare, so it is impossible to get good results.
• Limit low occupancy rate	☆	
• Road pricing	☆	
• Impose fuel tax	☆	
(3) Limit parking		
• Limit the capacity of off-road parking	☆	Few off-road parking lots
• Prohibit on-street parking	☆☆☆	Strengthen the regulation on illegal parking
• Charge parking fees	☆☆	To limit private car use
• Impose tax on parking space	☆	Few off-road parking lots

Notes: ☆ Long-term task.
☆☆ As a mid-term task, it should be tried now.
☆☆☆ Immediate implementation is required.

To facilitate motorization in China, the car manufacturing industry should be given attention. The automobile manufacturing sector is the pillar of Chinese industry, and for it to take off the domestic market is very important.

Every urban transport system in developed countries should take all kinds of measures to regulate the use of automobiles to improve mixed traffic situations, protect the urban environment and optimize energy use. It is very important for Chengdu's urban transportation system to rationalize the strategy for automobile transport.

There are three methods of controlling automobile transport (see Table 6.4.5), namely: (1) controlling the ownership of automobiles; (2) controlling the use of automobiles; and (3) controlling the parking of automobiles. It is obvious that controlling automobile ownership, especially those for private use, is a basic strategy. However, it is not

appropriate to enforce this method considering the current low income level and low ownership rate.

Controlling automobile usage is more important than controlling ownership in improving the quality of life and in supporting the automobile industry. However, the regulation of garage allocation should be implemented to remedy the disorderly parking in the city.

Approach to Bicycles

Japan, America and many European countries are now looking for a suitable alternative use for the automobile because it has nearly saturated traffic. The bicycle is a growing concern as an alternative to automobile. It is considered important because it causes no pollution. Many countries are in fact improving their transportation environment to encourage bicycle use.

In sharp contrast to Japan, Europe and America, the share of bicycles in Chengdu is the highest (70%) among the transport modes. Bicycles, however, cause much traffic disturbance and many accidents. Since the flat land of Chengdu is favorable to bicycle use and as the city is seated in a basin with little atmospheric circulation making it prone to serious air pollution, bicycle use should be encouraged.

However, bicycles cannot take the place of automobiles now. Chengdu is currently in the first stage of motorization. With economic development, bicycle use will gradually shift to automobile use. Nevertheless, the bicycle is and will continue to be an important transport means in Chengdu, making it necessary to improve the environment for bicycle use.

The strategies for improving the environment for bicycle transport includes the (1) enhancement of the network of bicycle lanes and (2) distribution of bicycle parking lots.

Approach to Pedestrian

Walking plays an important role in urban traffic. People travel a lot on foot after riding buses or trains. Hence, it is urgent to organize the space for pedestrians. Countries all over the world do research and implement ways to organize pedestrian space, such as building elevated (“skywalk”) or underground structures, keeping transportation in order and designating districts strictly for residential purpose.

Safety belts in the city center, including special squares and roads, should be set up to prohibit automobiles from entering the city center, create a good space for pedestrians and stimulate commerce. The pedestrian mall in commercial streets with large pedestrian traffic, for example, is set up as “special roads” for pedestrian use only. Another example is an exclusive pedestrian path. In small, unpaved streets, one measure that can be taken is controlling vehicle speed to ensure safe traffic.

The required conditions to enhance pedestrian convenience and safety are:

- (1) Develop the lanes and renovate large area of buildings, parks and squares near the road network to create more space for pedestrians.
- (2) Organize transportation safety belt and transport interchanges efficiently, so that the people will not get wet in the rain while changing transport modes.

Table 6.4.6 presents the various schemes for organizing pedestrian space.

Table 6.4.6 Schemes to Organize Pedestrian Space and Their Applicability in Chengdu

Schemes to Organize Pedestrian Space	Necessity and Urgency in Chengdu City	
(1) Improve pedestrian space		
• Create a pedestrian mall	☆☆	Urban renewal in commercial district
• Allot roads for pedestrians and automobiles	☆☆☆	Parallel with improvement in the living environment
• Build a pedestrian deck	☆☆☆	Applicable for major bus stations and commercial centers with complex flow of pedestrian traffic
• Create underground space for pedestrians	☆☆☆	
• Build elevated structures for pedestrians	☆☆	In line with vertical land use
(2) Enhance pedestrian safety and convenience		
• Limit vehicle speed	☆☆	Parallel with residential development/renewal
• Practice caution	☆☆	
• Limit automobile traffic	☆☆	
• Limit on-street parking	☆☆	
(3) Implement area measures		
• Establish traffic zone	☆☆	Parallel with residential development/renewal
• Establish residential zone	☆☆	
• Establish community zone	☆☆	

- Notes: ☆ Long-term task.
☆☆ As a mid-term task, it should be tried now.
☆☆☆ Immediate application is required.

Approach to Road Space Management

Roads used for traffic also function as the city's public utility service backbone, like tap water pipes and wires underground, and beautify the city. Roads are an indispensable to community life. Roads serve various functions including as passage for pedestrians, bicycles and transport facilities, and as parking space as well as provide space for the public and for safety and street facilities. When improving roads, making efficient use of current road space should be considered. Roads should be improved according to their functions and on preferential considerations of cutting down automobile traffic space. Narrow roads should be widened and ring roads and network of main routes improved. Some countries reduce lanes, taking out the low-speed lanes to narrow the lanes, then widen the pavement, set up bicycle lanes in high-traffic roads, and set up special, preferential and one-way lanes for public transport.

When shifting from a traffic system primarily for automobiles to a system mainly consisting of public transport, the improvement of bicycle traffic and pedestrian environment and the redistribution of road space are very important tasks.

Most main radial routes are wide and separated by automobile lanes, bicycle lanes (for non-motorized vehicles) and pavements. Determining the measure to adopt to prioritize public transport is crucial. In quasi-main routes, pavements and lanes are separated, and a large volume of public transport, including bicycle, bus and common traffic, runs on the same space. It is thus necessary to prioritize space and its distribution.

6.5 Physical Implications of Development Policies by Corridor

6.5.1 Characteristics and Traffic Demand by Corridor

Analysis Objective

The traffic system in Chengdu consists of a network of main radial routes concentrating on the city center. Although there is a plan to develop the secondary city center in the east and north, the city center is still the area with a large concentration of traffic demand. The current flow of population is around the city center and the border. The features and importance of the border differ by area and should be clarified. This analysis aims to use the concept of corridors (the area or roads within the same region of interdependent economy and direction; with Chengdu as a radial-circular region) to divide the subject region into several parts; analyze each corridor's current and future features according to some aspects of city development, land use, traffic demand, main route network, service quality of public transport, and their interrelationships; and formulate future improvement strategies.

Selected Corridors

In the analysis, seven radial corridors and three circular corridors are selected according to the following considerations:

- Current situation of land use and the future city development (eg, the zoning of the secondary city center, developing business centers in the border, seven satellite cities);
- Current and future city development;
- Main radial route network;
- Public transport services (bus lines, major bus stations); and
- Long-distance transportation (railway, aviation, high way, coach).

Figure 6.5.1 depicts the configuration of the selected corridors.

Characteristics of Corridors

Table 6.5.1 summarizes the characteristics of the corridors. In addition, sectional drawings concerned with traffic demand of each road corridor are illustrated in Figures 6.5.2 and 6.5.3. Table 6.5.2 shows the large traffic demand in the north, south and east corridors. This trend will not change. However, with the expansion of the city and the development in the southern and southeastern secondary city centers, especially the north-south and the east-west corridors, transportation around the 2nd Ring Road will expand to the 3rd Ring Road, as indicated by the increased volume and growth rate of traffic demand.

Figure 6.5.1 Configuration of the Selected Corridors

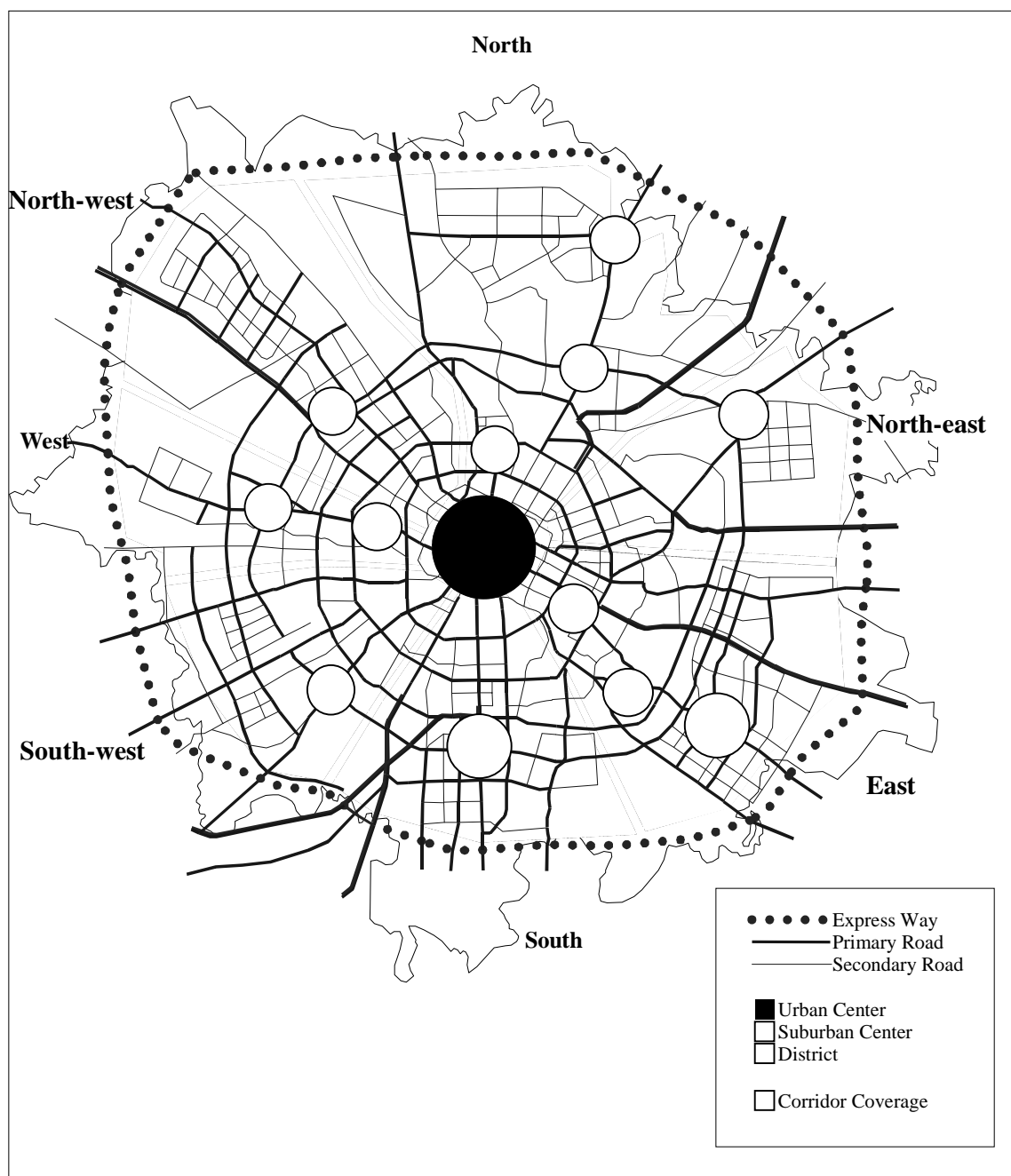


Table 6.5.1 Corridors in Chengdu

Serial No.	Corridors	Developing Center (Commercial Center)	Main Routes Concentrated with Business	Main Routes in Corridor Belt (Connecting with Highway)	Planned Subway	Long-Distance Passenger Transport Station	Satellite Cities	Long-Distance Transport Highway
1	North	- Periphery of the North Station - Near the crossroads of 3 rd Ring Road and Zhaojuesi Nan-Lu - Tianhui Town	- Renmin Nan-Lu - Jiefang Lu - Simaqiao Jie - Zhaojuesi Nan-Lu - Beizhan Xi-Lu - Rongbei Maoyi Da-Dao	- Renmin Bei-Lu - Jiefang Lu - Fuqing Lu(Cheng-Mian Highway) - Beizhan Xi-Lu(Cheng-Peng Highway)	1st line	North Railway Station Cheng-Peng Highway, Major Bus Terminal of Chuan-Zang Highway, Baliqiao bus stop	-Dawan Town -Guihu Town	To Mianyang City and Pengzhou City
2	North east	- Longtansi district - The industry layout between the 2 nd Ring Road and the 3 rd Ring Road		- Jianshe Lu - Xinhong Lu (Cheng-Nan Highway) - Shuanglin Lu	4th line	Longtansi, Cheng-Nan Highway, Cheng-Mian Expressway Bus Terminal		To Nanchong
3	East	- Niushikou district - Shahepu district - Secondary city center of Honghe-shiling	- Dong Da-Jie - Dong Da-Lu - Shahepu Jie - Honghe - the 3 rd Ring Road in Shiling district	- Shudu Road (Cheng-Yu Expressway) - Old Cheng-Yu Highway - Qinglong Lu	2nd line 5th line	Honghe station, Cheng-Yu Bus Terminal (conceptual)	Long-quan Town	To Chongqing City
4	South	- Secondary city center around North Station	- Renmin Nan-Lu	- Renmin Nan-Lu - Xin Renmin Nan-Lu - Ximianqiao Lu(Cheng-Ya Expressway)	1st line 3rd line 5th line	South Railway Station, Shuangliu Airport, North Station, Cheng-Ya Highway, the thief Bus Terminal in Cheng-Ren Highway	Huayang Town (Dong-sheng Town)	To Leshan City
5	South west	- Cuqiao-Jitou district	- Wuhouci Da-Jie - Chuan-Zang Highway	- Chuan-Zang Highway - Wuhou Da-Dao - Caojin Lu	4th line	Shuangliu Airport, Chuan-Zang Highway	Dongsheng Town	To Ya'an City
6	West	- District near the inter-section of 1 st Ring Road and Qingjiang Lu - Huangtianba district	- Qingjiang Lu - Cheng-Wen Highway - Qinghua Lu - Guanghuacun Jie	- West section of Shudu Road - Qinghua Lu	2nd line	Bus Terminal in Qingjiang Lu	Liucheng Town	To Chongzhou City
7	North west	- Tuqiao district	- Yinmenkou Lu - Chadianzi Lu - Fuqin Lu - Shawan Lu	- Fuqin Lu (Cheng-Guan Expressway) - Chadianzi Lu - Shawan Lu	2nd line 3rd line	Major Bus Terminal in Cheng-Guan Highway	Pitong Town	To Dujiangyan
8	No.1 Circle	3 Developing centers	-Concentrated commerce in the whole route	- 1 st Ring Road	4th line			-
9	No.2 Circle	3 Developing centers	- Concentrated commerce in the whole route	- 2 nd Ring Road	5th line			-
10	No.3 Circle	Other developing centers in 2 secondary city centers	- Concentrated commerce in the northeast and the south, concentrated industry in the northeast	- 3 rd Ring Road		Planned 14 long-distance passenger transport stations		-

Table 6.5.2 Change in Traffic Demand in Each Road of the Corridors

Sq. No.	Corridor	Main Routes in Corridors (Extended Highway)	Road Sections	Traffic in Different Road Sections ('000 people per day)			
				Year 2000	Year 2010	2010/2000	2010-2000
1	North	- Renmin Bei-Lu - Jiefang Lu - Fuqing Lu (Cheng-Mian Expressway) - Beizhan Xi-Lu(Cheng-Peng Expressway)	1) Inner Ring Road 2) 2 nd Ring Road 3) 3 rd Ring Road	357 287 198	432 435 244	1.2 1.5 1.2	75 148 46
2	North east	- Jianshe Lu - Xinhong Lu (Cheng-Nan Expressway) - Shuanglin Lu	1) Inner Ring Road 2) 2 nd Ring Road 3) 3 rd Ring Road	134 207 14	149 226 41	1.1 1.1 3.7	15 19 27
3	East	- Shudu Road (Cheng-Yu Expressway) - Old Cheng-Yu Highway - Qinglong Lu	1) Inner Ring Road 2) 2 nd Ring Road 3) 3 rd Ring Road	287 314 107	339 479 288	1.2 1.5 2.7	52 165 181
4	South	- Renmin Nan-Lu - Xin Renmin Nan-Lu - Ximianqiao Lu (Cheng-Ya Expressway)	1) Inner Ring Road 2) 2 nd Ring Road 3) 3 rd Ring Road	264 165 41	375 347 202	1.4 2.1 4.9	111 182 161
5	South west	- Chuan-Zang Highway - Wuhou Da-Dao - Caojin Lu	1) Inner Ring Road 2) 2 nd Ring Road 3) 3 rd Ring Road	183 146 93	278 258 181	1.5 1.8 1.9	95 112 88
6	West	- West section of Shudu Road - Qingnian Lu	1) Inner Ring Road 2) 2 nd Ring Road 3) 3 rd Ring Road	191 113 109	211 154 176	1.1 1.4 1.6	20 41 67
7	North west	- Fuqin Lu (Cheng-Guan Expressway) - Chadianzi Lu - Shawan Lu	1) Inner Ring Road 2) 2 nd Ring Road 3) 3 rd Ring Road	230 199 81	262 274 146	1.1 1.4 1.8	32 75 65
8	No.1 Circle	- 1 st Ring Road	Cross section of the circle	158	195	1.2	37
9	No.2 Circle	- 2 nd Ring Road	Cross section of the circle	20	36	1.8	16
10	No.3 Circle	- 3 rd Ring Road	Cross section of the circle	2	3	1.5	1

Figure 6.5.2 Current Traffic Demand in the Corridors (2000)

(Unit: Person/Day)

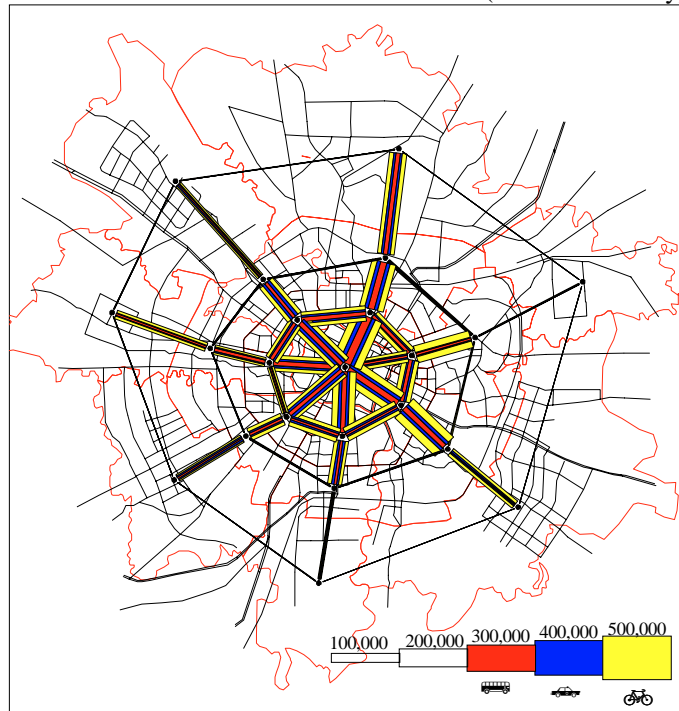
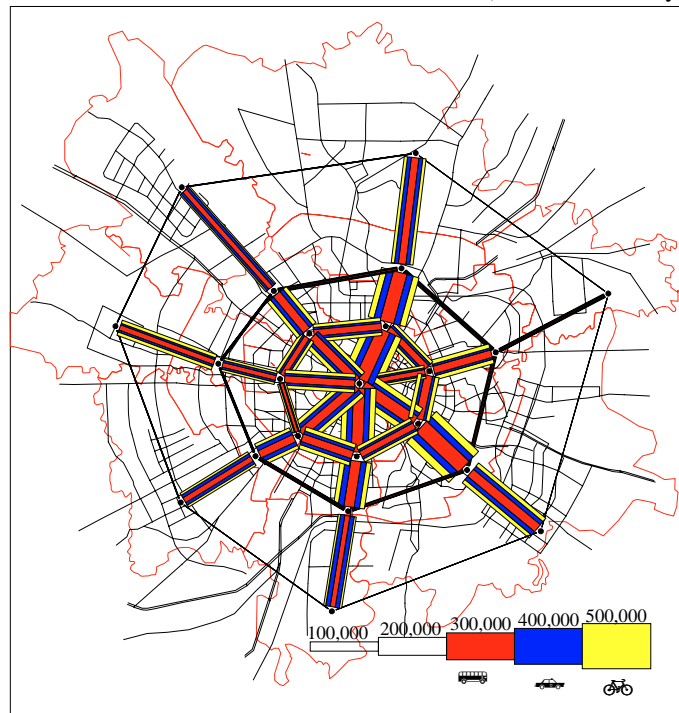


Figure 6.5.3 Future Traffic Demand in the Corridors (2010)

(Unit: Person/Day)



6.5.2 Development Goals and Strategies for the Corridors

(1) North Corridor

The long-term development goals of this corridor are to connect the central area at the periphery of the North Railway Station and the developing center in the north through efficient, diversified bus services and to improved linkages with the core areas of the northern satellite cities and those of other cities. Its long-term improvement strategy is to complement the 1st subway line with stable and high-quality bus services. The coordinated train-and-bus transport of the North Railway Station and major bus terminals in the core areas of cities should be established. These areas should link with the North Corridor where the south section of the 1st railway line is situated. The short- and mid-term improvement strategies, which will complement the long-term strategy, are as follows:

- The planned 1st subway line will be completed in 2010.
- Before the 1st subway line connecting the central area, southern region and North Railway Station will be opened to traffic, bus services should be improved to satisfy the increased traffic demand and to promote regular public transport service in the corridor as well as encourage the shift from public transport to subway.
- Based on the 1st subway line, the space for bus travel should be ensured in the high traffic demand routes, and the automobile traffic should be separated from the bicycle traffic to assure punctuality, high frequency and high speed of bus services.
- The separation of buses, automobiles and bicycles in other main routes should be done to ensure traffic safety.
- Bus services should be extended to the outskirts, especially in the district outside the 2nd Ring Road, to adapt to the expansion of the city. The improvement of major bus terminals connecting the traffic in the periphery of the 3rd Ring Road and the satellite cities, including Dawan Town and Guihu Town, with the north traffic, including Mianyang City and Pengzhou City, should be promoted.

(2) Northeast Corridor

The long-term development goals of this corridor are connect the city center and the developing center in Longtansi district with efficient bus services and to provide linkages with the core areas of the eastern satellite cities and other cities in the direction of Nanchong. Its long-term improvement strategies are to provide high-quality bus services and establish a highly efficient and coordinated transport with major bus terminals of core areas outside the city. Because industrial development

is implemented between the 2nd Ring Road and the 3rd Ring Road in the corridor, truck routes should be fully considered. The short- and mid-term improvement strategies to complement the long-term strategies are as follows:

- High-quality bus services should be provided, and the volume should be expanded in main routes with increased traffic demand. Punctuality, high frequency and speed of bus services should also be ensured.
- Bus traffic should be separated from automobile and bicycle traffic to ensure traffic safety in other main routes.
- Bus services should be extended to the outskirts especially the district outside the 2nd Ring Road to accommodate the expansion of the city. Improvement of major bus terminals connecting inner-city traffic in the periphery of the 3rd Ring Road with east traffic outside the city to Nanchong should also be promoted.
- Truck traffic in the industrial area between the 2nd Ring Road and the 3rd Ring Road should be properly managed.

(3) East Corridor

The long-term development goals of this corridor are to connect the central area with the planned secondary city center in the Honghe-Shiling district and the medium developing center, and to link with core areas of the eastern satellite cities and the big cities in the direction of Chongqing. Its long-term improvement strategies are to complement public transport with the 2nd subway line, provide stable and high-quality bus services and establish a highly efficient and coordinated transport among major bus terminals of core areas outside the city. The short- and mid-term strategies that will complement the long-term strategies are as follows:

- To meet increased traffic demand, public transport services should be frequent. High-quality bus services should be provided from the very beginning, even with the construction of subways.
- Based on the premise of constructing predetermined subway lines, the lanes for automobile traffic should be widened, the space for bus traffic separated from that of automobile and bicycle traffic and the punctuality, high frequency and high speed of bus services ensured.
- In other main routes buses should be separated from automobiles and bicycles to ensure traffic safety.
- Bus services should be extended to the outskirts, especially outside the 2nd Ring Road to accommodate the city's expansion. Renovation of major bus terminals connecting inner-city traffic around the 3rd Ring Road and traffic to the satellite cities of Longquan and Chongqing should be promoted.

(4) South Corridor

The long-term development goals of this corridor are to connect the central area with the secondary city center in the South Railway Station, which is planned for development, and to link the core areas of the southern satellite cities and those of other big cities. Its long-term improvement strategies are to complement public transport with the 2nd subway line, provide stable, high-quality bus services and establish a highly efficient and coordinated train-and-bus transport between major bus terminals and railway stations, which are the core areas outside the city, and connect them with the northern section of the 1st subway line in the North Corridor. Complementing the long-term strategies are the following short- and mid-term improvement strategies:

- The planned 1st subway line will be completed in 2010.
- Before the 1st subway line connecting the central northern region and the South Railway Station will be opened to traffic, bus services should be improved to satisfy the increased traffic demand and promote regular public transport services in the corridor and encourage the shift from public transport to subway.
- Assuming the operation of the 1st subway line, the space for bus travel should be ensured in the high traffic demand routes, and automobile traffic should be separated from bicycle traffic to guarantee punctuality, high frequency and high speed of bus services.
- The separation of buses, automobiles and bicycles in other main routes should be done to ensure traffic safety.
- Bus services should be extended to the outskirts, especially the district outside the 2nd Ring Road to accommodate the city's expansion. The improvement of major bus terminals connecting inner-city traffic in the periphery of the 3rd Ring Road and north traffic to the satellite areas of Huayang Town and Leshan City should be promoted.
- Bus and taxi services to Shuangliu airport should be improved.
- Bus transportation to the North Railway Station and subway station should be strengthened.

(5) Southwest Corridor

The long-term development goals of this corridor are to connect the central area and the developing center of Cuqiao-Jitou district with efficient bus services and to link the core areas of the eastern satellite cities and those of big cities in the direction of Xinjin County. Its long-term improvement strategies are to complement public transport with the 4th subway line connecting the 1st Ring Road and Shuangliu

Airport, provide stable and high-quality bus services and establish a highly efficient and coordinated transport among major bus terminals of core traffic areas outside the city. The short- and mid-term renovation strategies that will complement the long-term strategies are as follows:

- With the construction of the subway, the planned lanes should be extended, traffic in those main routes with increased traffic demand improved and high-quality bus services provided to promote regular bus use. Punctuality, high frequency and high speed of buses should also be ensured.
- Buses should be separated from automobiles and bicycles to ensure traffic safety in other main routes.
- Bus services should be extended to the outskirts, especially the district outside of the 2nd Ring Road to accommodate the city's expansion. Improvement of major bus terminals connecting inner-city traffic around the 3rd Ring Road and traffic to satellite areas of Longquan Town and Chongqing City should be promoted.

(6) West Corridor

The long-term development goals of this corridor are to connect the central area with the developing center along Qingjiang Lu and to link the core areas of the western satellite cities and those of cities in the direction of Chongzhou. Its long-term improvement strategies are to complement public transport with the 2nd subway line, provide high-quality bus services and establish a highly efficient and coordinated transport among major bus terminals of core traffic areas outside the city. The short- and mid-term strategies to complement the long-term strategies are as follows:

- To meet the increased traffic demand, public transport services should be regular and high-quality bus services should be provided even with the improvement work on subways.
- Even with the construction of predetermined subway lines, the space for bus traffic should be separated from that of automobile and bicycle traffic in the high traffic demand routes to ensure punctuality, high frequency and high speed of bus services.
- Buses should be separated from automobiles and bicycles to ensure traffic safety in other main routes.
- Bus services should be extended to the outskirts, especially the district outside the 2nd Ring Road to accommodate the city's expansion. Improvement of major bus terminals connecting inner-city traffic around the 3rd Ring Road and traffic

to the satellite areas of Liucheng Town and Chongzhou City should be promoted.

(7) Northwest Corridor

The long-term development goals of this corridor are to connect the central area and the developing center in Cuqiao district and to link the core traffic areas of the western satellite cities and those of cities in the direction of Dujiangyan. Its long-term improvement strategies are to complement public transport with the 2nd and 4th railway lines and provide high-quality bus services. Complementing the long-term strategies are the following short- and mid-term renovation strategies:

- Even with the construction of the subway, the planned bus routes should be extended, traffic in main routes with increased traffic demand improved and high-quality bus services provided to encourage regular use of public transport by citizens. Punctuality, high frequency and high speed of buses should also be ensured.
- Buses should be separated from automobiles and bicycles to ensure traffic safety in other main routes.
- Bus services should be extended to the outskirts especially the district outside the 2nd Ring Road to accommodate the city's expansion. Improvement of major bus terminals connecting inner-city traffic around the 3rd Ring Road and traffic to the satellite areas of Pitong Town and Dujiangyan City should be promoted.

(8) 1st Ring Road Corridor

The long-term development goals of this corridor are to make the main radial routes around the central area serve as roundabouts and to connect the developing centers along the 1st Ring Road by providing highly efficient and versatile bus services. The long-term improvement strategies are to link with part of the extended 4th railway line, enhance the utilization ratio of road by providing high-quality bus services and make bus transfers easier within the radial corridor. The short- and mid-term improvement strategies to complement the long-term strategies are as follows:

- High-quality bus services should be provided to meet increased traffic demand.
- Buses should be separated from automobiles and bicycles to ensure punctuality, high frequency and high speed of buses.
- Major bus terminals intended to be bus transfer facilities should be improved.

(9) 2nd Ring Road Corridor

The long-term development goals of this corridor are to make the main radial routes

on the outskirts serve as roundabouts and to connect the developing centers along the 2nd Ring Road by providing highly efficient and versatile bus services. Its long-term improvement strategies are to link with part of the extended 5th railway station, provide specific bus services and establish core areas in the crossing of this corridor and the radial corridor to make bus changes more efficient. The short- and mid-term improvement strategies that will complement the long-term strategies are as follows:

- With the construction of the railway, buses should be separated from automobiles and bicycles to promote regular public transport use and ensure punctuality, high frequency and high speed of bus services.
- Major bus terminals intended to be bus transfer facilities should be improved.

(10) 3rd Ring Road Corridor

The long-term development goals of this corridor are to connect the two secondary city centers around the 3rd Ring Road with other developing centers by providing highly efficient bus services and to strengthen linkages among long-distance passenger transport stations around the 3rd Ring Road. Its long-term improvement strategy is to provide bus services in core areas by using the 3rd Ring Road. To complement this long-term strategy, the short- and mid-term improvement strategies are as follows:

- Highly efficient and high-speed transport services should be provided in core areas.
- Bicycles should be separated from automobiles and buses to ensure traffic safety.
- Major bus terminals connecting buses around the 3rd Ring Road and long-distance buses should be improved.

(11) Other Common Short- and Mid-Term Strategies for Corridors

Other short- and mid-term strategies for all the selected corridors are as follows:

- Smooth and safe traffic on narrow roads should be ensured.
- Renovation on sections of main routes should be completed.