

2 PROFILE OF THE STUDY AREA

2.1 Administrative Setup of the Area

2.1.1 Historical Development

Chengdu City, the provincial capital of Sichuan, is situated in the center of the province. It has a long history dating back two thousand years with the founding of ancient Shu. Its administrative district has been altered many times and its area coverage gradually expanded. The area of the city district grew from 29.9 square kilometers in 1949 when New China was established to 12,390 square kilometers in 1983. A historical account of the main changes in the administrative district is as follows:

- 1951 Part of Chengdu County and Huayang County were incorporated into Chengdu City.
- 1952 The entire Chengdu County was incorporated into Chengdu City.
- 1953 With the adjustment in boundaries, the city was divided into three districts, namely: Dongcheng, Xicheng and Jiao .
- 1960 The Jiao District was renamed as Jinniu District. Part of Jintang County, Xindu County and Jianyang County were placed under Chengdu City. As such, two additional districts were formed in the city, namely: Qingbaijiang and Longquanyi. The city with its five districts now had an area of 821.9 square kilometers.
- 1976 Jintang County and Shuangliu County were placed under Chengdu City. The city measured 3,862.03 square kilometers at this time.
- 1983 The entire Wenjiang Prefecture was placed under Chengdu City. This prefecture included 10 counties, as follows: Wen Jiang County, Pi County, Xindu County, Peng County (elevated to Pengzhou City in 1999), Chongqing County (elevated to Chongzhou City in 1994), Guan County (elevated to Dujiangyan City in 1998), Xinjin County, Dayi County, Qionglai County (elevated to Qionglai City in 1994), and Pujiang County. As such, the city at this time consists of five districts and twelve counties with a total area of 12,390 square kilometers.
- 1990 The boundaries of three districts (Dongcheng, Xicheng and Jinniu) were adjusted to form five new urban-rural districts, namely: Jinjiang District, Qingyang District, Jinniu District, Wuhou District, and Chenghua District.
- 1996 The Chengdu Hitech Development Zone was formed covering part of Shuangliu County and Wuhou District. This zone is known as the Gaoxin District and is a quasi-district.

2.1.2 The Study Area vis-à-vis the Administrative Boundaries

As of 1999, the administrative hierarchical structure of China can be described as follows:

1. The entire nation is divided into 34 provincial regions. There are 4 municipalities (directly controlled by the state), 23 provinces, 5 autonomous regions and 2 special administrative regions.
2. Each region is divided into prefectures. In the case of Sichuan Province, there are 4 prefectures, 3 autonomous prefectures and 14 cities at prefectural level (Chengdu is one of them).
3. Each prefecture is divided into counties. In the case of Sichuan Province, there are 124 counties, 3 autonomous counties, 17 cities at county level and 36 districts (included in cities at prefectural level).
4. Each county is divided into lower administrative units known as “Jiedao” (literally meaning street), towns and villages. “Jiedao” is the administrative unit in the urban areas while towns and villages refer to units in the suburban and rural areas, respectively.

Incidentally, Chongqing City, which was one of the cities at prefecture level in Sichuan Province, was elevated to the classification of a city at the provincial level in 1997.

At present, Chengdu City is one of the cities at the prefectural level (also one of the 15 sub-provincial municipalities of China). It comprises 8 districts (including the Gaoxin District, which is not counted as an official District), 4 cities at county level and 8 counties. In this study, Gaoxin District is regarded as a District. As for the lower administrative units, 95 “jiedaos”, 2 towns and 16 Villages are located in the central 6 Districts (excluding Qingbaijiang District and Longquanyi District) while 193 Towns and 123 Villages are located in outer areas of Chengdu City.

The Study Area covers the central 6 Districts and neighboring 5 towns located within the Outer Ring Road (Honghe Town and Shiling Town of Longquanyi District, Dafeng Town of Xindu County, and Anjing Town and Xipu Town of Pi County). The central 6 Districts cover the following “jiedaos”, towns and Villages:

Jinjiang District — 21 “jiedaos” and 2 villages

Qingyang District — 16 “jiedaos” and 2 villages

Jinniu District — 24 “jiedaos” and 4 villages

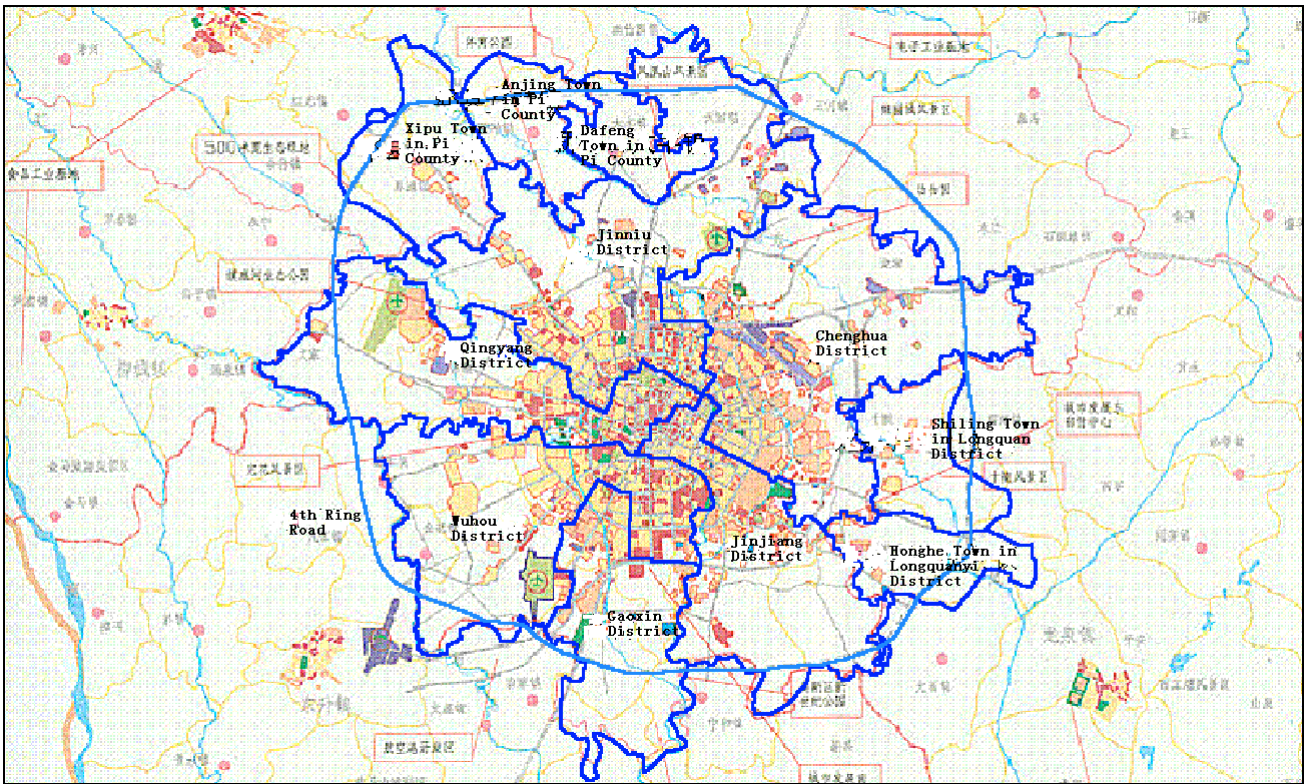
Wuhou District — 16 “jiedaos”, 2 towns and 2 villages

Chenghua District — 16 “jiedaos” and 4 villages

Gaoxin District — 2 “jiedaos” and 2 villages

Figure 2.1.1 shows the Study Area and its administrative classification.

Figure 2.1.1 The Study Area



Source: Study Team

2.2 Natural Condition

2.2.1 Topography and Geology

Chengdu City is situated in the center of Sichuan Province and northwestern part of the Sichuan Basin ($30^{\circ} 05' \sim 31^{\circ} 26'$ north latitude, $102^{\circ} 54' \sim 104^{\circ} 53'$ east longitude). It consists of eight districts (Gaoxin, Jinjiang, Qingyang and Wuhou, Chenghua, Longquanyi, Qingbaijiang), four cities (Dujiangyan, Pengzhou, Qionglai, Chongzhou) and eight counties (Jintang, Shuangliu, Wenjiang, Pi, Xindu, Dayi, Pujiang, Xinjin). The distance between east to west is 192 kilometers while north to south is 166 kilometers. The total area is 12,390 square kilometers, with about 4,700 square kilometers (37.5%) cultivated area, 3,100 square kilometers (24.4%) of forest area and 4,800 square kilometers (38.1 %) of waters, grassland and streets. The Study Area covers six central districts (Gaoxin, Jinjiang, Qingyang, Jinniu, Wuhou, Chenghua), part of Longquanyi District (Honghe and Shiling towns) which is situated inside the Outer Ring Road and parts of two counties (Xipu Town, Anjing Town of Pi County and Dafeng Town of Xidu County), and the total area is 576km².

The topography of Chengdu City is characterized mainly by a mountainous region with an elevation of 5,364 meters and a basin region with the lowest elevation at 387 meters. The basin consists of lands with an average height of 500 meters above the sea level as well as partly hilly and terrace lands. Its overall topographic composition is as follows: level ground at 36.4%, hilly land at 30.4% and mountainous region at 33.2%. There are more than 40 large, medium and small rivers in Chengdu City with the water area measuring more than about 700 square kilometers. The Minjiang River system is found in the southwestern part of the city while the Tuojiang River system is in the northeast.

The Longmen Mountain stands in the western part of Chengdu prefecture and Longquan Mountain exists in the eastern part. As a result, the central flat land forms the Chengdu Valley with a structural basin in the direction of 35° northwest due to the fault zone of the Xi Mountain in the west.

The ground water resource is abundant in Sichuan Basin with volumes reaching 66.9 hundred million tons per year. There is a 10 to 20 meters thick water vein, which is rich in CaCO_3 ¹, at about 20 meters deep underground.

The geological structure of Chengdu area consists mainly of the Cenozoic Quaternary deposit. For the area including the west side of Fuhe River, which runs through the whole city from north to south, and the east side of Shahe River as well as the central area between the two rivers mentioned above, the geology conditions can be divided into three classes:

- The area in the east of Shahe River has an altitude of 500-520m. Its geology is Cenozoic Quaternary early diluvial deposit clay in upper layers of about 23m thickness and mudstone of Mesozoic Cretaceous period in deeper layers. The layer of mudstone is found also in the east, south and center (Tianfu Square) of the city. Judging from the boring data from several sites, the mudstone layer goes down steeply from the south to the north beneath the layer of the boulder stone.
- The geology of the central area surrounded by the Shahe River and Fuhe River is reclaimed soil, alluvial clay and alluvial sand in the surface layers of about 8m thickness. Diluvial boulder stone and diluvial very-dense boulder stone are distributed in deeper layers. The topography is flat.
- The area in the west of Fuhe River is slanting with a gradient of 2‰ from northwest to southeast. The surface is covered with clay, sand and gravel. Under this surface, sedimentary layer of boulder stone is distributed, and its thickness is more than 60 m.

In Chengdu, bearing stratum, which can be the foundation of large buildings and structures,

¹ Ministry of Geology and Mineral Resources

is distributed in shallow layers .The layers of dense and very-dense boulder stone in the west, and the layers of Quaternary early diluvial deposit clay in the east are considered suitable as the bearing strata. The north station area and the central area have relatively thick layers of reclaimed soil and alluvial clay and their bearing strata are located at a depth of about 8 m. For more details on geological structure of Chengdu, please refer to Appendix B.

2.2.2 Climate

Chengdu City is partly of a subtropical zone with humid monsoon climate and with clear four seasons. It is warm and humid throughout the year with a yearly average temperature of 16.4°C, as shown in Table 2.2.1. The average temperature in January is 4.6°C~6.0°C and 24.5°C~27°C in July. The yearly average humidity is 82.3%. Therefore it is hot and humid in the summer and warm in winter. Its frost-free period averages 300 days or more a year.

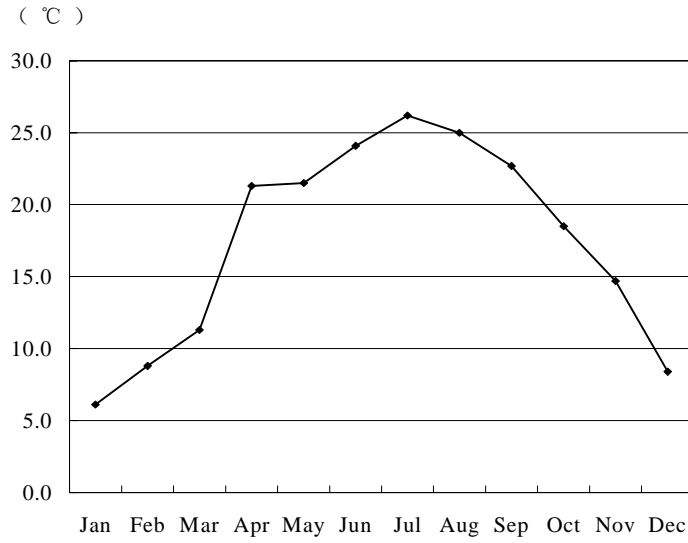
Annual average rainfall is 900~1300mm. From Figure 2.2.2, rainy season is from June to September with July having more rainfalls. Annual average wind speed is 1.3m/s, annual average sunshine time is 1042~1412 hours, annual average sunshine ratio is 28%. In a year, the number of cloudy days averages to 255 days or more. There are more sunny days in spring and in autumn. Owing to the basin topography of the area, there are many foggy days reaching about 60 days a year particularly in autumn and winter due to heat radiation, refer to Figure 2.2.3. The average atmospheric pressure is 956 Hpa since the altitude of Chengdu is about 500 meters.

Table 2.2.1 Monthly Climatic Variation of Chengdu (1998)

Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Temperature (°C)	6.1	8.8	11.3	21.3	21.5	24.1	26.2	25.0	22.7	18.5	14.7	8.4	17.4
Rainfall (mm)	2.7	17.2	15.3	41.9	71.2	122.8	320.1	166.7	110.8	10.5	9.4	17.1	905.7
Average wind speed.(m/s)	1.4	1.2	1.6	1.7	1.6	1.4	1.4	1.3	1.3	1.12	1.0	1.1	1.4
No. of rainy days	12.0	15.0	13.0	10.0	23.0	19.0	24.0	22.0	13.0	12.0	5.0	10.0	178.0
No. of foggy days	4.0	1.0	1.0				1.0	1.0	3.0	1.0	9.0	7.0	28.0
Sunshine time (hours)	43.1	37.8	53.9	168.1	91.2	120.9	104.7	112.7	93.6	23.1	72.2	40.1	961.4

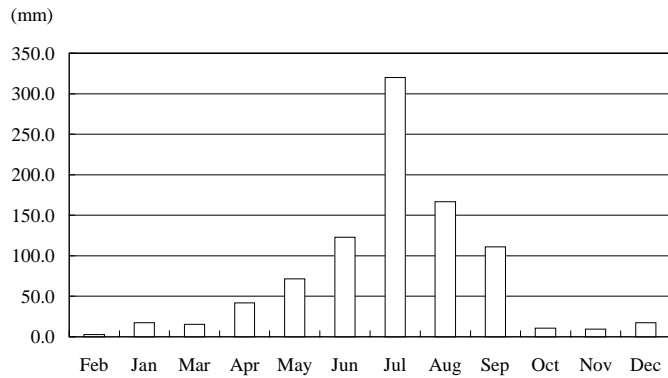
Source: China Statistical Yearbook, 1999

Figure 2.2.1 Monthly Variation of Temperature of Chengdu (1998)



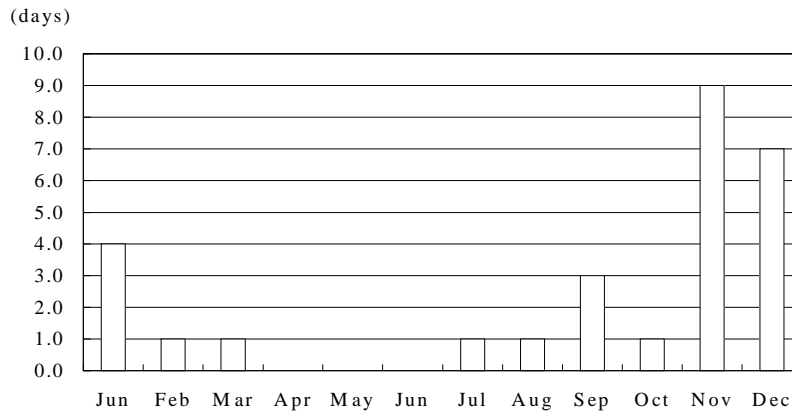
Source: China Statistical Yearbook, 1999

Figure 2.2.2 Monthly Variation of Rainfall Volume of Chengdu (1998)



Source: China Statistical Yearbook, 1999

Figure 2.2.3 Number of Foggy Days by Month of Chengdu (1998)



Source: China Statistical Yearbook, 1999

2.3 Socio-economic Condition

2.3.1 Demography

(1) Population Size and Growth

At the end of 1999, the number of residents registered in the Study Area totaled 2,596,800. Those living in the Central 6 Districts account for 2,427,200 and those in the nearby suburban Towns number only 169,600. Here, a resident who is locally registered is included in the statistics declared by the Public Securities Bureau at the end of the year. Furthermore, a person whose registration has not changed is still considered a local resident regardless of where he presently resides. This means that a person is not considered a local resident if he has not reported his current address to the local authorities, even if he has lived in that place for a long time. As such, the population declared in the city is depressed despite the high number of in-migration but overstated in the countryside even with the high incidence of out-migration. The population census is practically the only source to capture the actual population. A ten-year census is conducted in order to obtain the actual number of residents in one region. China has conducted the 4th census in 1990 and the 5th census in 2000.

The 1990 population statistics sourced from the Registration of Permanent Residents (average of year-end population of 1989 and 1990, often used to calculate per-capita GDP) and from the 4th Population Census have been compared as shown in Table 2.3.1. The following discrepancies are noticed between both data based on the breakdown of population by area:

- The 1990 census data for the six districts in the center of the city reflect more residents than in the registration data.
- The census reflects less residents in the outer areas (i.e., suburban districts and counties) as compared to registration data.
- On the whole, there are less people with registration counted in the 1990 census for the entire city as compared to those registered.

The reasons for the noted discrepancies may be attributed to the fact that there are people who transfer to other areas for work (either from the central districts or the suburbs) but have not registered in those areas. Almost 200,000 people who have moved to the central districts (coming from other places in Chengdu City and the countryside of Sichuan Province) have not changed their original registration.

In 1990, according to the census, the number of actual residents in the Central six Districts except the temporarily unregistered population of 1,300 is 2,206,800. 189,100 of this

population (190,400 - 1,300) are not registered. Immigrants without registrations who stay for more than 3 days need to report to the police station. For those who stay for more than one month need to obtain a certification of residency. Although the number is usually not declared, the Registration Department in-charge of the city refers to these people as temporary residents/population. As of yearend 1999, inside the study area, there were 459,400 temporary residents who lived in the Central Districts and 12,100 in the suburbs (making a total of 471,500). In addition, there is a considerable number of floating population (those staying within three days) for which an accurate count is hard to determine. The temporary population counted at the end of June in 1999 was 616,600. This fact implies that the fluctuation of temporary population is so large. This can be attributed to the people who come to stay in Chengdu for more than three days and less than one month for large-scale conference, performing, sightseeing, etc.

Table 2.3.1 Comparison of Registration and Census Population Statistics

(in 1,000)

		Entire City	Central 6 Districts	Suburban Districts, Cities and Counties
Statistics on Registered Residents	Average in 1990 (Average of the yearend population of 1989 and 1990)	9,140.5	2,047.3	7,093.2
Census of Population	<u>Total at the midyear of 1990</u>	9,266.5	2,208.1	7,058.4
	• With registration	8,965.8	2,017.7	6,948.0
	• Without registration	300.7	190.4	110.3
	- More than 1 year	232.5	170.2	62.3
	- No more than 1 year	13.5	9.9	3.6
	- Registration in process	53.1	9.0	44.1
	-Temporarily unregistered ^{1/}	1.6	1.3	0.3

^{1/} Temporarily unregistered population are those persons that have not cancelled their registration but have left their residence place for work abroad as well as for studying in another region.

Source: Chengdu City Statistics Yearbook 2000 and the Chengdu City Population Census Data

Because the data obtained is limited, it is difficult to go into details. The analysis here after was limited to the population registered in the Central Districts of the city. On the other hand, the time series analysis was based on the data since 1996 (when the present administrative boundaries were determined).

The 1999 population of 2,427,200 living in the Central 6 Districts accounted for 24.2% of the entire city's population of 10,035,600. This share has been increasing in the past years. During the period from 1997 to 1999, the average annual increase rate in the Central Districts was 1.49%. Rates of population growth in Jinjiang and Qingyang District recorded negative in recent years, while that of Gaoxin District has been very high (see Table 2.3.2).

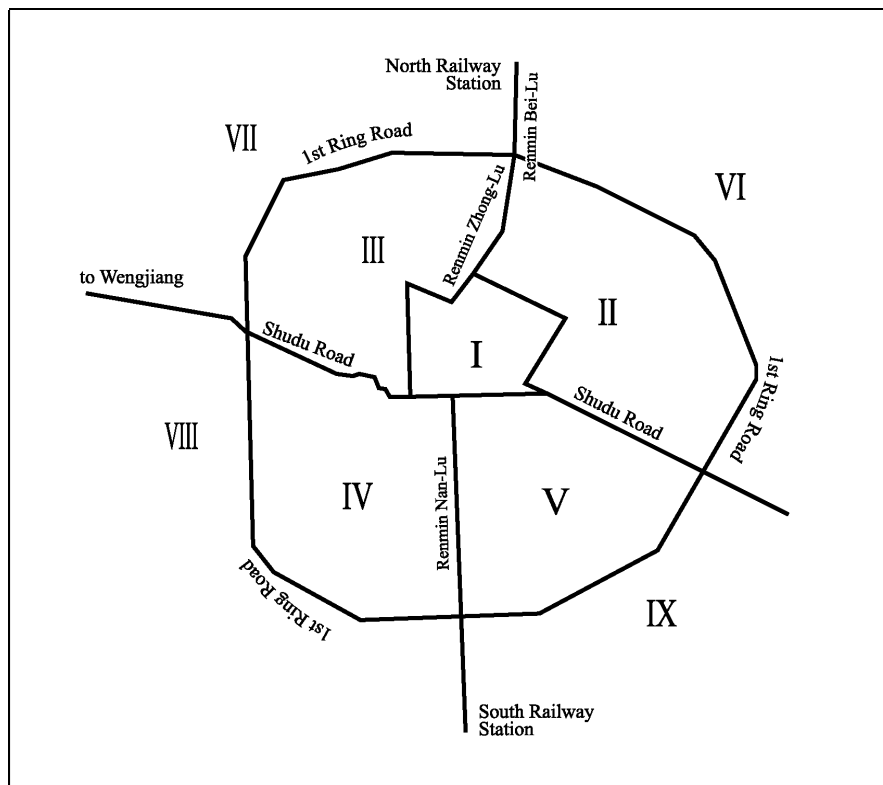
Table 2.3.2 Population Growth in the Central Districts

	Population (thousand) ^{1/}				Rate of Increase (%)			
	1996	1997	1998	1999	1997	1998	1999	1997-99
Chengdu City	9,807.4	9,891.9	9,970.0	10,035.6	0.86	0.79	0.66	0.77
Jinjiang District	393.9	392.7	392.8	388.6	-0.30	0.03	-1.07	-0.45
Qingyang District	458.1	457.8	459.6	459.3	-0.07	0.39	-0.07	0.09
Jinniu District	501.6	513.6	524.5	541.4	2.39	2.12	3.22	2.58
Wuhou District	361.4	377.9	387.2	395.1	3.82	2.46	2.04	2.77
Chenghua District	499.3	506.8	511.7	522.2	1.50	0.97	2.05	1.51
Gaoxin District	104.9	111.4	115.6	120.5	6.20	3.77	4.24	4.73
Total 6 Central Districts	2,321.7	2,360.3	2,391.5	2,427.2	1.66	1.32	1.49	1.49
Share to the whole city (%)	23.7	23.9	24.0	24.2				

1/ Population at the end of the year
Source: City Statistics Bureau

Because the fan-shaped districts of Jinjiang and Qingyang extend from the old central area to new suburban areas, the continuous decrease of population at the central part might be recently exceeding the increase of population in the new urban areas at the outskirts. It is difficult to grasp the change in population at the small zone level since the boundaries of "jiedaos" change yearly and each year's population of each "jiedao" is not declared. The population of the area within the 1st Ring Road was 804,400 in 1987 when the last person trip survey was conducted, and 818,700 at the end of 1999 (based on Public Securities Bureau's data by traffic zone), showing a slight increase. Although the population increased, the central area of Qingyang District surrounded by Shudu Road, Dongchenggen Jie, Qinglong Jie, Renmin Lu, Xinhua Da-Dao and Taisheng Nan-Lu experienced a decrease in population at an annual average rate of 3.94% from 114,000 to 70,400 during the same period. The southeast part of Jinjiang District and Wuhou District (Southeast zone bounded by Renmin Nan-Lu, the east part of Shudu Road that is from Renmin Dong-Lu via Zongfu Lu and Dacisi Lu to Dongfeng Lu and the 1st Ring Road) experienced a decrease in population at an average rate of 2.45% per annum, from 206,000 to 153,000. In the newer part within the 1st Ring Road (that is, Northeast zone between Fuhe River and the 1st Ring Road and Southwest zone between Nanhe River and the 1st Ring Road), the population persistently increased and has now reached a saturation (see Table 2.3.3, Figure 2.3.1).

Figure 2.3.1 Nine Major Zones for the Person-Trip Survey of 1987



Source: Chengdu City Comprehensive Transportation Planning Report (Southwest Jiaotong University, the Transportation Planning Office of Chengdu City 1993)

Table 2.3.3 Changes in Population within the First Ring Road; 1987 – 1999

Zone	1987	1999	Annual Average Rate of Increase (%)
I (Center zone)	114,042	70,440	-3.94
II (Northeast zone)	175,502	241,044	2.68
III (Northwest zone)	173,891	187,822	0.64
IV (Southwest zone)	134,907	166,393	1.76
V (Southeast zone)	206,075	153,046	-2.45
Total	804,417	818,745	0.15

Source: Calculated by the Study Team from the Chengdu City Comprehensive Transportation Planning Report, 1993, and the data from the Public Securities Bureau by station at the end of 1999.

The increase or decrease in population is determined by the natural increase (or decrease) of birth-death and the social increase (or decrease) caused by the incoming – outgoing registered permanent residents. The recent birth rate experienced at the Central 6 Districts has been 7 to 8‰ and the death rate is 4.5 to 5.5‰, resulting the natural increase rate of about 2.5‰. Generally speaking, the birth and death rates in the rural areas are higher than those in the urban areas, and the natural increase rate also shows the same tendency. In 1998, the natural increase rate of China as a whole was 9.53 ‰ (with a birth rate of 16.03‰ and a death rate of 6.50‰). On the other hand, the natural increase rate of Chengdu City (including rural areas) was 3.03‰ (with a birth rate of 9.17‰ and a death rate of 6.14‰) and that of the Central Districts was 2.61‰ (with a birth rate of 8.00‰ and a death rate of 5.39‰), which are very low compared with that of the whole country. As shown in Table 2.3.4, the annual natural increase of population in the Central Districts is 5,000 to 6,000 persons and the annual net migration is about 30,000 persons. From these facts, it is clear that 80-85% of the increase of population in the Study Area is attributed to the net migration, which means the difference between in-migration and out-migration.

Table 2.3.4 Trends in Population in the Central Districts (1996-1999)

	(in 1,000 persons)			
	1996	1997	1998	1999
Birth		16.7	19.0	17.2
Death		10.8	12.8	12.3
Natural increase		5.9	6.2	4.9
Net migration		32.7	25.0	30.8
Population at the end of the year	2,321.7	2,360.3	2,391.5	2,427.2

Source: Statistics Bureau

(2) Population Distribution and Density

Table 2.3.5 shows the characteristics of population distribution (registered and temporary population) at the end of 1999 according to the ring areas defined by the existing and planned ring roads in the Study Area. Of the total population of 3,070,000, there are 750,000 living between the 1st and the 2nd Ring Road (the 2nd Ring) that accounts for a quarter of the total. Within the Inner Ring Road (the Inner Ring) and between the Inner and 1st Ring Road (the 1st Ring), there are 960,000, with 490,000 living in the former and 470,000 living in the latter.

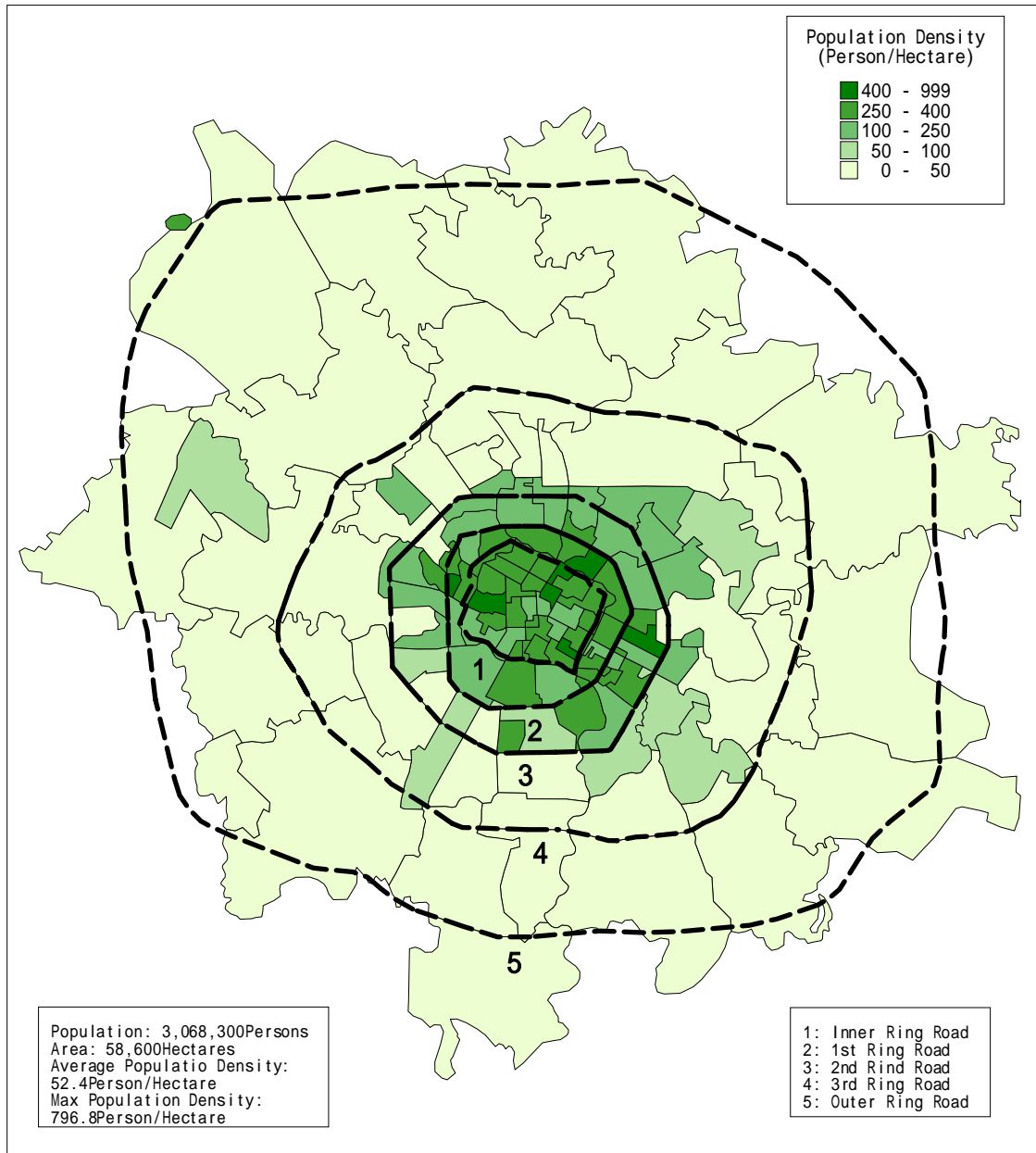
Although the distribution of population in each ring is not even, the size of population does not vary much. The Inner Ring and the 1st Ring are nearly equal in land area. However, from the 2nd Ring outwards, land area increases 2 times and then 4 times onwards. Accordingly, population density is highest in the inner area. Population density within the 2nd Ring Road is much higher than that of the outer area. Population density of the Inner Ring exceeds 360 persons per hectare. Figure 2.3.2 shows population densities by traffic zone. There are 5 zones with population densities exceeding 500 persons per hectare and 11 zones with densities of 400-500 person per hectare. The highest density is 796.8 persons per hectare at Zhonglicixijie.

Table 2.3.5 Population Distribution According to Ring Areas (1999)

Ring	Area (ha)	Population	Density (pers./ha)	Share of Temporary Res. To Total Pop. (%)
Inner Ring (within the Inner Ring Road)	1,350.05	488,677	361.8	15.9
1st Ring (between Inner & 1st Ring Road)	1,527.5	469,782	307.5	10.6
2nd Ring (between 1st & 2nd Ring Road)	3,247.1	754,673	232.4	16.3
3rd Ring (between 2nd & 3rd Ring Road)	11,999.8	657,564	54.8	20.0
Outer Ring (out of the 3 rd Ring Road)	40,429.4	679,616	17.3	12.8
Total Study Area	58,554.3	3,068,312	52.4	15.4

Source: Study Team

Figure 2.3.2 Population Density by Traffic Zone, 1999



As a whole, the ratio of the temporary population to total population is 15.4% in the Study Area. The ratio is comparatively high in the 3rd Ring (between the 2nd and the 3rd Ring Road). A more detailed analysis at the traffic zone level shows that there are 14 zones whose ratios of temporary resident to the total population exceed 40%. These are 2 zones within the Inner Ring Road, 3 zones between the 1st and 2nd Ring Road, 8 zones between the 2nd and 3rd Ring Road, and 1 zone out of the 3rd Ring

Road. There are 6 zones whose ratios of temporary residents against the total population exceed 50% (the temporary population is much more than the permanent population). These are: Shiren A (50.5%) and Shuangnan (50.0%) between the 1st and 2nd Ring Road, Shiren B (50.5%), Wukuaishi (65.4%), Jiulidi (56.0%) and Zhanbeilu (55.5%) between the 2nd and 3rd Ring Road. These zones are all located in the outskirts where urbanization is progressing and many new residents and construction workers may have not secured their registration as permanent residents.

(3) Labor Force and Employment

The number of employed persons in the Central Districts decreased in 1998 but increased in 1999. It is difficult to grasp the trends. However, based on the labor force resources distribution statistics in urban and rural areas , the employed persons in urban areas are recently decreasing (see Table 2.3.6). The ratio of employed persons to the permanent residents is a little more than 40%. Since the number of employed persons include the temporary residents, a recalculated ratio of employed to the total residents is obtained at 35.4% for 1999. The total population of 3,035.2 thousand includes 2,427.2 thousand permanent residents and 608.0 thousand temporary residents . Although there are no statistics showing directly the labor force status in the Central Districts , the rate of unemployment is 4.4% in 1999 for the entire urban areas of Chengdu City.

Table 2.3.6 Employment in the Central Districts and Entire Chengdu

		1997	1998	1999
Central Districts	Employed persons at the end of the year (thousand persons)	1,060.0	980.5	1,073.4
	Permanent resident at the end of the year (thousand persons)	2,360.3	2,391.5	2,427.2
	Ratio of employed to permanent residents employment (%)	44.9	41.0	44.2
Entire Urban Areas of Chengdu	Employed persons (thousand persons)	1,845.9	1,784.7	1,622.2
	Economically Active Population (thousand persons)	1,883.1	1,930.6	1,697.5
	Rate of unemployment (%)	2.0	7.6	4.4

Source: Statistics Bureau

Employment by sector is shown in Table 2.3.7. In the Central Districts, the primary sector accounts for 10.1%, the secondary sector 41.2%, and the tertiary sector 48.7%. In Chengdu City as a whole, employment in the primary sector industry employment predominantly occupies 45.1% of the total employment. About one third of employment in the secondary and tertiary sector is concentrated in the Central Districts.

Table 2.3.7 Employment by Sector (1999)

	Primary sector	Secondary sector	Tertiary sector	Total
Central Districts (thousand persons) (percentage distribution)	108.1 (10.1)	442.1 (41.2)	523.2 (48.7)	1,073.4 (100.0)
Chengdu City (thousand persons) (percentage distribution)	2,538.9 (45.1)	1,433.6 (25.5)	1,650.7 (29.4)	5,623.2 (100.0)
Share of the Central Districts to Chengdu City (%)	4.3	30.8	31.7	19.1

Source: Statistics Bureau

(4) Condition of Education

China has a nine-year compulsory education system with 6 years in the primary school and 3 years in the junior middle school. In Chengdu City, the percentage of school age children enrolled is 99.95% and the percentage of graduates of primary schools entering junior middle school is 98.3% in 1999. So most of the children are receiving the compulsory education. The percentage of graduates of junior middle schools entering high school (general senior middle school, vocational middle school, specialized secondary school, adult specialized secondary school and skilled worker school) is 75.8%, which is considerably higher than the national average level of 50.7%. The percentage of graduates of general senior middle school entering institutions of higher learning is 59.0%. At present, this percentage at the national level is not available, but a ratio of the number of graduates of general senior middle school to the number of students entering institutions of higher learning was 43.0% in 1998.

In the Central Districts, there are 301 primary schools (pupil enrollment totals to 174,550) and 119 general secondary schools (student enrollments total to 76,486 in the junior classes and 35,029 in the senior classes). The numbers of pupils and students enrolled in primary schools and junior middle schools almost show the population size of the corresponding age groups (primary school pupils of 7 to 12 years old and junior middle school students of 13 to 15 years old), because the enrollment rates of these age groups can be assumed nearly 100%. In addition, there are 20 vocational middle schools of senior classes with an enrollment of 19,765 students in the Central Districts. 17 special classes of the same purposes are opened in private enterprises with 2,094 students. There are 31 specialized secondary schools with a total enrollment of 41,569 students, which is 57.5% of the total students of this

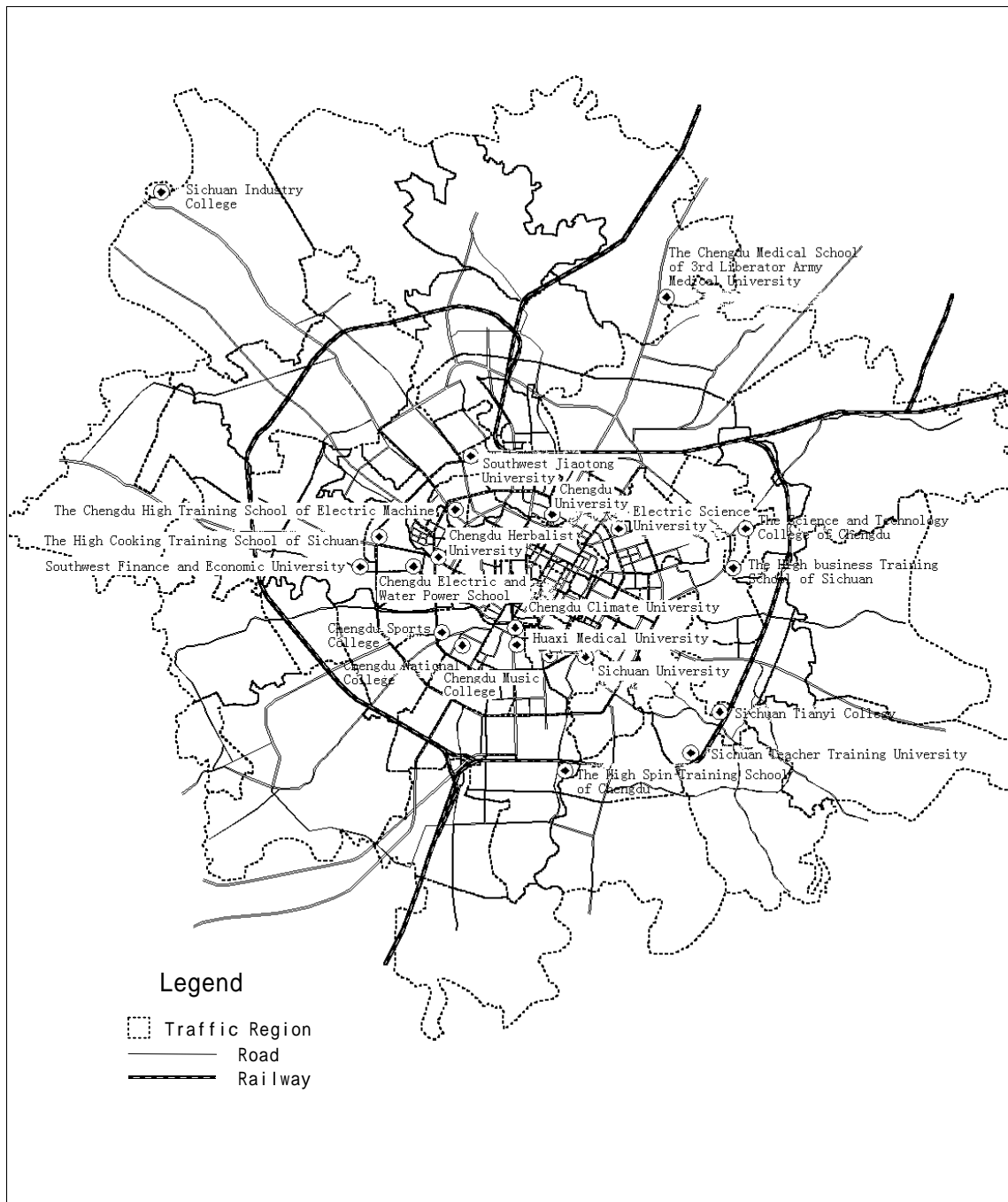
kind of school in Chendu City. In Chengdu City, there are 22 universities, of which except for one located in Pengzhou City all are located in the Central Districts with a total number of 105,280 students. In Jinniu District and Wuhou District more universities are located than in other districts. Southwest Jiaotong University with 12,292 students lies in Jinniu District and Sichuan University with 18,246 students is located in Wuhou District. The other universities with many students are Sichuan Teachers' University with 11,455 students lying in Jinjiang District and Electronic Science University with 10,866 students located in Chenghua District (see Figure 2.3.3).

Table 2.3.8 Number of Schools and Pupil/Student Enrollment in the Central Districts (1999)

	Primary school		General secondary school			Vocational middle school	
	No. of schools	No. of pupils	No. of schools	No. of students		No. of schools	No. of students
				Junior middle school	Senior middle school		Senior class
Jinjiang District	54	27,263	22	14,364	7,310	3	6,940
Qingyang District	57	32,917	24	16,627	9,191	4	2,916
Jinniu District	66	40,688	24	17,047	6,585	7	4,641
Wuhou District	36	29,545	14	10,404	6,634	2	1,697
Chenghua District	70	34,856	31	14,980	3,391	4	3,571
Gaoxin District	18	9,281	4	3,062	1,918		
Total in Central Districts	301	174,550	119	76,484	35,029	20	19,765
	Specialized secondary school		University				
	No. of schools	No. of students	No. of schools	No. of students			
Jinjiang District	4	3,228	2	12,174			
Qingyang District	10	14,300	3	7,200			
Jinniu District	7	9,316	6	31,247			
Wuhou District	7	11,942	6	32,937			
Chenghua District	1	716	3	20,360			
Gaoxin District	2	2,067	1	1,862			
Total in Central Districts	31	41,569	21	105,780			

Source: Chengdu City Education Statistics 1999

Figure 2.3.3 Distribution of Universities



2.3.2 GDP and Income

(1) GDP Trends in the 1990's

The average increase rate of the Chinese GDP of the 8th 5-year plan period during the first half of the 1990's (1991-95) was 12.0%. After going into the 9th 5-year plan period, the average increase rate was 8.7% during three years of 1996-98. Also, during the period of 1991-1998, the average increase rate was 10.8%. During the

same period, Sichuan province experienced a growth of 10.7% per annum, 11.2% in the first half and 9.8% in the latter half. This is to say that Sichuan province grew at a lower level than the national average during the 8th 5-year plan period but at present in the 9th 5-year plan period is growing at a higher pace than the nation.

In all of the above, Chengdu City created a higher increase rate of 16.0% in the former half of 1990's and 11.1% in the latter half, achieving a very high average rate of 14.1% during the whole period. Its share of GDP in the Sichuan province increased from 21.8% in 1990 to 30.8% in 1998.

During the period of the 8th 5-year plan, the annual average increase rates of Per Capita GDP were 10.7% in China as a whole, 10.4% in Sichuan province and 14.7% in Chengdu City. From 1996 to 1998, the increase rates dipped to 7.6% at the national level, 9.1% in Sichuan Province and 10.0% in Chengdu City, respectively. Per Capita GDPs at current prices in 1998 were RMB6,392 in China as a whole, RMB4,319 in Sichuan Province and RMB11,103 in Chengdu City. The increase rate of Per Capita GDP of Sichuan Province in recent years exceeded the national average but it is still at a level of 68% of the whole country. Comparing the Per Capita GDP of Chengdu City with the 4 municipalities directly controlled by the state, Chengdu's is much more lower than those of Shanghai City (RMB 28,253) and Beijing City (RMB 18,482) .

But it is twice the level of Chongqing City's (RMB 4,684), which includes vast rural areas and it is near the level of Tianjin City (RMB 14,808).

**Table 2.3.9 GDP in China, Sichuan Province and Chengdu City
(1991 – 1998)**

		1998 (at Current Prices)	Growth Rate in 1990's (%)		
			1991 – 1995 (8 th 5-year plan period)	1996 – 1998 (9 th 5-year plan period)	1991 – 1998 average
GDP (billion RMB)	China	7,939.57	12.0	8.7	10.8
	Sichuan Province	358.03	11.2	9.8	10.7
	Chengdu City	110.26	16.0	11.1	14.1
Per Capita GDP(RMB per person)	China	6,392	10.7	7.6	9.5
	Sichuan province	4,319	10.4	9.1	9.9
	Chengdu City	11,103	14.7	10.0	12.9

Source: the Statistics Yearbook of China, Sichuan Province and Chengdu City.

(2) The GDP of the Study Area

The study area consists of the Central Districts and part of the adjoining suburban district and counties. With the limitation of available data, only the following descriptions can be noted for the Central Districts.

The GDP of the Central Districts in 1999 is 54,483 million RMB , accounting for 45.8% of the total GDP of the whole Chengdu City. The share of tertiary sector is 55.2%, accounting for more than half of the whole city's. Per Capita GDP of the Central Districts is 22,613 RMB per person, which is 1.9 times higher than that of the whole Chengdu City of 11,897 RMB per person. In the composition by sector , the tertiary sector accounts for 54.1% while the primary sector accounts for only 1.6%. In terms of the growth rates during the period of 1998 to 1999, the primary sector posted a negative growth and the other sectors had low increases compared with the whole Chengdu City. The economy of Chengdu City is recently growing outside the Central Districts. The growth rate of the Per Capita GDP was 8.4%.

Table 2.3.10 GDP of the Central Districts in Comparison with Chengdu City (1999)

		1999		1998 to 1999	
		Amount (million RMB, at current year's prices)	Share by Sector (%)	Ratio of the Central Districts to the Whole City	Growth rate (%, at constant prices)
Chengdu City	Total of GDP	119,003	100.0	-	10.2
	Primary sector	12,374	10.4	-	3.4
	Secondary sector	53,239	44.7	-	10.3
	Tertiary sector	53,390	44.9	-	11.7
	Per Capita GDP (RMB per person)	11,897			9.4
Central Districts	Total of GDP	54,483	100.0	45.8	9.9
	Primary sector	877	1.6	7.1	-16.4
	Secondary sector	24,129	44.3	45.3	9.8
	Tertiary sector	29,477	54.1	55.2	11.1
	Per Capita GDP (RMB per person)	22,613			8.4

Source: Calculated by the Study Team based on the Chengdu City Statistics

(3) Income Level of the Study Areas

There is no statistical data directly showing the income level of the Study Area. In China, however, the Urban and Rural Household Surveys are conducted every year by sampling. The same type of survey is conducted in Chengdu City. Income level of the Study Area can be inferred from the Urban Household Survey results.

The disposable income per household member of the urban household in Chengdu City was 6,446 RMB in 1998 and 7,098 RMB in 1999. Due to limited available data, the following analyses are based on the 1997 and 1998 data.

The disposable income level of 6,446 RMB per household member in 1998 is 1.19 times higher than the national level and is 1.26 times higher than the average income of the Sichuan Province. The difference in income levels for the two year period between Sichuan Province and China, as a whole, seem to be narrowing while that of Chengdu City is gradually increasing. Compared with the other cities, the income level of Chengdu City is higher than that of Chongqing City and is close to the level of Tianjin City. Among the 15 vice-province class cities, the income level of Shenzhen City is outstandingly the highest, followed by Guangzhou City and Ningbo City. Chengdu City is in the ninth place close to Qingdao City. Compared to that in 1997, Chengdu is closing its distance to Shanghai City, Ningbo City and Xiamen City, etc., and overtook Dalian City to get the ninth position from its previous 10th place among the vice-province class cities.

Table 2.3.11 Disposable Income per Urban Household Member in China, Sichuan Province and Chengdu City (1997 and 1998)

	Disposable income per household member (in RMB)		Ratio to the whole country	
	1997	1998	1997	1998
China	5,160.32	5,425.05	1.00	1.00
Sichuan Province	4,763.26	5,127.08	0.92	0.95
Chengdu City	6,018.74	6,446.44	1.17	1.19

Source: Statistics Yearbook of China, Sichuan Province and Chengdu City

Table 2.3.12 Comparison of the Disposable Income per Urban Household Member of Chengdu City with Selected Cities (1997 and 1998)

	Disposable income per household member (in RMB)		Ratio to Chengdu City	
	1997	1998	1997	1998
Chengdu City	6,019	6,446	1.00	1.00
Municipalities directly controlled by the state				
Beijing City	7,813	8,427	1.30	1.31
Tianjin City	6,609	7,111	1.10	1.10
Shanghai City	8,439	8,773	1.40	1.36
Chongqing City	5,323	5,467	0.88	0.85
Vice province class cities				
① Shenzhen City	18,579	19,886	3.09	3.09
② Guangzhou City	10,445	11,256	1.74	1.75
③ Ningbo City	9,069	9,193	1.51	1.43
④ Xiamen City	8,980	9,179	1.49	1.42
⑤ Hangzhou City	7,896	8,465	1.31	1.31
⑧ Qingdao City	6,222	6,554	1.03	1.02
⑩ Dalian City	6,100	6,093	1.01	0.95

Source: Chengdu City Statistics Yearbook 1998 and 1999

The net income per rural household member in the Central Districts is shown in Table 2.3.13. The income of every district is higher compared to that of the whole city. Moreover, the incomes of all districts except for Gaoxin District exceed 3,000 RMB in 1998, which reflects the higher rate of profitability of city outskirts agriculture.

Table 2.3.13 Net Income per Rural Household Member in the Central Districts (1997 and 1998)

	Net income per household member (RMB)		Ratio to the Whole Chengdu City	
	1997	1998	1997	1998
Chengdu City	2,427	2,631	1.00	1.00
Central Districts				
Jinjiang District	3,078	3,317	1.27	1.26
Qingyang District	3,006	3,250	1.24	1.24
Jinniu District	2,910	3,170	1.20	1.20
Wuhou District	2,887	3,112	1.19	1.18
Chenghua District	3,145	3,384	1.30	1.29
Gaoxin District	2,788	2,996	1.15	1.14

Source: Chengdu City Statistics Yearbook 1998 and 1999

2.3.3 Production and Consumption

(1) Agricultural Production

Chengdu City is located at the middle of west-Sichuan plain. Endowed with fertile soil, it has been an important base for rice production. Forest industry has not been developed. Aquaculture has been increasing in recent years but its production barely reaches 2% of the total production of the primary sector. Within the total production, the agricultural industries account for 60% or more and stockbreeding 35%.

Major agricultural products of Chengdu are foodstuff (including cereals, legumes, potatoes etc., accounting for 46% of agricultural production with more than half for rice.), vegetable (22%), fruit (7% in which citrus fruits account for half of total). Market plants are primarily rape seeds and sugarcane. Cotton, jute and tobacco are also being produced, but their production is so little and is decreasing gradually.

Influenced by urbanization and road expansion, the cultivated area of Chengdu is declining every year. In addition to that, due to the switch from foodstuff to vegetable production, foodstuff plantation is decreasing. However, the quantity of foodstuff production is increasing gradually, due to the rise of land productivity. On the other hand, the quantity of vegetable production is increasing almost parallel with the increase of planted areas.

Stockbreeding products are mainly pork, chicken, eggs and milk, which are increasing year by year. Aquatic production is also increasing rapidly in recent years even if the quantity is not large.

The planted area in the Central Districts is decreasing rapidly due to urbanization. The planted area was 14,800ha at the end of 1998, which is merely 70% of that in 1990, and in the adjacent Longquanyi District it is 80%. On the remaining farmland, agricultural production is still continued while stockbreeding and aquatic production are being developed. In 1998, the sum of the primary sector production in the Central Districts is 1,366 million RMB, which accounts for 7.1% of the production of the whole city. Although the total sum is small, the aquatic production's percentage is rather high.

Table 2.3.14 Production Amount in the Primary Sector in the Central Districts (1998)

	(1,0000 RMB)				
	Sum	Agricultural	Forest industry	Stockbreeding	Aquaculture
Central Districts	136,630	62,772	221	68,510	5,127
Jinjiang District	15,918	10,535	18	4,598	767
Qingyang District	23,802	8,598	17	14,596	591
Jinniu District	27,298	12,982	38	13,957	321
Wuhou District	15,319	7,978	33	6,996	312
Chenghua District	35,549	17,001	106	15,356	3,086
Gaoxin District	18,744	5,678	9	13,007	50
The whole city	1,919,066	1,187,104	28,482	667,369	36,111
Share to the city (%)	7.12	5.29	0.78	10.27	14.20

Source: Chengdu City Statistics Yearbook, 1999

Main agricultural and stockbreeding productions in 1997 are shown in Table 2.3.15. There are 16,400 hectares of cultivated land in the Central Districts . Compared to other districts, there are more cultivated land remaining in Jinniu and Chenghua Districts. Foodstuff production is 116.8 thousand tons (in which the rice production is 84 thousand tons), which accounted for less than 2.9% of the city's production while fruit production is 3,400 tons, which is less than 1% of the city's. However, vegetable production is 380.4 thousand tons, which accounted for 12.4% of the city's production. By analyzing the production of each district, it is remarkable that foodstuff and fruit production of Jinniu District and vegetable production of Chenghua District are higher than other districts. As to stock breeding production in the Central Districts, meat production is at 41.5 thousand tons, milk at 28.6 thousand tons, and eggs at 28.1 thousand tons. The production ratios compared to that of the entire city are 7.1%, 21.2% and 72.2%, respectively. Among the districts, meat production of Chenghua District is the largest and so are egg production of Qingyang District and milk production of Jinniu District. Aquatic production of 4,600 tons occupies a high share in the city, which is mainly from Chenghua District.

Table 2.3.15 Main Agricultural and Stockbreeding Production in the Central Districts (1997)

	Cultivated Land (0000 ha)	Foodstuff (Ton)			Vegetable (Ton)	Fruit (Ton)	Milk (Ton)	Egg (Ton)	Fishery Products (Ton)	Meat (Ton)	
		Total	Wheat	Rice						Total	Pork
Central Districts	1.64	116,751	30,908	84,018	380,348	3,441	28,562	28,068	4,599	41,465	32,228
Jinjiang District	0.20	11,004	3,041	7,910	57,195	713	2,529	985	360	3,450	2,978
Qingyang District	0.25	20,438	5,495	14,903	43,241	194	5,630	7,629	105	6,625	4,860
Jinniu District	0.40	27,660	6,661	20,834	88,387	1,614	11,171	6,245	552	7,845	6,067
Wuhou District	0.27	23,793	6,044	17,749	35,864	36	1,502	2,724	400	5,719	4,699
Chenghua District	0.31	17,129	5,349	10,294	133,029	745	4,459	7,213	3,072	9,100	7,157
Gaoxin District	0.21	16,727	4,318	12,328	22,668	139	3,271	3,272	110	8,726	6,467
The whole City	44.54	4,020,984	902,858	2,529,190	3,069,964	385,907	39,568	131,936	40,558	587,974	441,886
Share to the city (%)	3.68	2.9	3.32	3.32	12.39	0.89	72.18	21.27	11.34	7.05	7.29

Source: Chengdu City Statistics Yearbook 1998

According to the recent changes in production, foodstuff production has decreased parallel to the decrease in cultivated land, while other products have increased (egg production decreased from 1997 to 1998), though their growth rates are lower than the whole city. The adjacent districts and counties are all developing their own characteristic products. Foodstuff production is decreasing continuously in Longquanyi District and Shuangliu County, while the others remain unchanged. Longquanyi District is famous for its productions of peach and loquat. The production of the fruit in Longquanyi District in 1998 exceeded 7 times the production in 1990, also the output of Shuangliu County increased 5 times during the same period. In addition, the egg production in Longquanyi District increased rapidly with a production scale of 5.5 times that in 1990. Meat except pork (especially chicken) production has experienced a greater growth in Chengdu City. This growth in Longquanyi District and Shuanliu County has surpassed the city average and their outputs have increased 5.1 times and 5.3 times, respectively compared to those in 1990. The output increase of aquatic products in Shuangliu County, Xindu County and Qingbaijiang District has driven the increase of the whole city's output.

Table 2.3.16 Changes in Cultivated Area and Major Products in the Central Districts and Adjacent Districts and Counties (1990-1998)

	Cultivated area				Foodstuff			
	Annual average change rate (%)			Ratio	Annual average change rate (%)			Ratio
	1990-95	1995-98	1997-98	1990-98	1990-95	1995-98	1997-98	1990-98
Central Districts	-3.45	-3.15	-9.59	0.71	-4.25	-4.5	-0.64	0.73
Longquanyi District	-3.23	-1.91	-2.02	0.8	-1.6	-0.1	-0.63	0.91
Qingbaijiang District	-0.71	-0.85	-1.07	0.94	1.21	-0.79	1.08	1.06
Shuangliu County	-0.51	-0.55	-0.98	0.95	0.74	-1.14	-0.08	1.01
Pi County	-0.48	0.16	0	0.98	1.65	0.72	0.03	1.1
Xingdu County	-0.42	-1.97	-1.05	0.93	0.74	-2.14	4.01	1.03
The city	-0.72	-0.41	-1.06	0.95	0.89	0.39	0.44	1.06
	Fruit				Meat			
	Annual average change rate (%)			Ratio	Annual average change rate (%)			Ratio
	1990-95	1995-98	1997-98	1990-98	1990-95	1995-98	1997-98	1990-98
Central Districts	14.66	3.2	8.28	2.29	6.66	0.05	2.49	1.42
Longquanyi District	31.41	23.94	19.26	7.18	9.13	4.51	0.44	1.7
Qingbaijiang District	8.46	-5.37	20.33	1.62	4.03	1.53	7.19	1.35
Shuangliu County	25.52	17.36	13.81	4.88	10.32	4.23	2.9	1.83
Pi County	1.94	10.61	9.82	1.48	4.11	5.34	7.51	1.46
Xingdu County	3.44	13.22	30.17	1.98	4.81	0.28	0.54	1.28
The city	20.63	16.3	12.49	3.89	6.86	4.66	2.9	1.57
	Pork				Other meat			
	Annual average change rate (%)			Ratio	Annual average change rate (%)			Ratio
	1990-95	1995-98	1997-98	1990-98	1990-95	1995-98	1997-98	1990-98
Central Districts	5.54	1.14	4.33	1.4	10.77	-3.51	-3.94	1.49
Longquanyi District	4.45	2.92	-2.28	1.29	32.54	8.42	6.67	5.13
Qingbaijiang District	3.5	1.52	6.77	1.31	8	1.55	10	1.67
Shuangliu County	4.13	-0.1	-0.03	1.22	31.91	11.46	7.06	5.31
Pi County	3.01	1.95	2.87	1.24	12.53	23.48	26.21	3.47
Xingdu County	4.19	-0.17	-0.54	1.22	10.3	3.59	7.99	1.89
The city	4.35	2.8	1.43	1.33	20.16	10.95	7.33	3.31
	Egg				Fishery products			
	Annual average change rate (%)			Ratio	Annual average change rate (%)			Ratio
	1990-95	1995-98	1997-98	1990-98	1990-95	1995-98	1997-98	1990-98
Central District	14.82	2.76	-5.32	2	6.66	4.9	7.5	1.63
Longquanyi District	33.47	10.56	7.69	5.58	9.03	4.39	2.4	1.72
Qingbaijiang District	10.38	-7.52	16.01	1.63	8.84	5.4	11.89	1.9
Shuangliu County	6.13	2.41	0.89	1.42	9.91	12.76	6.65	2.17
Pi County	9.94	12.87	2.9	2.11	1.12	7.01	8.2	1.31
Xingdu County	8.93	5.38	4.87	1.79	7.85	15.21	3.7	2.01
The city	13.36	8.68	3.19	2.28	7.57	8.57	9.49	1.86

Source: 50 years' data of Cheugdu.

(2) Industrial Production

The total industrial production of Chengdu City is 132.1 billion RMB in 1999. This has been increasing with a high growth rate of up to 17.4% over the past 21 years. As for the heavy industry, its production totaled 60.3 billion RMB accounting for 45.6% of the total industrial production. There are 1,293 enterprises in Chengdu whose revenues are over 5 million RMB and their production reached 58.9 billion RMB. The so-called four mainstay industries' production totaled 32.9 billion RMB, including food and tobacco industry (8.7 billion RMB), machine and automobile industry (10.9 billion RMB), medicine industry (4.3 billion RMB), and electronic and information technology industry (8.9 billion RMB, accounting for 56% of the total production of large-scale enterprises).

However, there are predominantly many medium- and small-scale enterprises, such as village operated enterprises, individual enterprises and enterprises of other types. In 1977, the total number of industrial enterprises in Chengdu City was 38,966, of which enterprises at the level above village were 4,582 and those at the level of below village were 34,384 whose industrial production occupied 42% of the city total.

The industrial production in the Central Districts is 54 billion RMB, accounting for 41% of the total in 1999. As for the heavy industry, its share in the whole city is 42.32% and so its weight compared to light industry in the Central District is a little larger than in the whole city.

Table 2.3.17 Industrial Production of Chengdu City and the Central Districts (1999)

Unit: billion RMB

	Total	Light industry	Heavy industry
Chengdu City	132.08	71.82	60.26
Central Districts	54.02	28.54	25.48
Ratio (%)	40.9	39.7	42.3

Source: Chengdu City Statistics Yearbook 2000

For the lack of industrial production data of each district, value added in the secondary sector is compared. The highest value is found in Chenghua District where the accumulation of industrial activities are intensive. This is followed by Jinniu District but with a remarkably large drop from Chenghua's value. There are no remarkable differences among the others. Jinjiang and Qingyang Districts show a declining tendency, while Gaoxin District is growing rapidly.

Table 2.3.18 Value Added in the Secondary Sector by District in the Central Districts (1998-1999)

Unit: million RMB

	1998	1999	Percentage distribution (%) 1999	Increase rate 1998-1999 (%)
Jinjiang District	2,190	2,060	12.3	-6.07
Qingyang District	1,920	1,600	9.6	-16.28
Jinniu District	2,490	2,700	16.2	8.65
Wuhou District	2,380	2,590	15.6	9.05
Chenghua District	5,010	5,180	31.1	3.29
Gaoxin District	2,010	2,530	15.3	25.60
Total in Central Districts	16,000	16,660	100.0	4.16

Source: Chengdu City

There are over 200 enterprises for electronics, information technology and electrical technology, belonging to the nation, province or city in Chenghua District. This district has become a famous base of electronic industry in the whole of China. Jinniu District practices the so called “5+8” strategy that focuses on 5 most important products including software, computer terminals and laser-fabric production along with 8 other important products which include stiffened glasses, and at present possesses predominant industries including medical, chemical, electronic, information, electricity, and mechanical industry. Gaoxin District is designated as “Chengdu Hi-tech Development Zone” and it is recently enjoying a fast pace in industrial growth. The sum of industrial output in Gaoxin District was 12 billion RMB in 1998, in which electronic, information, medicine, biologic, and food industries account for 81.8%. There are 248 high-tech enterprises whose production accounts for 53% of the total. In adjacent districts and counties, Longquanyi District holds the Chengdu Economic Technology Development Area. It is provided with the national cosmic factory and the enterprises of motorcycle, optics, packaging, plastic, glass, measure gauge and construction material, etc. which were built with foreign capital. In 1998, the output of these enterprises is 2,170 million RMB. In addition, other types of enterprises, mainly town and village enterprises produce 1,970 million RMB. Qingbaijiang District is an important industrial area and is the primary chemical and metallurgy base of Sichuan province, which holds more than 300 enterprises for chemical, metallurgy, mechanical, chemical fiber, construction material, clothing, food, electric power and metalwork, etc. belonging to the nation, province and city. In 1998, all of the production value of the whole Qingbaijiang District was 5,870 million RMB, in which town and village enterprises produced 2,310 million RMB. The production value of Shuangliu County enterprises was the greatest among districts, cities and counties outside the Central Districts, which was 11,570 million RMB. Shuangliu County holds the Southwest Aviation Aerodrome Economic Development Area authorized by the provincial government and its production value was 1,700 million RMB. In Shuangliu County, there are 6 main industries like medicine, electric, chemical, food, mechanical and construction material.

(3) Consumption

The agricultural products and industrial products get to the hands of the consumer mainly via the marketing system. The marketing system from the producer and the consumer are through various channels. In Chengdu City, department stores, supermarkets, retail shops and consumer goods market play an important role.

The market is a large-scale facility where traffic relatively concentrates. In the Study Area, beside Chengdu Hehuachi General Market with the largest sales, there are also markets for agricultural products such as Qingshiqiao Market, etc. In addition, there are special markets selling industrial products like automobiles and computers. The retail amount of the social commodity is 50 billion RMB in 1999, in which the amount of wholesale and retail trade was 28.2 billion RMB accounting for 56.6% of the total. The restaurant sales amounted to 8.3 billion RMB accounting for 16.6% of total while direct sale of agricultural products is 9.8 billion RMB (19.7%) and the direct sale of industrial products and others is 3.5 billion RMB (7.1%). In the Central Districts, the social commodity retail amount is 30.3 billion RMB, which accounts for 60.7% of the whole amount in the city. The share of the wholesale and the retail trade is high, which accounts for 64.5% of the whole city, but its percentage distribution of marketing might be similar to other districts and counties.

The average consumption expenditure per person in an urban household in Chengdu is 5,798 RMB, accounting for 81.7% of the disposable income of 7,098 RMB. The food expenses account for about half the housing expenses and expenses for clothes, entertainment, culture and education account for about 10%, respectively. The expenses for durable consumer goods (household articles and services) total to 472 RMB and account for 8% of the total expenses.

Table 2.3.19 Value of Retail Sales in Chengdu City and the Central Districts (1999)

		Total value of retail sales	Wholesale and retail trade	Restaurant	Direct retail of agricultural products	Direct retail of industrial products
Chengdu City	Amount (thousand RMB)	50,008,170	28,321,530	8,310,750	9,846,150	3,529,740
	Percentage distribution(%)	100.0	56.6	16.6	19.7	7.1
Central Districts	Amount (thousand RMB)	30,340,420	18,271,090	4,547,930	5,735,360	1,786,040
	Percentage distribution(%)	100.0	60.2	15.0	18.9	5.9
	Share in the city (%)	60.7	64.5	54.7	58.2	50.6

Source: Chengdu Statistical Yearbook 2000

**Table 2.3.20 Consumption Expenditure per Person in
Urban Household (1999)**

	Amount (RMB)	Percentage distribution (%)
Total amount of consumption expenditure	5,798	100.0
Food	2,544	43.9
Clothes	618	10.7
Household articles and services	472	8.1
Medical and health	225	3.9
Transportation and communications	288	5.0
Culture, education, entertainment and services	679	11.7
House	597	10.3
Other commodities and services	375	6.5

Source: Chengdu Statistical Yearbook 2000

Table 2.3.21 shows the number of durable consumer goods held by 100 households comparing the urban household with the rural household. For the urban household, every household has generally more than 2 bicycles , 1 refrigerator, 1 colored television and every 4th household has one air conditioning unit. As for the vehicle ownership, generally speaking there is one motorcycle for every 15 households and one private car for every 140 households. The number of these commodities owned by rural household is generally smaller than that of urban household, but only the ownership of motorcycle shows a higher rate for every 3 households.

**Table 2.3.21 Ownership of Durable Consumer Goods of Urban and
Rural Household (1999)**

	Every 100 urban households	Every 100 rural households
Bike	227.3	160.0
Refrigerator	93.7	11.0
Color TV	124.0	49.6
Motorcycle	6.7	31.7
Motorcar	0.7	-
Air conditioning	25.7	-

Source: Chengdu Statistical Yearbook 2000

2.3.4 Land Use

(1) Development of Built-up Areas

In 1949, the built-up areas of Chengdu City covered an area of 1,800 hectares, including the area within the Inner Ring Road with some extensions to the south and southeast directions and some scattered built-up lands. The built-up area within the Inner Ring Road was formed by the Qing Dynasty and surrounded by the castle wall at that time. The built-up areas after that started to spread out and developed forward ceaselessly along the main radial roads. By 1990, 40 years after the nation was built, the built-up areas had expanded towards east, south and north directions to the railway and towards west direction to nearly the 2nd Ring Road. As a result, the total built-up area reached 7,440 hectares, which is about 4 times the original area. (see Figure 2.3.4 and Table 2.3.22)

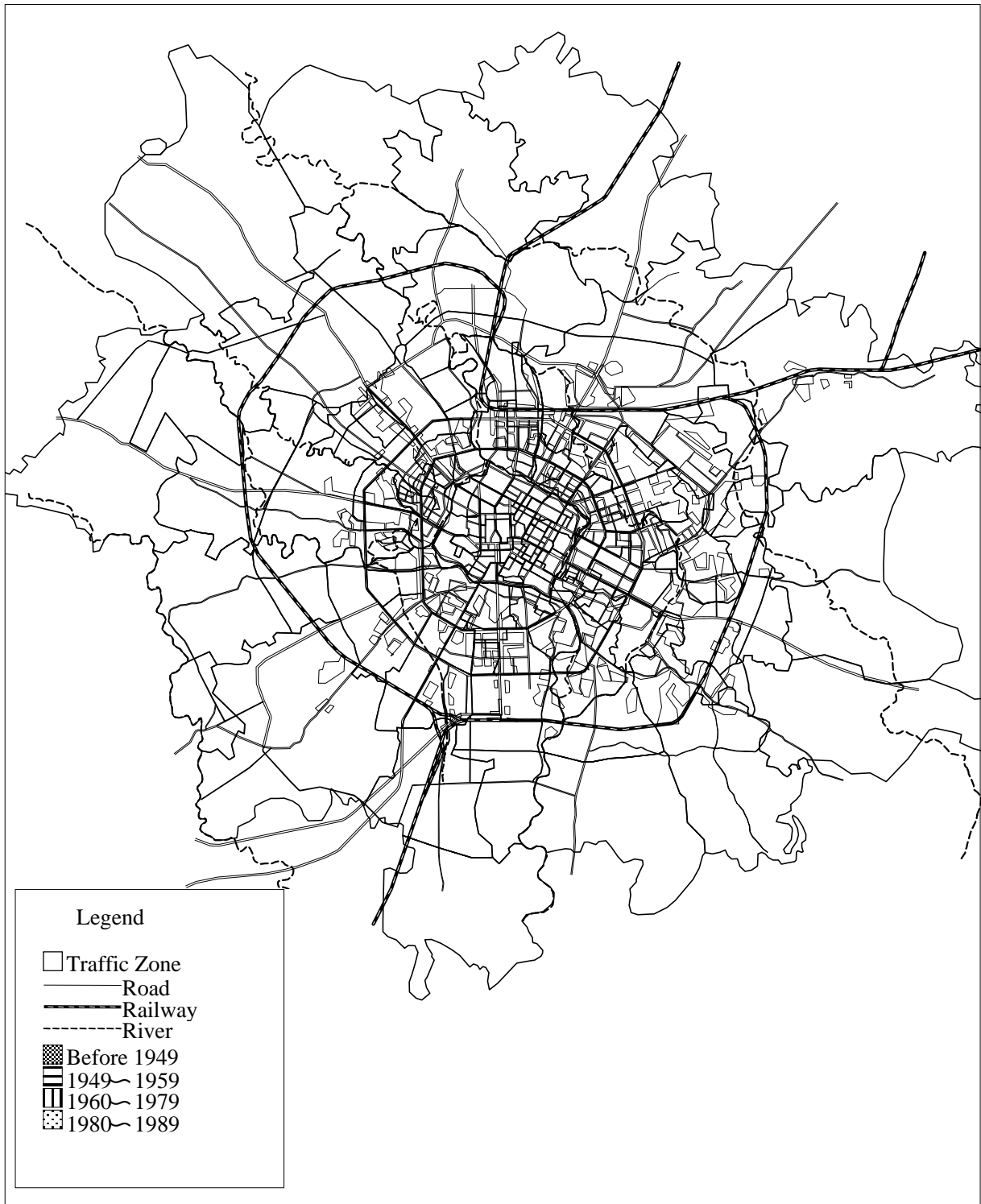
In 1990's, the rate of expansion was faster than ever. During 9 years from 1990 to 1999, the built-up area expanded from 7,440 hectares to 20,230 hectares, an increase of 12,790 hectares, and the size became 2.7 times that in 1990 (see Figure 2.3.4 and Table 2.3.22). As for the urban land area by use in 1999, 32.4% is for residential, 22.7% for industrial, 18.2% for green space and 14.2% for commercial and public facilities.

Table 2.3.22 Expansion of the Built-up Area of Chengdu City (1949 to 1999)

		1949	1980	1990	1995	1999
Area (ha)	Built-up area	1,800	6,000	7,440	12,900	20,230
	Residential			3,860	4,060	6,550
	Commercial and public facilities				2,080	2,870
	Industrial, manufacturing			2,230	3,280	4,590
	Warehouse			340	370	540
	Transportation			300	490	850
	Green space	64	277	1,699	2,165	3,674
	Others				455	1,156
Percentage Distribution (%)	Built-up area	100.0	100.0	100.0	100.0	100.0
	Residential			51.9	31.5	32.4
	Commercial and public facilities				16.1	14.2
	Industrial, manufacturing			30.0	25.4	22.7
	Warehouse			4.6	2.9	2.7
	Transportation			4.0	3.8	4.2
	Green space	3.6	4.6	22.8	16.8	18.2
	Others				3.5	5.7

Source: Study Team based on the data from the Chengdu Statistical Yearbook 2000

Figure 2.3.4 Development of Urban Areas of Chengdu City (1949-1990)



(2) Present Land Use

From the land area by use of 1999 shown in Table 2.3.22, the outline of the present land use of the built-up area in the Study Area can be understood. However, precise reference data and corresponding maps are not available. Chengdu City has already formulated its plan for 2010 (that is, the Overall Land Use Plan of 1997 – 2010 and authorized by the national government in September, 1999) and worked out a Present Land Use Map for 1994 in the course of formulating the plan (see Figure 2.3.5). From then on, urbanization was ceaselessly carried through, but no revised land use map or new Present Land Use Map has been made out. The Table 2.3.23 shows the results calculated from Figure 2.3.5.

Table 2.3.23 Land Area by Use According to Distance from City Center in the Study Area (1994)

(hectare)

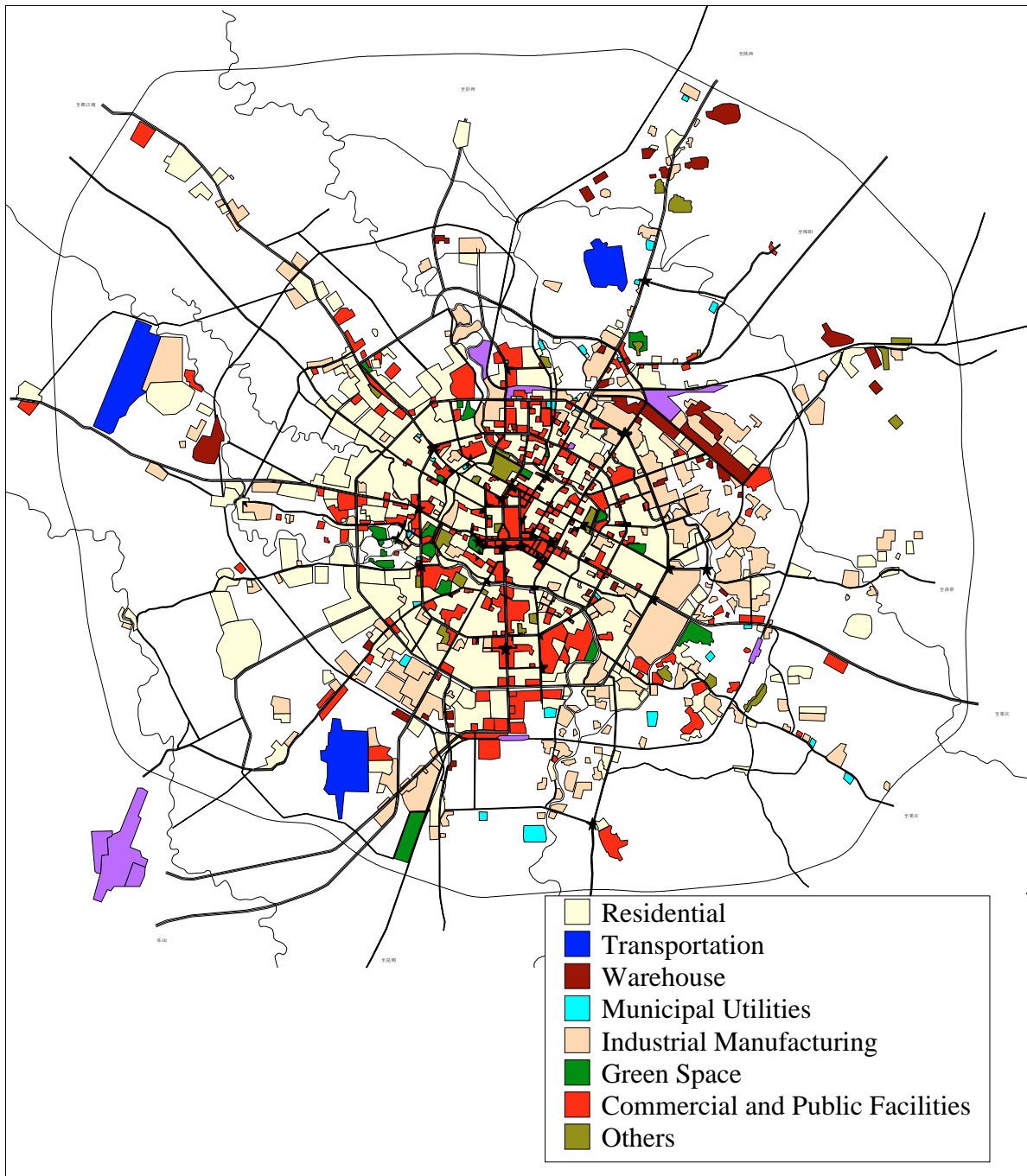
		Inner Ring (within the Inner Ring Road)	1 st Ring (Inner ~ 1 st Ring Road)	2 nd Ring (1 st ~ 2 nd Ring Road)	3 rd Ring (2 nd ~ 3 rd Ring Road)	Outer Ring (outside 3 rd Ring Road)	Study Area total
Total area of Ring		1,350.58	1,527.47	3,247.14	11,999.79	40,429.26	58,554.25
Built-up area	Residential	670.05	836.15	1,847.03	1,989.23	1,035.56	6,378.01
	Commercial and public facilities	355.45	364.46	488.20	583.83	205.85	1,997.79
	Industrial, manufacturing	45.33	75.28	311.08	1,704.99	835.44	2,972.13
	Warehouse	0.00	8.74	2.43	248.64	182.08	441.88
	Transportation	0.00	1.06	18.80	133.08	0.00	152.95
	Municipal utilities	0.00	4.90	16.20	44.45	59.76	125.31
	Green space	28.49	42.43	73.20	65.09	60.36	269.58
	Specially designated	94.56	35.06	16.51	55.03	1,416.16	1,617.32
Total		1,193.88	1,368.09	2,773.45	4,824.34	3,795.22	13,954.97
Others		156.70	159.38	473.70	7,175.45	36,634.05	44,599.28

Source: Study Team

Judging from Figure 2.3.5 and Table 2.3.23, the area within the 2nd Ring Road has been already fully urbanized. Non urbanized area such as farmlands accounted for about 60% in the 3rd Ring and about 90% in the Outer Ring. 24% of the Study Area had been urbanized. From then urbanization has been extended mainly in the 3rd Ring and in the Outer Ring. As shown in Table 2.3.22, at present the built-up area is 20,230 hectares in the whole Districts (including Longquanyi and Qingbaijiang Districts), and by subtracting 3,520 hectares of the built-up areas of the two suburban

districts, the built-up area of the Central Districts is considered to be 16,710 hectares. From Table 2.3.23, it can be understood that “residential”, “commercial and public facilities”, “industrial, manufacturing” are the main urban land uses besides “specially designated” lands. And remarkably industrial and warehouse lands are located outside the 2nd Ring Road.

Figure 2.3.5 Present Land Use (1994)



2.3.5 Vehicle Ownership

According to the Chengdu City Statistics Yearbook, there are 647,800 vehicles in Chengdu City in 1999. An annual average increase rate is 19.5% through the 1990s. The numbers by type of vehicle are: truck 77,700, bus and passenger car 187,900 and others 382,200. “The others” include motorcycle, tractor and special use car. Based on the data from the Public Securities Bureau Vehicle Management Office, the number of motorcycles is 292,000, which is a considerable large number under the present restriction of motorcycle ownership. The most of the remaining vehicles amounting to about 90,000 (382,200 - 292,000) are tractors owned by farmer families.

Table 2.3.24 Increase in the Number of Vehicles by Type (1990 to 1999)

Type of vehicle	Number of vehicles				Annual increase rate (%)			
	1990	1995	1998	1999	1990-95	1995-99	1998-99	1990-99
Truck	29,800	45,200	69,600	77,700	8.69	15.48	11.64	11.24
Large type	16,900	17,100	22,800	25,200	0.24	10.06	10.53	4.54
Bus and passenger car	19,400	84,500	162,900	187,900	34.22	24.46	15.35	28.70
Small type			156,200	180,200			15.36	
Others	81,200	136,700	307,000	382,200	10.98	30.96	24.50	18.78
Total	130,400	266,400	539,500	647,800	15.36	26.52	20.07	19.50

Source: Chengdu Statistical Yearbook 2000

Although there is no data on the accurate number of vehicles in the Study Area, there are 200 thousand vehicles in the Central Districts in May, 2000 according to the data of the Public Securities Bureau as shown in Table 2.3.25. From the table, it is revealed that the number of trucks is 37 thousand, bus and passenger car 117 thousand, motorcycle 40 thousand. Of the 117 thousand buses and passenger cars 4,700 units are large vehicles and 112,500 units are small vehicles. The former might be buses and the latter might be minibuses and passenger cars. At present, there is no data for classifying vehicles according to use purposes (business use or private use).

Table 2.3.25 Number of Vehicles in the Central 5 Districts (2000)

	Total	Jinjiang District	Qingyang District	Jinniu District	Wuhou District	Chenghua District
Truck	37,032	11,194	6,538	7,473	5,993	5,834
Bus and passenger car	117,291	39,293	24,211	21,319	18,401	14,067
Motorcycle	39,966	13,852	6,986	6,948	6,966	5,214
Special use vehicle	368	110	64	78	57	59
Exclusive-use machines	2,278	754	400	449	314	361
Exclusive-use machines	322	129	51	60	50	32
Others	3,143	1,067	643	431	507	495
Total	200,400	66,399	38,893	36,758	32,288	26,062

Source: Public Securities Bureau

Table 2.3.26 shows the number of vehicles by type in 1988 when a vehicle OD survey was carried out in Chengdu City. At that time, there were 85 thousand vehicles in Chengdu City and 39 thousand in the Central Districts, which accounted for 45.6% of the total. Of these, 11 thousand were trucks, 10,000 were buses and passenger cars and 11.5 thousand were motorcycles. In the suburban districts, cities and counties, the numbers of trucks and motorcycles were about 10 thousand respectively, which were almost at the same level of the Central Districts. However, in the suburban areas, there were 20 thousand tractors that were twice the number of trucks or motorcycles.

A comparison of the number of vehicles in the Central Districts in 1988 and in 2000 reveals that the total number in 2000 is 5 times that in 1988. The numbers of trucks and motorcycles are 3.3 times and 3.5 times, respectively. At the same time, the number of buses and passenger cars has increased remarkably to the level of 11.7 times that in 1988.

Table 2.3.26 Number of Vehicles by Type, Entire City and Central Districts (1988)

Type of vehicle	Chengdu City	Central districts	Others
Large truck	15,200	7,875	7,325
Small truck	5,963	3,212	2,751
Bus	3,126	1,958	1,168
Minibus and passenger car	10,718	8,048	2,670
Small light vehicle	2,544	1,833	711
Motorcycle	21,341	11,501	9,840
Special use vehicle	1,325	867	458
Tractor	21,976	1,828	20,148
Others	3,063	1,752	1,311
Total	85,256	38,874	46,382

Source: Chengdu City OD Survey and Its Comprehensive Analysis

2.3.6 Bicycle Ownership

According to the data from the Public Securities Bureau Vehicle Management Office, the number of bicycles registered in Chengdu City was 3,393,200 in 1999. Comparing the mid-year number of households of 3,071 thousand, the ownership was 1.10 units per household. On the other hand, the Urban and Rural Household Surveys for Chengdu City present a series of bicycle ownership of urban and rural households as shown in Table 2.3.27.

Table 2.3.27 Change in Number of Bicycles per Household (1990 - 98)

Year	Urban household	Rural household
1990	2.18	1.61
1995	2.42	1.82
1996	2.46	1.75
1997	2.41	1.74
1998	2.33	1.65

Source: Urban and Rural Household Surveys

Since 1990 the bicycle ownership increased till 1996 in urban areas and till 1995 in rural areas, and recently it is decreasing in both areas. In 1998, urban households owned 2.33 bicycles per household, 1.4 times that of rural households of 1.65. These numbers are considerably larger than 1.10 registered bicycles per household in 1999. The difference may be partly explained by the fact that there are some unregistered bicycles, but it is difficult to understand such a large gap. The Household Survey data might be more reliable because those are based on interviewed results for sampled resident households. According to the national statistics that collected all Urban Household Surveys, the national average bicycle ownership of urban households in China was 1.82 units per household in 1998. It can be said that the urban households in Chengdu City own bicycles 1.28 times the national average.

As for the Study Area, the Person Trip Survey shows that there are 3,393,200 bicycles, with an ownership of 1.52 units per household in 2000. The number of households interviewed in the Survey includes temporary resident households of which smaller percentages own bicycles. The reason why the bicycle ownership is lower in the Household Survey may be attributed to this fact. The rates of bicycle owning household are shown in Table 2.3.28. The average rate of bicycle owning household is 83.1%. The differences of rates by district are not large, but Jinniu District and "Others" (adjacent counties included in the Study Area) show comparatively lower rates.

Table 2.3.28 Number and Rate of Bicycle Owning Households in Study Area, 2000

District	Owning Households	Not owning households	Rate of owning Households (%)
Jinjiang district	159,212	30,089	84.1
Qingyang district	232,655	32,882	87.6
Jinniu district	224,078	71,261	75.9
Wuhou district	206,090	35,818	85.2
Chenghua district	179,823	28,247	86.4
Gaoxin district	46,343	8,487	84.5
Others	43,024	14,928	74.2
Total	1,091,225	221,712	83.1

Source: Person Trip Survey

2.4 Legal System and Organization of Urban Planning

2.4.1 Urban Development Plan

(1) Institutional System Relating to Urban Development Plan in China

In China, "Comprehensive Urban Development Plan" based on the People's Republic of China City Planning Law (December 26, 1998) and "Comprehensive Land Use Plan" based on the People's Republic of China Land Administration Law (August 29, 1998) were established as fundamental space use plans for a city including urban areas

and rural areas under its jurisdiction. The former focuses on the city planning area, which includes urban and suburban districts and future development areas, while the latter covers the whole area under its jurisdiction. In addition, “Development Zone Plan” based on the Development Zone Planning and Administration Law (June 1, 1995) can be prepared for economic development zones, hi-tech development zones and national tourism development zones planned within the city planning area, in order to implement special priority measures for the development. And “Comprehensive Village and Town Plan” based on the Village and Town Planning, Construction and Administration Regulation (June 29, 1993) can be worked out for the villages and Towns in the rural areas.

An urban development plan is generally composed of “Comprehensive Plan” and “Detailed Plan”. In large-scale cities (i.e., those whose non-agriculture population in urban districts and suburban districts exceed 500,000) and middle-scale cities (those whose non-agriculture population in urban districts and suburban districts exceed 200,000 but less than 500,000), “Sub-zone Development Plan” can also be prepared. A detailed plan is based on the comprehensive plan or sub-zone plan and is made for the implementation of particular construction projects planned within the short-term development areas.

According to the Land Administration Law, land within the urban districts belongs to the nation, while all the land in the countryside and the outskirts belongs to the peasants collectively, except for the land which has been declared by law as belonging to the nation. If land for construction projects is required, it is necessary to submit a written request to the concerned department of city planning. After acquiring the license, an official request should be made to the Land Administration Department and, after getting confirmation, then the right of land use can be awarded by the Department.

In the City Planning Laws, there are regulations on how to carry on the “New Urban Development” in the rural area and “Old Area Rebuilding” in the old city districts. When developing new areas, the Administration Department can give the right of land use to the public sector freely, or to the private sector or foreign investors with monetary payment, once the local government has acquired the land for the nation, which originally belongs to the peasants. When acquiring the farmland, it should give the peasants compensation for the buildings and crops standing on the land and should also guarantee their employment. The same is true for acquisition of land in the old regions, although a few buildings may need to be transferred compulsorily. A detailed relocation plan needs to be carefully worked out.

The task of preparing a comprehensive plan (sub-zone plan and detailed plan) is mainly the responsibility of the Town Planning Design Academy. The academy is the

technical consulting arm of the Town Planning Department. During the planning phase of a project, careful consideration of a relocation plan is very important to ensure the successful implementation of the project later.

(2) Current Situation of Chengdu's Urban Development Plan

At present Chengdu City has two guidelines for its urban development, namely "The Comprehensive Urban Development Plan of Chengdu City (1995-2020)" and "The Comprehensive Land Use Plan in Chengdu (1997-2010)," which were passed by the State Department in June 1999 and September 1999, respectively.

Outline of the Comprehensive Urban Development Plan

a) Planning Period

- The whole planning period is set between 1995 and 2050. The short-term plan covers until 2000; the mid-term plan until 2010; the long-term plan until 2020; and the long-term prospect until 2050.

b) Planning Area of the City and Phasing of Development

- All the administrative area of the city, totaling 12,390 sq. km., will be the planning area for development
- Three development phases will be adopted in the plan.. The first phase will cover an area of 598 sq. km. within the center of the city, inside the ring road. The area for the second phase covers the two districts and four counties around the city center, totaling 2,662 sq. km.. The third phase will cover the rest of the city, with an area of 9, 130 sq. km..

c) Population

- The population of the whole city is estimated at 10,200,000 in 2000. This is projected to reach 10,700,000 in 2005, 11,000,000 in 2010, and 11,500,000 by 2020.
- The projected population of the city center is 2,050,000 for non-agricultural and 2,300,000 total inhabitants in 2000; 2,230,000 non-agricultural and 2,500,000 total inhabitants in 2005; 2,420,000 non-agricultural and 2,700,000 total inhabitants in 2010; and 2,780,000 non-agricultural and 3,100,000 total inhabitants in 2020. Long-term non-agricultural population is projected to reach 3,050,000 and total population will be 3,500,000 by 2050.

d) Level of Land Utilization

- The planned level of utilization in the whole city for urban construction is 342 sq. km., with 30 sq. km. set aside for traffic facilities in 2000. This is projected to increase to 422 sq. km. for urban construction and 36 sq. km. for traffic facilities in 2005; 490 sq. km. for urban construction and 40 sq. km. for traffic facilities in 2010; and 670 sq. km. for urban construction and 60 sq. km. for traffic facilities in 2020.
- In the urban center, the planned level of land utilization for urban construction is 172 sq. km. in 2000, 200 sq. km. in 2005, 226 sq. km. in 2010, and 248 sq. km. in 2020. The scale of long-term land utilization for urban construction is limited to 310 sq. km..

e) Development of the Urban Area

- The urban area is a complex of modern cities, which is comprised of the city center and seven satellite cities, namely Dawan, Longquan, Liucheng, Guihu, Pitong, Dongsheng and Huayang.
- The satellite cities have the role of developing the secondary sector, separating the industrial enterprises from the city center and preventing the newly flourishing industrial enterprises from entering into the city center.
- Considering the most important orientation for development of the urban area, there are several parts including the down-wind area and down-stream part of the river in the south, and the hilly lands and plateau in the east. Thus, a high-technology development zone from Shiyang to Huayang along the Renmin Nan-Lu, and an industrial development zone of Honghe-Longquan along the Old Cheng-Yu Highway, are being developed.

f) Structure of the Urban Center

- There are 13 sub-zones and 22 large blocks in the urban center. The average population of each block is 150,000. The urban center is developing from a single-center structure to a complex one, leading towards a city structure with the city center, sub-center, large-block center and neighborhood center.
- The city center can be divided into three parts on the basis of the structure of radial-circumference highways. The inner area within the 1st Ring Road is the urban center, covering 28 sq. km.. The area between the 1st and 3rd Ring Roads (railways are in the south and east) is the main circular urban belt, covering 128 sq. km. The area outside the main circular urban belt and within the Outer Ring Road is the outer circular urban belt, consisting of 422 sq. km.

g) Urban Center

- Large-scale financial, commercial, cultural, information and service facilities will be highly developed in the urban center.
- The remaining industrial enterprises will be transferred by the year 2000. Any extension or rebuilding on the sites will be forbidden.
- The development intensity will be absolutely limited and the average floor area ratio will be controlled at 400%.
- The number of actual inhabitants will be reduced from 800,000 to 700,000 in 2010, 600,000 in 2020, but will be kept to at least 500,000.

h) Main Circular Urban Belt

- The main circular urban belt is the main part of the city where the accommodation, research and education, and traffic center services as well as interflow of commodities will be concentrated. Except for some new hi-tech establishments, new and large-scale industrial projects will not be launched. Meanwhile, the remaining industrial enterprises are expected to be transferred to the satellite cities.
- The main circular urban belt can be divided into five blocks, namely the eastern, southern, western, northern, and north-eastern blocks. Each block has its own characteristics focused on the development of the city.

i) Outer Circular Urban Belt

- The outer circular urban belt has been formed from the seven independent sub-zones of Tianhui-Dafeng, Longtansi, Honghe-Shiling, Shifang-Liuli, Cuqiao-Jitou, Huangtianba and Xipu-Tuqiao based on the remaining towns and industrial belts.
- The land utilization for urban construction is limited to 69.7 sq. km. in 2010 and to 91.7 sq. km. in 2020.
- In terms of industries, it will develop some kind of less land-utilizing, high-profit and low-pollution industries and attract some enterprises transferred from the urban center and the main circular urban belt.
- Each sub-zone is pursuing a type of development that strikes a balance between daily life and work environment.

j) Public Facility System (Installation for the Urban Center's Functions)

- The public facility system of the urban center is composed of one city center, 2 sub-centers, 20 large block centers and some neighborhood centers as the four grades. The sub-center in the south is located at the intersection of the extended section of Renmin Nan-Lu in the high-technology zone and the 3rd Ring Road. The sub-center in the east is set in the Honghe block along the Old Cheng-Yu Highway.
- The rate of land utilization for public facility in the city will be kept at the level of 14~17%. By the year 2010, land utilization for public facility will be up to 11.16 sq. km., reaching 12.76 sq. km. by 2020.

k) Land Utilization for Housing

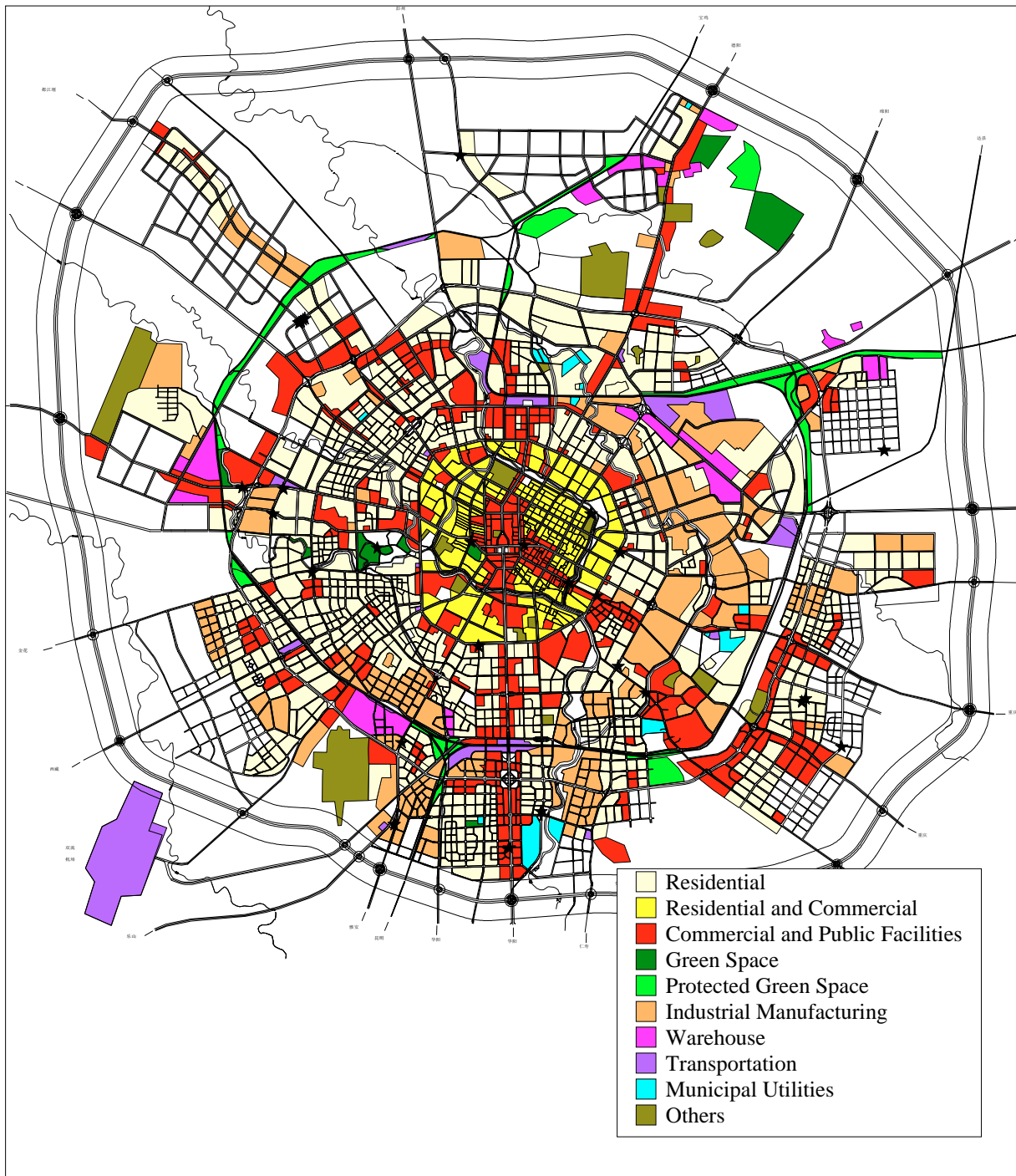
- The rate of land utilization for housing in the urban center will fall from 35.0% now to 31.92% by the year 2010 and 24.51 sq. km. will be added for new apartment construction. The average housing area of every person will be increased to 26.72 square meters. Every person's living space will increase from 8.44 to 12-13 square meters. Additionally, apartments of 1,750-2,020 square meters will be constructed and new housing areas for 30,000-40,000 people's dwellings will be developed.
- The rate of land utilization for housing in the urban center will be kept at 30.93% by the year 2020. The average housing area per person is fixed at 24.73 square meters. Every person's living place will be increased to 14-15 square meters. Apartments of 960-1,270 square meters will be constructed and new housing areas for 30,000-40,000 people's dwellings will be developed.

l) Land Utilization for Industry

- The proportion of land utilization for industry will be decreased gradually. Land will be used efficiently to improve the environment of the city. By the year 2010, the rate of land utilization for industry will be decreased from 23.65% now to 16.75% and 5.70 sq. km. of land will be added for new industrial development. By the year 2020, the rate of land utilization will fall to 14.35% thereby reducing land utilization by 2.27 sq. km.

The details of the comprehensive urban development plan and land utilization in 2010 are shown in Figure 2.4.1. However, for the time being, the sub-zone development plan is not yet prepared. Thus, the population distribution for each sub-zone and detailed land use plan has not been determined.

Figure 2.4.1 Comprehensive Urban Development Plan (2010)



Outline of the Comprehensive Land Use Plan

The Comprehensive Land Use Plan is adjusted to the Comprehensive Urban Development Plan for 2010. The planning targets are as follows:

- The land use composition of the whole city in 2010 will be: agricultural land, 9,123.7 sq km (75.01%); built-up area , 1,906.3 sq km (9.32%); unused land, 1,133.2 sq km (9.32%).
- During the planning period, 127.2 sq km of cultivated land will be used as land for development. However, 33.3 sq km of desert land will be explored and 93.9 sq km of cultivated land will be reused to replenish the loss of the cultivated land.
- Capital farmland will be guaranteed for about 4,229.9 sq km.
- By the year 2010, the built-up area in the urban center will be kept to about 226 sq. km., population at 2,700,000 and land per person at 84 square meters. However, in the rural areas where the peasants live, land per person will be decreased from the current 140 square meters to 120 square meters for the promotion of intensive land utilization.

2.4.2 City Government Budget

Table 2.4.1 shows the budget of Chengdu City in the last five years. It is interesting to note that, except for special subsidy only for national projects, such as that of the Big Bank of Sanxia, there is no other subsidy earmarked from the state and the province. The following sections will discuss only nominal figures available from the China Statistical Yearbook. The City budget nominally grew by 15% per year from 1995 to 1999. However, taking into account the national rate, which reflects a deflation of GDP in 1995 and 1998, the actual growth rate is 6.3%. There has been a rapid growth in revenues and other income. However, on the expense side, the amount of some expenditures and subsidy for municipal enterprises is cause for apprehension. Inasmuch as some other income and expenses are not quite specific, we only consider the income and subsidy of the municipal enterprise. When reference is made to the growth rate of income and expense, it can be said that the situation is improving, though the rate has not reached 50% yet. What's more, the gap between income and expense is becoming large and the balance has surpassed 770,000,000 RMB. If subsidy is used for expenditures, the municipal enterprises could hardly get back half of this sum.

In the past five years, the average annual growth rate of the region is 11%. Financial income accounts for 8% of the GDP in the region. The sum of income and the local income is 12%, which is rather stable. In Table 2.4.2, the sum of investment and construction is also presented. The growth rate of investment and construction does not exceed that of finance. Therefore, the rate of investment and construction in proportion to financial expenditure is down from 30% at the end of 1995 to 24% in 1999. Other expenses do not show such difference as this. Frankly speaking, the growth of expenses on construction maintenance for public facility is somewhat high.

Table 2.4.1 Relevant Financial Statistics of Chengdu (In Nominal Terms)

(10,000 RMB)

Year	1995	1996	1997	1998	1999	Average Growth Rate	Standard Growth Rate
• Revenue	5,289,330	6,540,850	7,725,340	8,941,400	10,478,670	1.15	1.00
- Industrial and Commercial Tax	4,431,290	5,139,110	5,896,330	6,939,450	7,960,630	1.12	0.98
- Agricultural Tax	248,120	355,610	368,920	466,540	499,620	1.15	1.00
- Income of Enterprise under City	186,140	322,310	475,770	435,830	719,940	1.31	1.14
- Special Subsidy	128,730	157,700	158,700	167,760	202,430	1.09	0.95
- Budget Management Fund Revenue	0	0	243,780	216,610	301,950		
- Other Income	295,050	566,120	581,840	715,210	794,100	1.22	1.06
• Expenditure	3,520,850	4,440,240	5,283,230	6,006,760	7,221,360	1.15	1.00
- Subsidy of Enterprise under City	640,400	924,220	1,181,280	1,193,610	1,491,100	1.18	1.03
- Special Subsidy Expenditure	413,450	603,440	710,760	674,900	677,950	1.10	0.96
- Budget Management Fund Expenditure	0	0	188,070	245,590	331,530		
- Price Subsidy	125,180	149,830	110,960	133,570	95,470	0.95	0.82
- Agricultural Subsidy	235,790	271,920	310,760	347,950	401,750	1.11	0.96
- Administrative Expenditure	350,290	408,360	477,840	575,430	660,870	1.14	0.98
- Cultural, Educational and Sanitation Expenditure	930,330	1,104,610	1,206,000	1,367,440	1,552,870	1.11	0.96
- Procuratorial Organ, Public Securities Court Expenditure	218,530	305,730	353,020	405,740	485,830	1.17	1.02
- Other Expenditures	606,880	672,130	744,540	1,062,530	1,524,440	1.20	1.04
• Ratio of Income to Expenditure of Enterprise under city	0.29	0.35	0.40	0.37	0.48		
• Difference of Income to Expenditure of Enterprise under City	-454,260	-601,910	-705,510	-757,780	-771,160		
• GDP of Chengdu	71,367,180	85,933,560	100,702,600	110,259,480	119,003,250	1.11	
• (Revenue + local revenue)/GDP of Chengdu	0.12	0.12	0.12	0.13	0.14		

Source: Chengdu Statistical Yearbook (1998 and 2000)

Table 2.4.2 Amount of Chengdu City's Construction and Investment

(10,000 RMB)

Year	1995	1996	1997	1998	1999	Average Growth Rate	Average Growth Rate
• Construction Investment	1,067,250	1,225,060	1,475,770	1,571,940	1,760,500	1.11	0.96
A: Construction, Maintenance of Public Facilities	692,160	787,410	925,090	1,026,010	1,038,860	1.08	0.94
- Road	262,290	312,930	256,080	292,020	443,630	1.11	0.96
- Drainage	36,670	23,570	12,090	26,950	25,400	0.93	0.80
- Environmental Sanitation	161,530	197,260	199,320	229,090	228,330	1.07	0.93
- Afforest	86,570	98,270	125,950	198,580	166,210	1.14	0.99
- Other Investment	547,060	632,030	593,440	746,640	863,570	1.10	0.95
B: Construction Maintenance of Public Causes	88,280	88,850	149,490	108,950	206,810	1.19	1.03
- Sewerage	34,960	39,950	38,730	35,720	63,450	1.13	0.98
- Others	53,320	48,900	110,960	73,230	143,360	1.22	1.06
C: Residence Construction and Maintenance	170,720	204,840	260,270	240,610	283,710	1.11	0.96
D: Subsidy for Environmental Protection	37,000	44,750	34,350	41,700	52,890	1.07	0.93
E: Construction Capital for Water Source	2,960	7,800	8,740	10,820	10,130	1.28	1.11
F: Other Expenditures	76,130	91,410	97,830	143,850	168,100	1.17	1.01
• Hold Ratio in Construction Investment for Expenditure	0.30	0.28	0.28	0.26	0.24		

Source: Chengdu Statistical Yearbook (1998 and 2000)

2.4.3 Tax System

Ranked according to amount, the different tax items are the value-added tax, business-tax, luxury tax, and enterprise income tax. The first three items have nothing to do with profit, so the structure of Chengdu City's financial income is stable. As Chengdu lies in the inland region of China, the rate of tax income from enterprises in the city is nearly 10 times of that from foreign enterprises. Table 2.4.3 shows the composition of the tax revenue. The total tax revenue in 1999 was 9,860,000,000 RMB.

The tax on the city's construction and maintenance is set according to the sum of value-added tax, luxury tax, and business tax.

Table 2.4.3 Situation of Tax Revenues in Chengdu (1999)

(10,000 RMB)

Enterprise Form	Total	Internal Capital	Foreign Capital	Individual
Total tax revenue	9,864,900	8,413,640	862,270	588,900
Value-added tax	4,456,570	3,535,440	601,560	319,570
Luxury tax	1,085,290	1,060,930	12,340	12,020
Business tax	215,590	1,951,510	111,130	87,950
Enterprise income tax	961,260	961,260	0	0
Foreign enterprise income tax	103,650	0	103,650	0
Individual income tax	289,840	158,280	28,060	103,500
Resource tax	11,160	10,080	10	1,070
Fixed capital tax	64,860	47,640	0	17,220
City maintenance, construction tax	415,040	405,300	0	9,740
Building ownership tax	207,740	196,190	2,800	8,750
Stamp tax	36,770	32,680	2,720	1,370
Royalties for cities and towns land	39,990	39,210	0	780
Increased value tax for land	560	270	0	290
Royalties for vehicle and ship	16,660	13,300	0	3,360
Tax on slaughtering animals	24,920	1,550	0	23,370

Source: Chengdu Statistical Yearbook (2000)

2.5 Environment

2.5.1 Introduction

(1) Environmental Administration

Environmental administration is done at three levels, as follows:

- **State Level:** National Environment Protection Committee, whose Chief is the Vice Premier.
- **Regional Level:** An Environment Protection Committee is established in every province, autonomous region and municipality directly under the Central Government and big cities. An Environment Protection Bureau is also established in each region.
- **County Level:** By the Special Administrative Organization – the administrative government of every county.

(2) Laws Relevant to the Environmental Impact Assessment

The construction items which are necessary to get the environmental impact assessment should be in line with the second clause of the Environmental Impact Assessment Regulations on Construction Items which states that “They must be suitable for all the construction enterprises, technical-transformed enterprises and regional exploration enterprises which have the certain effect on environment, such as industry, traffic, water conservation, forest, commerce, hygiene, culture, scientific research, travel and local public facilities.” Thus, the clause sets a rule that all the construction enterprises must obey the Environmental Effect Evaluation policy.

The law, which the Environmental Impact Assessment Evaluation Regulations refers to, is the Environmental Protection Law of PR (promulgated and implemented in 1989). All the relevant laws concerning the environmental protection are enumerated in Table 2.5.1.

The third clause (on Environmental Impact Assessment) of the Environmental Protection Law (1979) states that “Any construction estate, which is possible to cause environmental pollution, must obey the national policy about the management of construction enterprises’ environmental protection (Environmental Protection Regulations on Construction Items).” The environmental impact report from the construction enterprises, is expected to evaluate the pollution and impact brought on the environment, and to draw up its protection measures. The report should be subjected to some relevant process, and then checked by the chief of the operations bureau of the enterprise. Once permission is given for the environmental impact report, the planning department can approve of the deed of trust of the construction enterprise.

Table 2.5.1 Environment-Related Laws

Classification	Laws
Basic Law	Environmental Protection Law (1979)
Related to Environmental Protection	<ul style="list-style-type: none"> • Sea Environmental Protection Law (1982) • Water Pollution Prevention Law (1989) • Air Pollution Prevention Law (1987) • Wild Animals Preservation Law (1989) • Cultural Relics Preservation Law (1982) • Foodstuff Hygiene Law (1983) • Solid Waste Environmental Pollution Prevention Law (1995) • Noise Prevention Law (1996)
Related to Natural Resources	<ul style="list-style-type: none"> • Forestry Law (1984) • Soil Management Law (1986) • Prairie Law (1985) • Mineral Resource Law (1986) • Fishery Law (1986) • Water Law (1988) • Soil Preservation Law (1991)
Relevant Law	<ul style="list-style-type: none"> • Regulations about Environmental Protection on Construction Items (1986) • Urban Program Law (1989) • Environmental Impact Assessment on Construction Items Regulations (1989) • The sixth clause of Criminal Law's Revision (1997)
Relevant Regulations	<ul style="list-style-type: none"> • Environmental Protection Design Regulation on Construction Items (1987) • Environmental Protection Impact Assessment Standard on Construction Items (1990)
Relevant Standards	<ul style="list-style-type: none"> • Road Natural Divergence Criteria (JTJ 003-86; 1986) • Environmental Impact Assessment Standard on Road Construction Items (trial) (JTJ 005-96; 1997) • Road Drainage Design Standard (JTJ 018-97; 1998) • Environmental Protection Design Standard of Road (JTJ/T 006-98; 1998) • Air Quality Standard (GB3095-1996 and GB3095-1996 [2000] No.1) • Environment Noise Standard for City Region (GB3096-93) • Noise Limits for Construction Place (GB12523-90)

(3) Environmental Evaluation Process

Projects Targeted for Environmental Impact Assessment

In China, it is compulsory for all construction projects, technically-transformed projects, and regional exploration projects which have certain impact on industry, traffic, water conservation, forest, commerce, hygiene, culture, education, scientific research, travel and local public facilities to do environmental impact assessment (according to the Environmental Impact Assessment Regulations on Construction projects).

Environmental Impact Assessment Process

- The projects should submit to the Inspection Department either an IEE (Initial Environmental Evaluation) report or an EIA (Environmental Impact Assessment) report.
- Those projects and technically-transformed ones which have little impact on the environment are expected to make the IEE report.
- The necessity of making the EIA report should be decided by the Environmental Protection Bureau above the county level after the owner of the projects provides the “Environmental Project Proposal” prior to making the EIA. A plan for the EIA must be submitted and should be approved by the Environmental Protection Bureau.
- The EIA report is evaluated as follows: First, it should be checked by the administrative department of the enterprise. Then, it should be examined and approved by the Environmental Protection Bureau of the city or province, or state depending on the project’s actual scale of operations. If the EIA report is not approved, any implementation activity of the project is invalid and also forbidden.
- The construction project is supposed to carry out environment impact assessment in the following five phases of its operations:
 - a) Submission of the project plan and the investigation for the feasibility study in advance;
 - b) Investigation on the feasibility of the projects;
 - c) Design period;
 - d) Construction period; and
 - e) Project completion, trial and delivery.

This study includes the reorganization of the public transport system, especially the improvement of roads. Some of the recommendations are considered to have an impact on the city's environment. Thus, the Governments of Sichuan Province and Chengdu City both think that the environmental impact assessment should be conducted when such projects are identified for implementation.

Qualifications for EIA Implementor

By law, the implementor of the EIA should get a qualified license on EIA and perform the EIA in the range allowed (according to the EIA Regulations on Construction projects).

There are two kinds of licenses, namely A and B. License A is granted by the State and it allows the conduct of EIA for any project. License B is granted by the Environmental Protection Bureau at the provincial level and allows the conduct of EIA for projects in the region.

(4) Environmental Situation of Chengdu City

Administration of Environmental Management in Chengdu

In order to promote environmental protection, the reorganization of relevant environmental laws in Chengdu was gradually improved in the 1990s. Furthermore, the daily environmental protection and supervision has been intensified. The following are the main local regulations relevant to environmental management:

- a) Potable Water Resource Preservation Regulations of Chengdu
- b) Vibration Control Regulations of Chengdu
- c) Vehicles' Exhaust Pollution Prevention Regulations of Chengdu
- d) Solid Waste Pollution Prevention Regulations of Chengdu

The Environment of Chengdu

Chengdu City lies in the Sichuan Basin, making the urban area flat. This encourages more and more people to ride bicycles and contributes to the rapid growth in the number of vehicles. As shown in Figure 2.5.1, the number of vehicles rose from 260,000 in 1996 to 540,000 in 1999.

Chengdu has been experiencing massive traffic of vehicles and bicycles, although efforts are being undertaken to address this problem. Due to so many unreasonable shortcuts and crossing roads made by vehicles, bicycles and pedestrians (as shown in Table 2.5.2), traffic accidents frequently happen, threatening the lives of the residents.

However, the accurate accident statistics were not available, and large fluctuations in the table could not be properly explained. In addition, these accidents disturb the flow of traffic and cause traffic jams.

Figure 2.5.1 Number of Vehicles in the Last Four Years

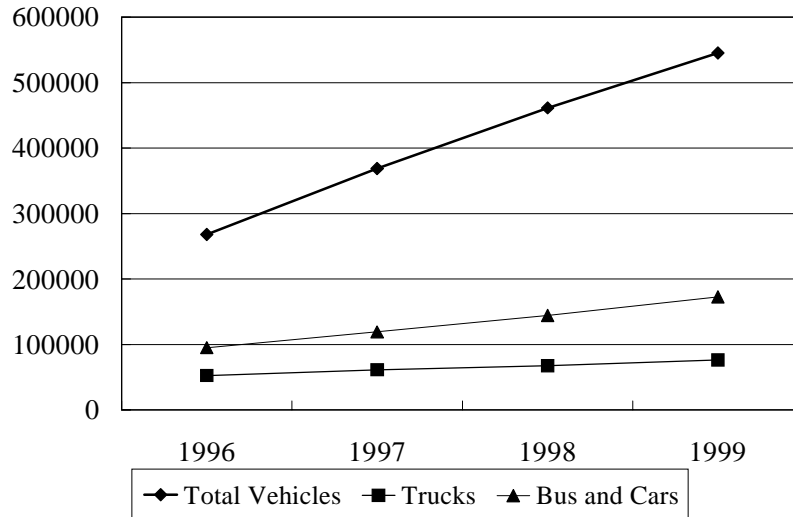


Table 2.5.2 Traffic Accidents and Casualties

	1992	1994	1996	1997	1998	1999
Number of traffic accidents	1,445	467	2,496	3,094	3,562	41,940
Number of deaths	1,165	619	1,697	2,204	2,801	10,578
Number of wounded	246	269	577	570	585	1,348

Sources: 1992 and 1994 data came from the Statistical Yearbook.
1996-1999 data obtained from Public Securities Bureau.

In order to prevent the increase of traffic accidents and to ensure the smooth flow of traffic, the government not only reclassifies vehicles, designates one-way roads for bicycles, and intensifies traffic operations but also carries out the vehicle inspection system as shown in Table 2.5.3 to ensure that vehicles pass standards of roadworthiness.

**Table 2.5.3 Requirements for Vehicle Inspection,
by Type of Vehicle and Frequency**

Items	Checking Site	Vehicle Type	Frequency
Damper brakes Lamps Gas exhaust Cross friction Chassis Speed	Checking field of The Ministry of Public Security	Ordinary vehicles Taxis Buses (including long –distance buses) Discarded / Deferred Vehicles	once/year twice/year twice/year twice or four times/year

Source: Technical Standards for Motor Vehicles' Safe Running (GB7258--1997).

Since the wind force in Chengdu is weak, the environmental pollution caused by the accumulation of vehicles' exhaust has reached threatening levels. In order to solve this problem, natural gas, which is abundant in the Sichuan Basin, is planned to substitute petrol and gasoline as vehicle fuels. This scheme is currently being promoted.

Table 2.5.4 presents a comparative assessment of the degree of environmental pollution caused by traffic in Chengdu and other foreign cities, based on sight observation. Information about the other cities is based on the Report on the Countermeasures to Urban Pollution Caused by Transportation (Japan, 1997). The degree of severity of environmental pollution per item is indicated as letters A to E, with A as good and E as very bad.

The comparative analysis reveals that:

- Compared with Jakarta, Bangkok, Manila and Cairo, pollution caused by vehicle's exhaust in Chengdu is much lighter. However, if the Public Traffic Department does not take measures to solve the problems of the increase in vehicles and of the congestion caused by high traffic volume, the situation will probably become worse.
- Especially in terms of terrain and climate, the conditions to deal with air pollution in Chengdu is inferior to those of other foreign cities .
- A very helpful condition is that the greenbelt areas in Chengdu are very successfully developed.

Table 2.5.4 Comparative Assessment of Environmental Pollution from Traffic

	Chengdu	Dalian	Hanoi	Jakarta	Bangkok	Manila	Cairo	Nagoya
1.Growth rate of motor vehicles	D	D	D	E	E	E	E	D
2.Increase of city population	C	C	C	E	E	E	E	C
3.Topography affecting air pollution	E	C	D	D	D	E	E	C
4.Climate affecting air pollution	E	B	C	C	D	E	E	C
5.Road web (in town center)	D	C	D	D	E	E	E	B
6.Road (in suburb)	C	C	D	D	D	D	D	C
7.Traffic control	D	C	E	D	E	D	D	A
8.Bus network	D	C	E	C	D	D	D	A
9.Railway network	E	C	E	E	D	C	C	A
10.Traffic congestion (in town center)	D	C	D	D	E	E	E	C
11.Traffic congestion (in suburbs)	A	B	A	C	D	D	D	C
12.On-street parking	B	C	D	D	D	E	E	D
13.Paratransit	B	A	B	D	E	D	D	A
14.Condition of vehicles	D	C	D	D	D	E	E	A
15.Composite rate of big vehicles (in town center)	B	B	B	C	C	D	D	C
16.Mixed traffic	D	D	E	D	D	D	D	A
17.Air pollution (in town center)	E	D	D	E	E	E	E	B
18.Air pollution (beside residential quarters)	C	C	C	D	D	D	D	A
19.Air pollution (both sides of the road)	E	D	D	E	E	E	E	B
20.Effect on health	D	C	D	E	E	E	E	B
21.Environmental greenbelt	B	C	D	D	E	E	E	B

2.5.2 Air Pollution

Compared with other cities, the climate and terrain of Chengdu is very special and the temperature is constantly changing. Once the air-pollution-causing substance is emitted, it is difficult to disperse. Therefore, we must take note that, though the exhaust is less, the air density may easily become very high.

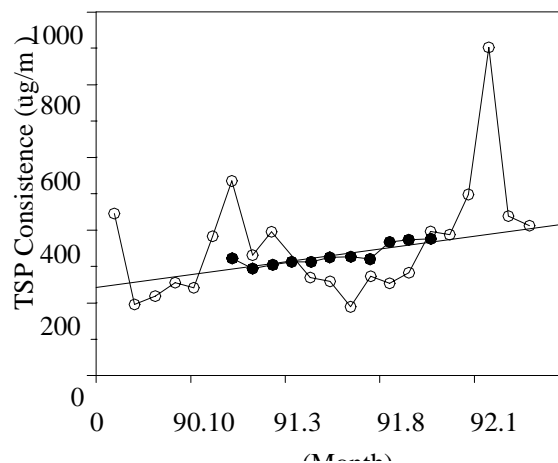
(1) Air Pollution Situation According to Historical Data

What is presented in Table 2.5.5 is the measured result of air pollution by the Air Pollution Monitoring station. In Chengdu, the commercial, traffic, residential area, cultural area, scenic spots, historical sites and large countryside areas belong to grade two of the standard air environment, including the condition of air purity.

However, based on a joint survey conducted by a small group of Keio University students and the Chengdu Government between 1991 and 1992, we can see the daily average density of floating dust TSP reaches the second grade by a rate of 50% and, in some places, reaching the third degree by a rate of 17%. Furthermore, as shown in Figure 2.5.2, the density of TSP will rise obviously in winter by about three to five times that in summer. The reason for this phenomenon is that the basin terrain of the City brings about the active inversion layer and the reduction of rain.

The analysis of TSP's main ingredients reveals that dust particles and particles of building materials, coal burning and exhaust of vehicles are the most important ingredients. The average deposit density and rate of the source are as follows: earth particles, $40 \mu g/m^3$ (11%); building materials, $101 \mu g/m^3$ (29%); steel industry, $37 \mu g/m^3$ (10%); particles of vehicles' exhaust, $40 \mu g/m^3$ (11%); and particles of coal burning $69 \mu g/m^3$ (20%). With the increase of vehicles and the improvement of household fuel, the particle of vehicles' exhaust will increase while that from coal burning will decrease in the total deposit rate.

Figure 2.5.2 Change of TSP in Chengdu



Source: China Environmental Review

**Table 2.5.5 Situation of Air Pollution in Chengdu:
Daily Average Values in 1998**

Measurement Site	SO ₂	NO _x	Dust	Pollution Index	Material Needing Attention	Class	State
Sports Center	0.058	0.049	0.251	86	Dust	II	Fine
Chaotang Temple	0.049	0.042	0.191	70	Dust	II	Fine
No.2 Railway Engineering Co. Ltd.	0.064	0.055	0.267	91	Dust	II	Fine
No. 65 Factory	0.067	0.056	0.262	89	Dust	II	Fine
Jinniu Dam	0.034	0.027	0.171	64	Dust	II	Fine
Average Value	0.060	0.050	0.243	81	Dust	II	Fine

Note: Measurement unit for SO₂, NO_x and dust is mg/m³

Table 2.5.6 Air Environmental Standards of China

Standard "GB 3095-1996"

Pollutant	Limit of Density (mg/m ³)			
	Time of Evaluation	Datum Value Class I	Datum Value Class II	Datum Value Class III
Sulphur dioxide	Annual average value	0.02	0.06	0.10
	Daily average value	0.05	0.15	0.25
	Instantaneous value	0.15	0.50	0.70
Dust	Daily average value	0.15	0.30	0.50
	Instantaneous value	0.30	1.00	1.50
NO _x	Daily average value	0.05	0.10	0.15
	Instantaneous value	0.10	0.15	0.30
Carbon monoxide CO	Daily average value	4.00	4.00	6.00
	Instantaneous	10.00	10.00	20.00
Actinic oxide	Value per hour	0.12	0.16	0.20

Notes: Datum value Class I fits I district; Datum value Class II fits II district; Datum value class III fits III district.

I - Nature reserves designated by the government, scenic spots, places for sight-seeing, and historical sites, and specially protected area; II - Residential quarters around the city, commercial/residential area, cultural area, scenic sports and historical sites; III - Cities and towns where the air pollution indices are higher, industrial districts, hubs of communications, districts with city main highways.

(2) Surveys Conducted on Air Pollution

It is the responsibility of this project to make an environmental impact assessment. The survey is the first stage of the main program. Thus, in order to make the brief IEE, the current survey on air pollution in Chengdu was conducted.

The survey items are listed in Table 2.5.7, the sites in Table 2.5.8 and Figure 2.5.3. Some necessary items from China environmental assessment were selected as the survey items and ten spots were chosen as the survey sites, such as the end of the roads, crossing points, and those with heavy traffic jams. The survey was done during one weekend and one weekday.

Table 2.5.7 Survey Items on Air and Noise Pollution

Items	Time	Place
Nitrogen dioxide Sulphur dioxide Carbon monoxide Hydrocarbon TSP	Aug 13,2000 (SUN), 24 hours Aug 14,2000 (MON), 24 hours	See Table 2.5.8 and Figure 2.5.3
Noise and vibration	--do--(day ,night)	--do--

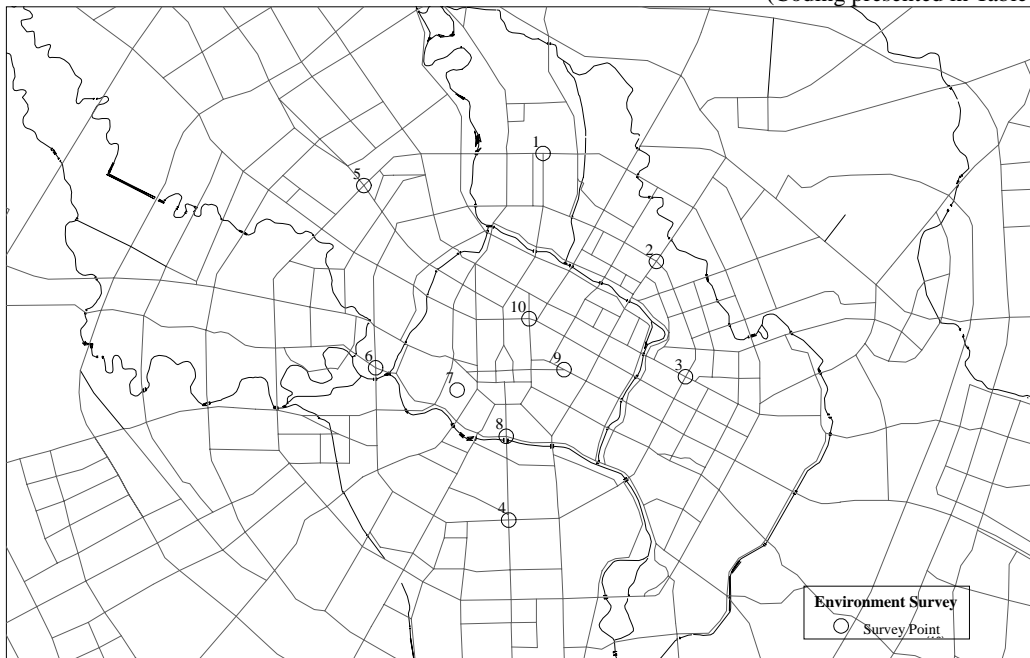
Note: The time and sites for the noise and vibration survey was the same as those for the air Pollution survey.

Table 2.5.8 Sites for Measuring Air Pollution and Noise Vibration

Number of Measurement Sites	Location	Remarks
1	Gongjiao Beizhan (Renmin Bei-Lu / 1st Ring Road)	
2	Fuqing Lukou (Fuqin Lu / 1st Ring Road)	Grade separated bridge (west side)
3	Shuanglin Lukou (Shuanglin Lu / 1st Ring Road)	
4	Tiaosanta (Renmin Nan-Lu / 1st Ring Road)	
5	Yingmenkou (Yingmenkou Lu/ 2nd Ring Road)	Grade separated bridge
6	Qingyanggong (1st Ring Road / Qingyanggong)	
7	Renmin Park (Junping Jie)	Generally the number one site for investigation
8	Jinjiang Hotel (Binjiang Lu / Renmin Nan-Lu)	
9	Chengbai Gongsu (Zongfu Lu)	Highly polluted and level of mixing is serious
10	Yudai Lijiaoqiao (Tianzuo Jie / Xi Yulong Jie)	Grade separation bridge

Figure 2.5.3 Measurement Sites for Air Pollution and Noise Vibration

(Coding presented in Table 2.5.8)



NO₂

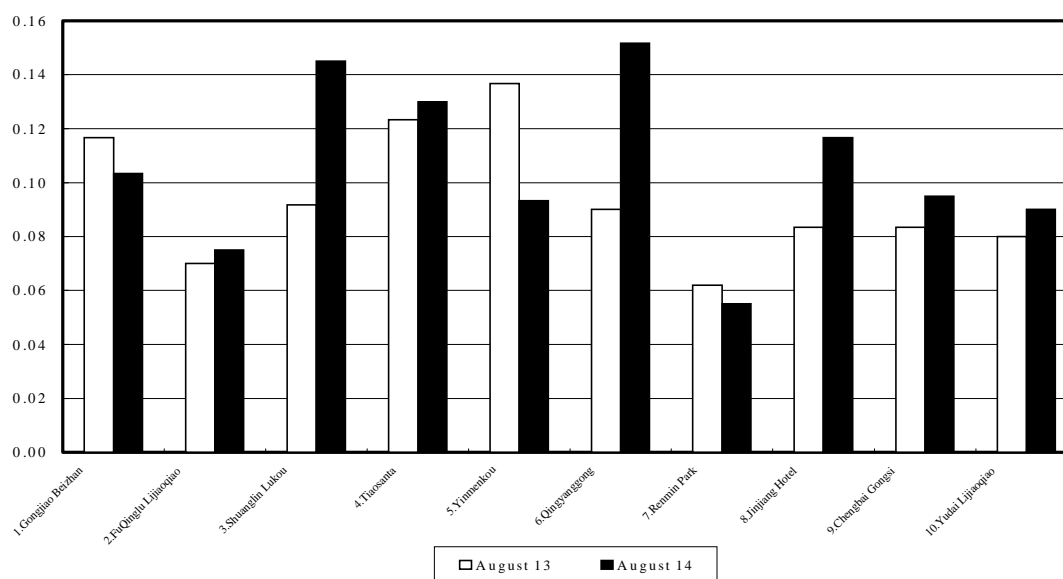
The results of measurement are presented in Table 2.5.9. The average density per day in various places are illustrated in Figure 2.5.4.

The places that were investigated were highly polluted, facing the vital transportation lines and main lines. This categorizes these places under the third grade of environmental standards in China. The average density per day reaches 0.15 mg./m³. The place found to be exceeding the environmental standard is the Qingyanggong, which was surveyed on 14th August. The other places exceeding 0.10mg/m³ (the second grade standard) are the Northern bus stop (during weekends and weekdays), the Shuanglin Lukou Intersection (during weekdays), the Tiaosanta (during weekends and weekdays), Yingmenkou (during weekends), the Qingyanggong (during weekdays), and the Jinjiang Hotel (during weekdays). Furthermore, it was found that compared with weekends, the density of air NO₂ pollution during weekdays in every place is a little higher.

Table 2.5.9 Results of the Measurement of the Density of NO₂

Place	13 August 2000 (o'clock)						14 August 2000 (o'clock)						NO ₂ (mg/m ³)	
													Average	
	2	7	11	13	18	21	2	7	11	13	18	21	13Aug	14Aug
1. Gongjiao Beizhan	0.11	0.08	0.14	0.15	0.09	0.13	0.09	0.05	0.11	0.14	0.14	0.09	0.117	0.103
2. Fuqinglu Lijiaoqiao	0.08	0.11	0.05	0.05	0.03	0.10	0.08	0.08	0.07	0.07	0.09	0.06	0.070	0.075
3. Shuanglin Lukou	0.07	0.12	0.05	0.09	0.08	0.14	0.14	0.15	0.18	0.16	0.14	0.10	0.092	0.145
4. Tiaosanta	0.08	0.08	0.12	0.18	0.17	0.11	0.14	0.10	0.12	0.12	0.17	0.13	0.123	0.130
5. Yingmenkou	0.11	0.08	0.13	0.20	0.17	0.13	0.09	0.04	0.11	0.12	0.11	0.09	0.137	0.093
6. Qingyanggong	0.11	0.08	0.08	0.10	0.07	0.10	0.10	0.06	0.27	0.22	0.18	0.08	0.090	0.152
7. Renmin Park	0.08	0.07	0.05	0.02	0.09	N.A.	0.06	0.05	0.05	0.06	0.05	0.06	0.062	0.055
8. Jingjiang Hotel	0.12	0.09	0.06	0.07	0.10	0.06	0.10	0.08	0.13	0.12	0.14	0.13	0.083	0.117
9. Chengbai Gongsì	0.08	0.10	0.10	0.08	0.06	0.08	0.06	0.06	0.12	0.07	0.12	0.14	0.083	0.095
10. Yudai Lijiaoqiao	0.10	0.12	0.07	0.07	0.05	0.07	0.11	0.09	0.08	0.10	0.06	0.10	0.080	0.090

Figure 2.5.4 Average Daily Concentration of NO₂ (mg/m³) in Various Sites



SO₂

The results of the SO₂ measurement are presented in Table 2.5.10 and the daily average density of SO₂ in various places are illustrated in Figure 2.5.5.

The environmental standards for the daily average density of SO₂ are as follows: the third grade is 0.25mg/m³, and the second grade is 0.15mg/m³. The survey results show that the densities in various places are all within the environmental standards, despite the rather high density at the Northern bus stop. The densities at the places with nearby factories are a bit high during weekdays while the densities at Qingyanggong, Chengbai Gongsi, and Yudai Lijiaoqiao are a little high on weekends.

CO

The measured results of CO are presented in Table 2.5.11 and the average density of CO in various places and according to the different measurement times are illustrated in Figure 2.5.6 and Figure 2.5.7, respectively.

The environmental standard for the average density of CO at the third grade is 6.00mg/m³. The instant value is 20.00mg/m³. The survey results show that the average densities of CO in various places are all far beyond the environmental standard. Also, the instant values in some places at night are within environmental standards. However, in the daytime these values are far beyond the standards. In places like the Tiaosanta, Qingyanggong, Jinjiang Hotel (during weekdays), and Chengbai Gongsi, average CO densities at night are a little higher than they are during daytime. Furthermore, aside from being high during ordinary weekdays, the density tends to be higher in the crowded places on weekends.

Table 2.5.10 Results of the Measurement of the Density of SO₂ (mg/m³)

Place	13 August 2000 (o'clock)						14 August 2000 (o'clock)						Average	
	2	7	11	13	18	21	2	7	11	13	18	21	13Aug	14Aug
1. Gongjiao Beizhan	0.03	0.16	0.03	0.07	0.04	0.02	0.04	0.12	0.02	0.06	0.06	0.11	0.058	0.068
2. Fuqinglu Lijiaoqiao	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.00	0.06	0.01	0.00	0.01	0.013	0.015
3. Shuanglin Lukou	0.03	0.02	0.02	0.01	0.02	0.01	0.01	0.04	0.02	0.00	0.01	0.06	0.018	0.023
4. Tiaosanta	0.02	0.04	0.01	0.04	0.01	0.02	0.03	0.04	0.00	0.00	0.01	0.03	0.023	0.018
5. Yingmenkou	0.04	0.03	0.01	0.02	0.01	0.02	0.01	0.09	0.02	0.01	0.02	0.07	0.022	0.037
6. Qingyanggong	0.03	0.017	0.02	0.01	0.01	0.06	0.01	0.02	0.03	0.02	0.01	0.02	0.050	0.018
7. Renmin Park	0.06	0.04	0.01	0.01	0.02	0.00	0.06	0.02	0.01	0.01	0.00	0.04	0.023	0.023
8. Jingjiang Hotel	0.01	0.06	0.01	0.00	0.01	0.01	0.01	0.02	0.02	0.00	0.01	0.03	0.017	0.015
9. Chengbai Gongsu	0.02	0.09	0.01	0.04	0.09	0.08	0.04	0.02	0.03	0.01	0.01	0.02	0.055	0.022
10. Yudai Lijiaoqiao	0.04	0.07	0.01	0.03	0.08	0.02	0.03	0.06	0.01	0.00	0.00	0.02	0.042	0.020

Figure 2.5.5 Average Daily Concentration of SO₂ (mg/m³) in Various Sites

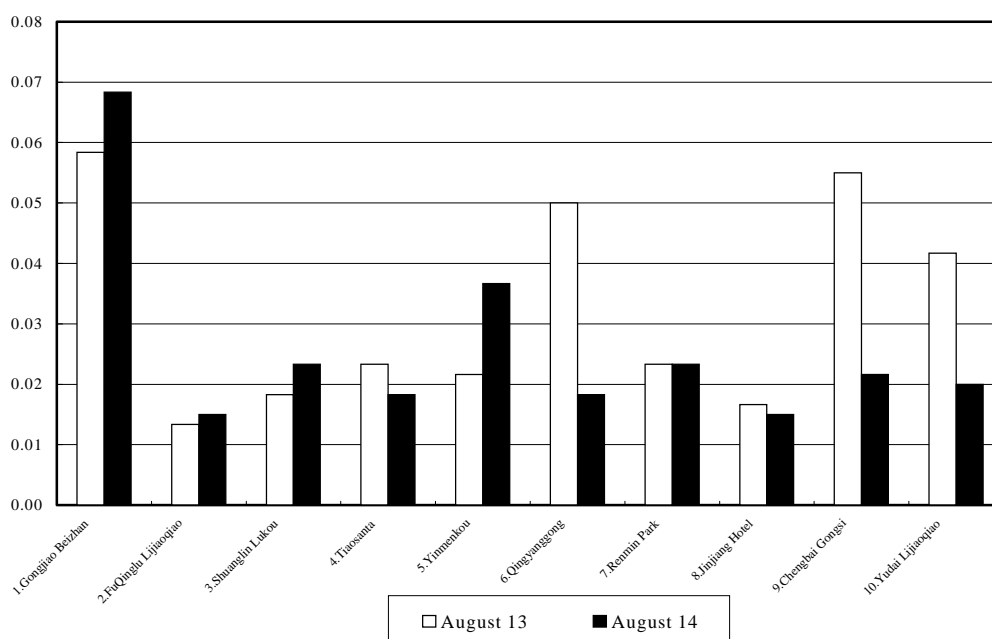


Table 2.5.11 Results of the Measurement of the Density of CO (mg/m³)

Place	13 August 2000 (o'clock)						14 August 2000 (o'clock)						Average	
	2	7	11	13	18	21	2	7	11	13	18	21	13Aug	14Aug
1. Gongjiao Beizhan	8.25	25.40	29.80	11.90	2.90	0.62	5.50	23.50	13.10	10.50	6.20	12.30	13.145	11.850
2. Fuqinglu Lijiaoqiao	4.50	4.25	8.37	9.75	2.75	6.38	5.80	11.40	15.00	13.50	7.30	9.30	6.000	10.383
3. Shuanglin Lukou	10.50	19.00	31.20	9.80	5.60	9.75	7.75	31.00	31.80	15.20	9.00	2.50	14.308	16.208
4. Tiaosanta	15.50	32.00	36.20	10.20	35.80	12.80	14.80	39.50	32.20	9.80	21.00	21.80	23.75	23.183
5. Yingmenkou	12.00	37.30	19.20	5.10	18.20	25.60	22.10	51.20	16.50	9.40	10.20	16.80	19.567	21.033
6. Qingyanggong	19.20	19.20	57.50	9.30	27.50	17.50	19.20	58.50	9.38	1.25	23.90	14.20	25.033	21.072
7. Renmin Park	20.60	3.38	12.20	8.40	4.80	5.60	25.00	17.80	15.80	16.00	5.50	24.80	9.163	17.483
8. Jingjiang Hotel	1.50	2.50	25.10	2.60	9.10	20.80	20.20	39.60	51.60	11.00	15.40	22.00	10.267	26.633
9. Chengbai Gongs	13.70	57.10	42.50	37.60	46.20	12.70	22.10	23.00	16.60	39.60	48.40	15.80	34.967	27.583
10. Yudai Lijiaoqiao	8.60	16.20	10.20	12.50	1.40	6.50	11.00	21.20	23.20	20.80	8.10	11.80	9.233	16.017

Figure 2.5.6 Average Daily Concentration of CO (mg/m³) in Various Sites

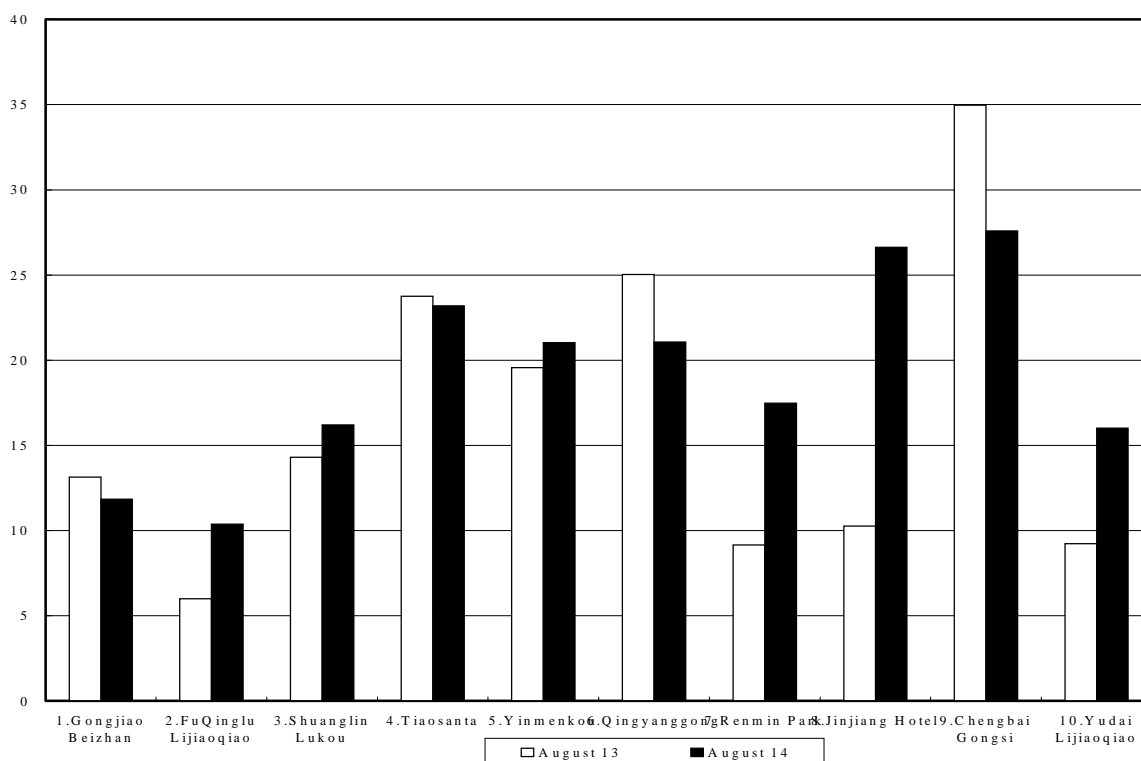
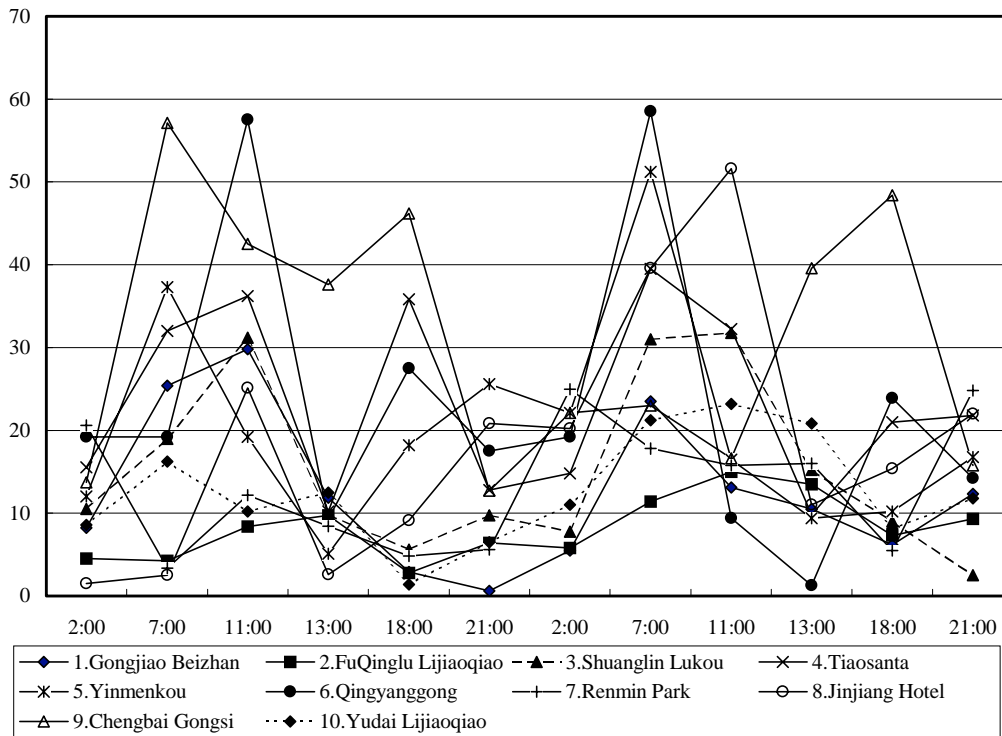


Figure 2.5.7 Hourly Change of Concentration of CO (mg/m³) in Various Sites



CnHn

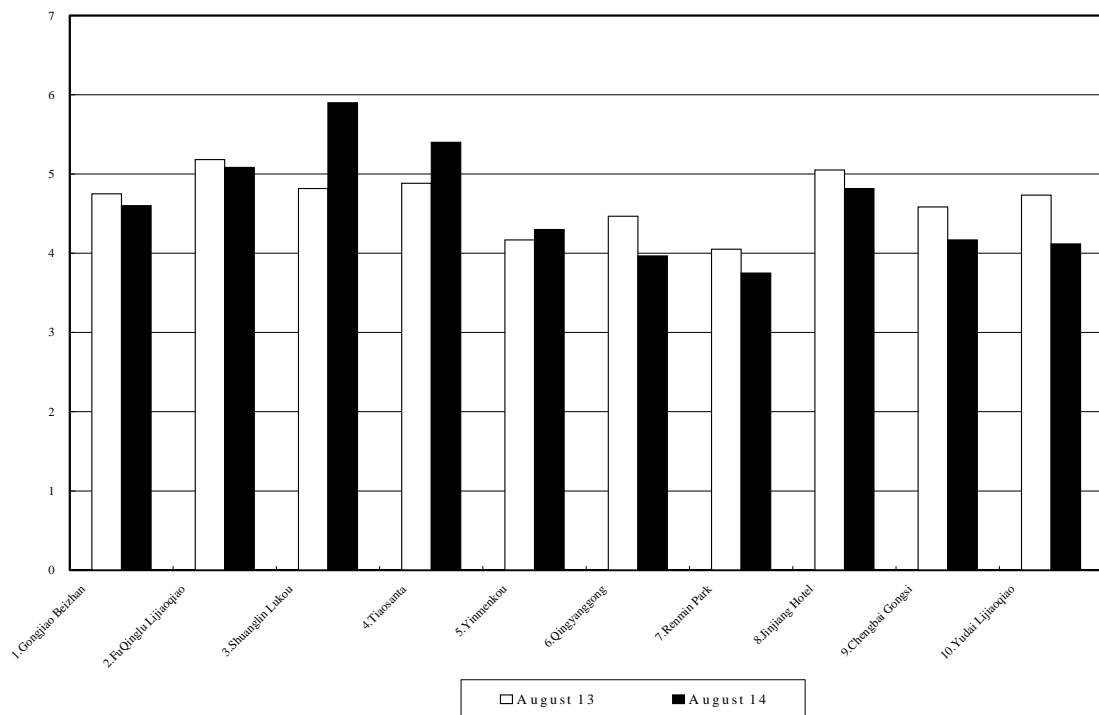
CnHn, including CH₄ and nonCH₄, was also measured during the air pollution survey. The results of the measurement of the average daily concentration of CnHn are presented in Table 2.5.12 and illustrated in Figure 2.5.8.

Although this item is not required in the environmental standard, it has great impact on human health. The places with high density of CnHn are the intersection of Shuanglin Lukou, Tiaosanta, and the Fuqinglu Lijiaoqiao. In addition, the density of CnHn on weekends tends to be thicker, such as the case in the intersection of Shuanglin Lukou, Tiaosanta and Yingmenkou.

Table 2.5.12 Results of Measurement of CnHn Density (mg/m³)

Place	13 August 2000 (o'clock)						14 August 2000 (o'clock)						Average	
	2	7	11	13	18	21	2	7	11	13	18	21	13Aug	14Aug
1. Gongjiao Beizhan	5.0	5.8	4.2	4.3	4.4	4.8	4.9	5.0	4.6	4.3	4.6	4.2	4.75	4.60
2. Fuqinglu Lijiaoqiao	6.2	6.5	4.6	3.6	3.6	6.6	5.3	5.3	6.8	4.4	3.5	5.2	5.18	5.08
3. Shuanglin Lukou	5.6	5.8	4.8	4.2	4.2	4.3	6.4	6.2	4.9	5.0	6.4	6.5	4.82	5.90
4. Tiaosanta	4.4	5.9	4.0	4.2	5.0	5.8	5.8	5.4	6.1	4.0	5.1	6.0	4.88	5.40
5. Yingmenkou	4.5	4.4	4.7	4.0	3.8	3.6	3.8	5.2	3.8	4.0	5.0	4.0	4.17	4.30
6. Qingyanggong	4.0	6.1	4.2	3.6	4.2	4.7	3.4	4.8	4.2	4.0	3.6	3.8	4.47	3.97
7. Renmin Park	4.6	4.1	4.0	3.4	4.8	3.4	4.8	4.9	3.2	3.2	3.1	3.3	4.05	3.75
8. Jingjiang Hotel	5.1	8.1	4.0	4.1	4.0	5.0	6.5	5.6	4.6	4.2	4.0	4.0	5.05	4.82
9. Chengbai Gongs	5.6	5.4	3.4	4.3	4.2	4.6	5.4	3.0	4.6	4.0	4.0	4.0	4.58	4.17
10. Yudai Lijiaoqiao	5.4	7.0	3.9	3.8	3.9	4.4	4.6	4.4	3.9	3.8	3.2	4.8	4.73	4.12

Figure 2.5.8 Average Daily Concentration of CnHn (mg/m³) in Various Sites



TSP

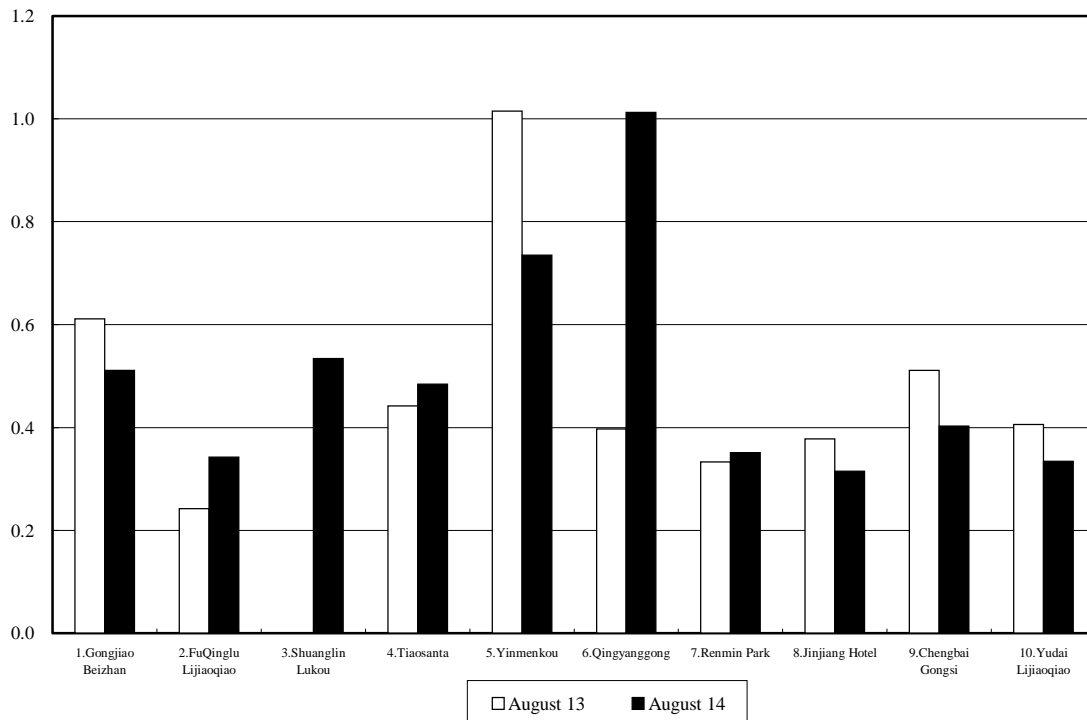
The results of the measurement of TSP are presented in Table 2.5.13 and Figure 2.5.9.

The second grade environmental standard for TSP is a daily average of $0.3\text{mg}/\text{m}^3$. Both during weekends and weekdays, the TSP levels at all places except Fuqinglu Lijiaoqiao are exceeding the standard.

Table 2.5.13 Results of Measurement of TSP Density (mg/m^3)

Place	13 August 2000	14 August 2000
1.Gongjiao Beizhan	0.611	0.511
2.FuQinglu Lijiaoqiao	0.242	0.342
3.Shuanglin Lukou	N.A.	0.534
4.Tiaosanta	0.442	0.484
5.Yinmenkou	1.015	0.735
6.Qingyanggong	0.397	1.013
7.Renmin Park	0.333	0.351
8.Jinjiang Hotel	0.378	0.315
9.Chengbai Gongsi	0.511	0.403
10.Yudai Lijiaoqiao	0.406	0.334

Figure 2.5.9 TSP Concentration (mg/m^3) in Various Sites



2.5.3 Noise and Vibration

(1) Noise

The environmental standards for noise levels in China are shown in Table 2.5.14. For the noise pollution measurement survey, places such as ends of roads, intersections, and places with traffic jams were selected as measurement sites.

The results of noise measurements are shown in Table 2.5.15 and Figure 2.5.10. From these results, it seems that noise pollution is most severe at the Yingmenkou site. During the night, the measured results are all over the standard value, except during weekdays at the North bus stop. Also, during the daytime, the measurement results in only a few places were within the standard value, except in Renmin Park.

Table 2.5.14 Noise Standard (L_{Aeq} : dB)

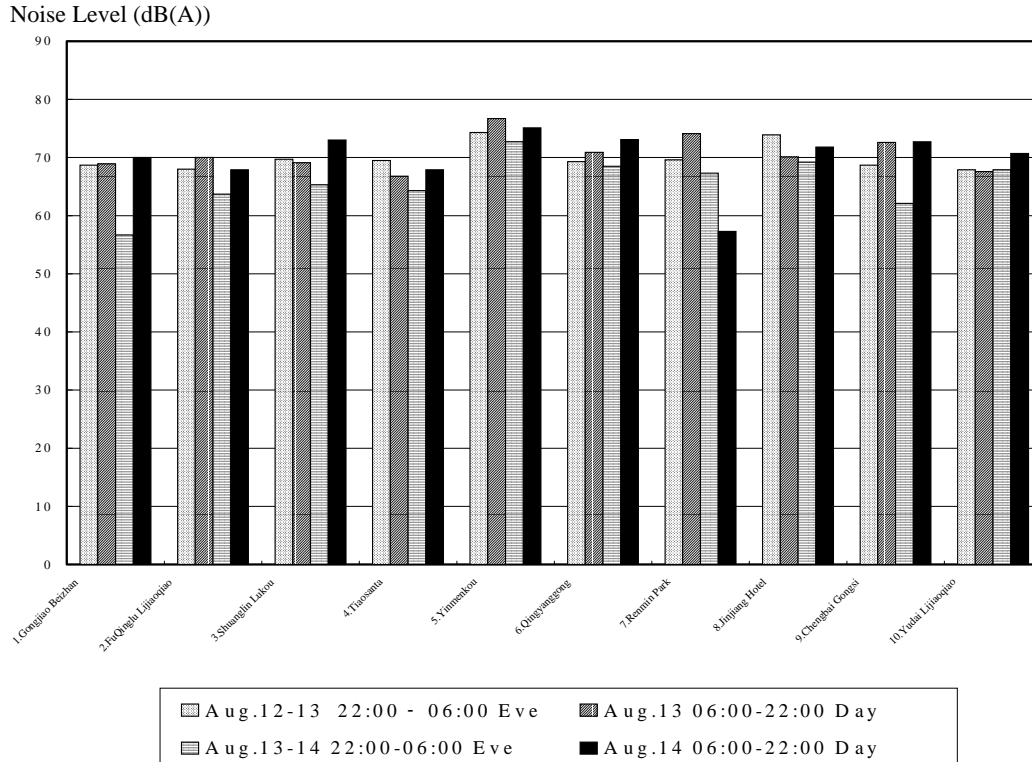
Class	Daytime	Night
0	50	40
1	55	45
2	60	50
3	65	55
4	70	60

Note: Class 0: Hospital, high class villa and hotel area.
 Class 1: Residential or educational/public facility area.
 Class 2: Residential/commercial/industrial mixed area.
 Class 3: Industrial area.
 Class 4: Area along urban trunk road, navigable river and railway.

Table 2.5.15 Results of Measurement of Noise Pollution

Place	Noise Standard (L_{Aeq} : dB)			
	12~13, August	13, August	13~14, August	14, August
	22:00~06:00	06:00~22:00	22:00~06:00	06:00~22:00
	Night	Daytime	Night	Daytime
1.Gongjiao Beizhan	68.7	68.9	56.7	70.0
2.FuQinglu Lijiaoqiao	68.0	70.0	63.7	67.9
3.Shuanglin Lukou	69.7	69.1	65.3	73.0
4.Tiaosanta	69.5	66.8	64.3	67.9
5.Yinmenkou	74.3	76.7	72.7	75.1
6.Qingyanggong	69.3	70.9	68.5	73.1
7.Renmin Park	69.6	74.1	67.3	57.3
8.Jinjiang Hotel	73.9	70.1	69.2	71.8
9.Chengbai Gongsu	68.7	72.6	62.1	72.7
10.Yudai Lijiaoqiao	67.9	67.6	67.9	70.0

Figure 2.5.10 Results of Measurement of Noise



(2) Vibration

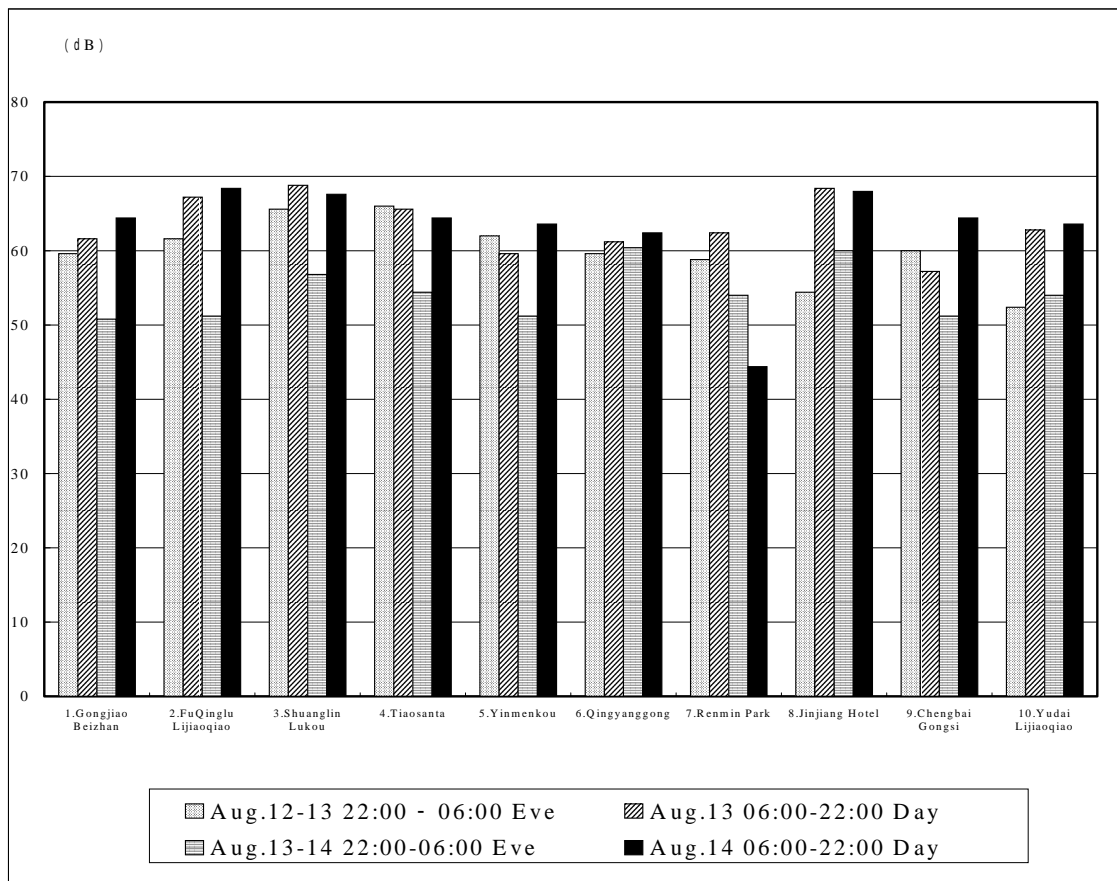
The results of the measurement of vibration levels are shown in Table 2.5.16 and Figure 2.5.11.

The results indicate that the noise during the night is lowest from Monday to Sunday (except in Renmin Park) and, during the daytime, it is the highest on weekdays.

Table 2.5.16 Results of the Measurement of Vibration Levels (dB)

Place	12~13, August	13, August	13~14, August	14, August
	22:00~06:00	06:00~22:00	22:00~06:00	06:00~22:00
	Night	Daytime	Night	Daytime
1. Gongjiao Beizhan	59.6	61.6	50.8	64.4
2. Fuqinglu Lijiaoqiao	61.6	67.2	51.2	68.4
3. Shuanglin Lukou	65.6	68.8	56.8	67.6
4. Tiaosanta	66.0	65.6	54.4	64.4
5. Yingmenkou	62.0	59.6	51.2	63.6
6. Qingyanggong	59.6	61.2	60.4	62.4
7. Renmin Park	58.8	62.4	54.0	44.4
8. Jingjiang Hotel	54.4	68.4	60.0	68.0
9. Chengbai Gongsu	60.0	57.2	51.2	64.4
10. Yudai Lijiaoqiao	52.4	62.8	54.0	63.6

Figure 2.5.11 Results of Measurement of Vibration Levels (dB)



2.5.4 Resettlement

With the implementation of public facility development, such as road construction, a program for the demolition of old building and relocation of occupants has been launched. The policy adopted by the Chengdu Government is to compensate for the losses incurred by the occupants, housing estate owners, and proprietors of some enterprises in compliance with the regulations of the public document on housing estate management in Chengdu.

Residential Housing

To compensate for the loss of demolished old buildings, some standard apartments are provided, with the following conditions:

- Basic construction fee is RMB 320 /m²; and
- Price for commercial housing is RMB 1,400 /m².

Of course, there are some variations of this standard depending on the locations of the old buildings and the new houses.

Non-Residential Housing

Similarly, compensation is provided for the loss of demolished old buildings and some standard non-residential houses are provided, with the following conditions:

(Basic construction fee in RMB/m²)

Brick, tile and concrete structure	580	industrial ware of production spots, discount rate 15%
Semi-framework structure	640	
Full-framework structure	700	

(Price for commercial housing in RMB/m²)

	Area I	Area II	Area III, IV	Office building, discount rate 15%, industrial and warehouse, production spots, discount rate 20%
Brick, tile and concrete structure	3,080	2,430	1,820	
Semi-framework structure	3,220	2,565	1,950	
Full-framework structure	3,360	2,770	2,080	

Regional differences in costs are discussed in the “Circular on the Price for Renting Non-Residential Housing in Urban Areas.”

In addition, some rules are in accordance with the implementation program mentioned above.

- (1) There are regulations on price differences between old buildings and new apartments.
- (2) For relocation, every family can gain RMB 300.
- (3) Compensation for business suspension will be given to commercial estate proprietors.
- (4) Compensation for the Losses of House Renters

Basically, land is state-owned. Thus, there is no personally-owned land. For this reason, the main problem is the exchange of ownership of the housing estate and the change of contracts. In addition, though there are many labor workers going into the city, no illegal resident is found.

2.5.5 Disasters

There was an unprecedented heavy rain in the Chengdu urban center, Wenjiang county and Dayi County. During the rainy season from June to September, especially in July and August, heavy rains are always experienced. The heavy rains cause the waters to swell in the Minjiang River and Tuojiang River systems, which results in floods. Floods are concentrated in Yue Town of Jintang County, Xinjin County, Wuyang Town and the area along the Jinmahe River. Landslips and landslides mostly happen in the Longquanyi District, Pengzhou City, Dayi County and the hilly lands of Pi County.

Among the most disastrous floods, which hit Chengdu City, were those in 1985 and the storm and floods in Pengzhou City on August 15th, 1997.

On July 4th-6th, 1998, torrential rains poured in Chengdu, Shuangliu County, Wenjiang County and Xinjin County. The heaviest rainfall in Shuangliu county reached 360mm. Medium-sized rivers and small rivers overflowed and plants were damaged. In 1998, the heaviest rainfall in Dayi County exceeded 330mm. The Xiejiang River, the biggest one, together with many other rivers surpassed the highest water levels of the last 10 years. There were many landslips and landslide incidents that happened. There were also cases of land sinking.

In order to prevent the floods of Minjiang River and Tuojiang River systems and the drought caused by the inland terrain, the Water Prevention Headquarters was established in 1952 to reduce the occurrence of disasters.

Chengdu belongs to the earthquake-prone seismic area, where the intensity is over the Chinese magnitude 7. The Sichuan Basin is caused by the subsidence of the earth's crust. On its west, the fault zone of Mount Longmen swells up; on its east, faults of Mount Longquan converge. Because of the threat of earthquake disasters, the Chengdu Earthquake Prevention Bureau was established in 1979 to help improve the earthquake-resistance of houses.

Recently in 1998, an earthquake took place in Chengdu City, with a magnitude of over 4 on the Richter scale. The strongest earthquake intensity was sensed in Dayi County, with a scale of 3.6. Soon after the earthquake, the Bureau investigated the situation in the subject area and the damage on the city. On October 6th, 1998, the Government of Chengdu announced Resolution No.145 on the "Corresponding Measures for Destructive Earthquakes in Chengdu City" and formulated the corresponding strategies for earthquake preparedness.

2.5.6 Plant and Animal Resources

Sichuan Province is abundant in plant and animal resources. The ecological system is well preserved. Pines, firs and bamboo are the common trees, but there are some precious species, such as China fir and metasequoia. The living specimen ginkgo, is the symbol of Chengdu City.

As for animals, bulls, leopards, bears, golden monkeys, black bears, lesser pandas, green-tailed pheasants, and red-bellied pheasants are among the very precious species. The panda has become famous all over the world.

Chengdu of Tang Dynasty as described by the poet Du,Fu, "flowers redden the city in spring, trees green in winter," is a beautiful place of flowers and trees. Striving to surround the city with green plants, the City Government of Chengdu has promulgated two regulations, namely "Regulations on Urban Gardens and Green Project of City of Chengdu" and "Regulations on Precious Trees Preservation in the City of Chengdu."

The percentage of plant cover in Chengdu was 10.2% in the late 1970s. Due to the success in making the city green, this rate has reached 30.1% by the end of 1999. In addition, Chengdu, as an ancient city of history and culture, is striving to make the FuNanhe River green by linking the Baihuatan Park, Wangjianglou Park, Dufu Caotang, Wuhouci Temple together as a greenbelt along the river bank, presenting a scenic spot of “Green Chengdu.”

The efforts in making the city green include the selection of the road-planted trees and the main street-planted trees. The main species planted are ginkgo, nanmu, beech, yulan magnolia, willow, Chinese horse chestnut, fir, etc.

2.5.7 Historical and Cultural Sites

Chengdu City was first built during the Zhou Dynasty, about 2,500 years ago. Construction of the city was started by King Kaiming IX of ancient Sichuan Province. During the Han Dynasty, it was known as the center of politics and culture. Particularly during the time of the Three Kingdoms, Chengdu became known as the capital of the Shu and Han Kingdoms, under the rule of Liubei.

Therefore, six zones in Chengdu’s urban center have taken the lead, together with many districts, countries and towns rich with history and culture, in promoting the area’s historical and cultural legacy. Many historical remains have not been excavated yet.