4.3 Master Plan Orientation on Future Urban Development

1) HCMC Urban Development Master Plan

HCMC's M/P 2020 is a legal document which was approved by the Prime Minister in 1998. M/P 2020 was established by revising HCMC's Master Plan 2010, approved by the Prime Minister in 1993. The reason for the revision was the rapid socio-economic changes in HCMC and its surrounding areas after 1993. In particular, population and foreign investment in the region's industrial activities increased more than expected.

M/P 2020 covers a wide area of 30-50km radius from the city center including some parts of its surrounding provinces (see Figure 4.3.1). It emphasized the urban and industrial development in the south, such as Nha Be and Hiep Phuoc districts, and the southeast including Can Gio and Thu Duc districts. M/P 2020 has the following characteristics:

(1) The city will be changed to a polycentric urban structure from the present monocentric structure.

(2) The population of the existing urbanized area will be reduced to 3 million from the present population of 3.6 million.

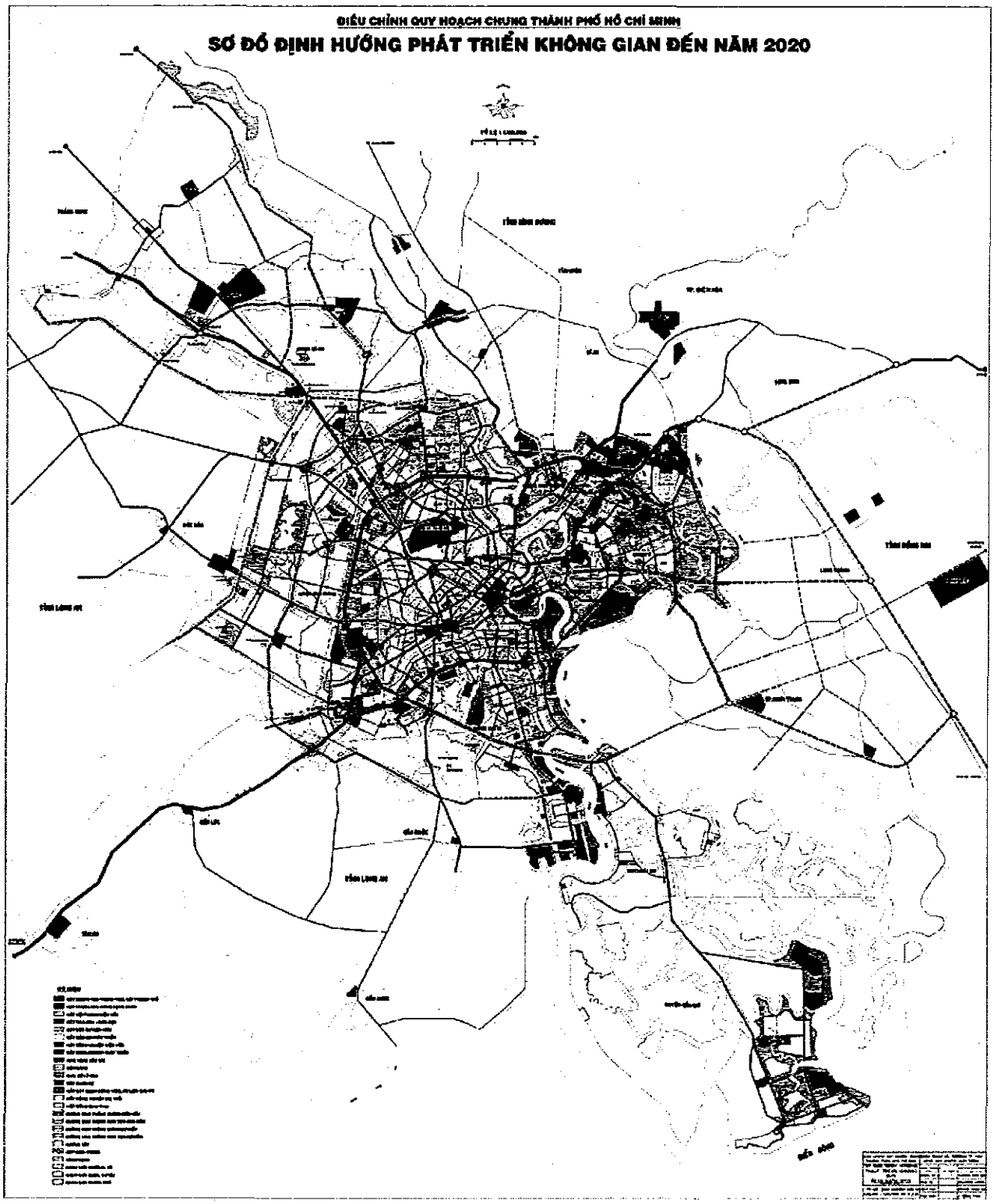
(3) Housing and industrial developments in suburban areas will be accelerated to absorb the future increase in population and labor force.

In 2003, the Prime Minister ordered HCMC to make adjustments to M/P 2020. One of the reasons for the adjustment was due to the fact that urban development activities were occurring mainly in the northeast and northwest of the city, which differs from the forecast made in M/P 2020 (see Figure 4.3.2). The main reasons for the discrepancy between the master plan and the current urban situation are as follows:

- Effective laws and regulations and their enforcement mechanism to control and guide urban development had not yet been established.
- The current urban development situation had been considerably affected by land conditions, indicating that urban development was market-driven. This scenario, however, was not consistent with the future land use and development projects as indicated in the city's master plan.
- The future land use and development projects illustrated in the master plan did not thoroughly consider land conditions which are the factors in determining urban development.

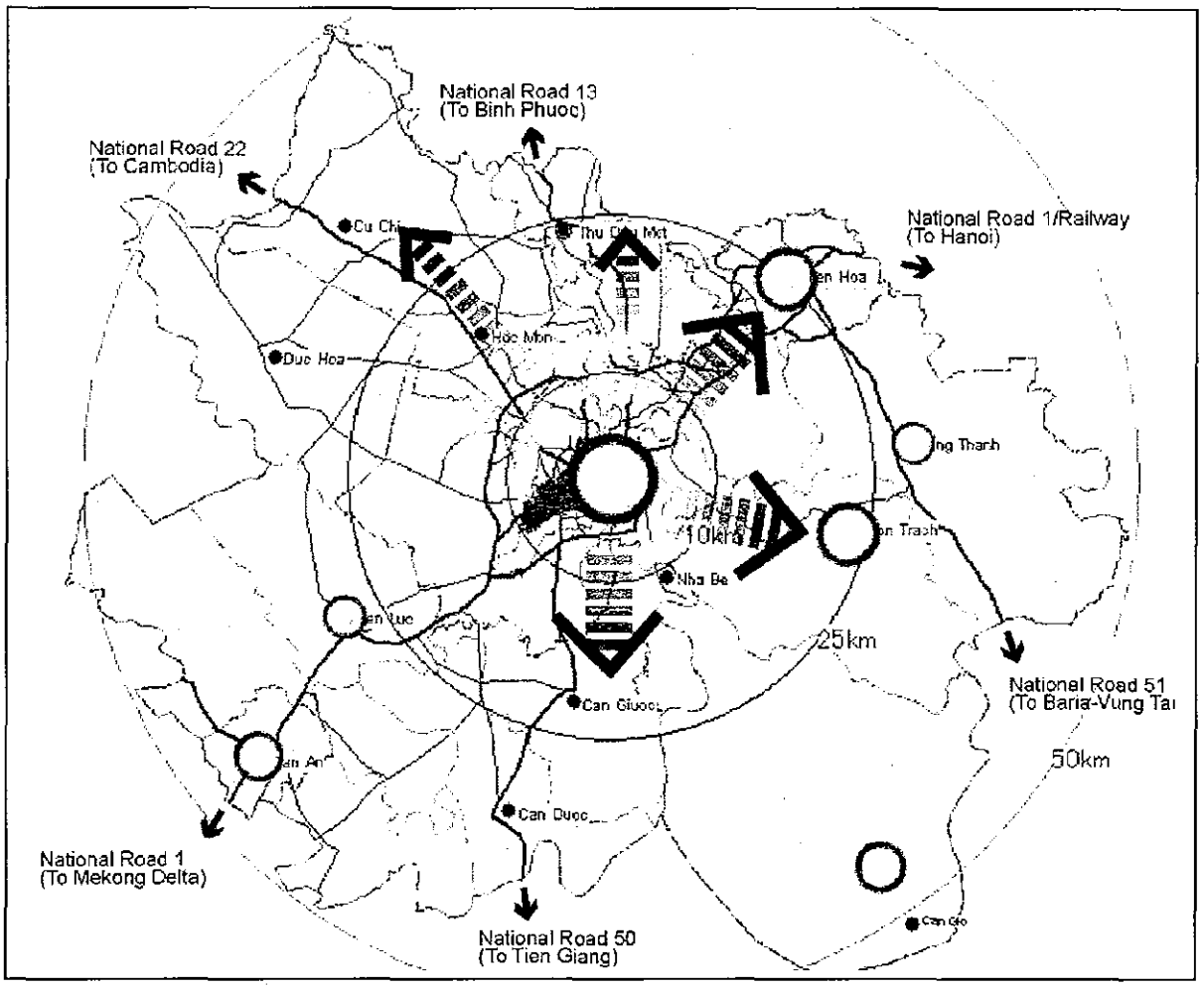
In addition, urban activities were expanding beyond city boundaries, so that the city needed to carefully take into account its neighboring provinces in the formulation of a new master plan. The city authority is planning to adjust M/P 2020 within 2004 so that it can be approved by the Prime Minister in 2005.

Figure 4.3.1 HCMC's Urban Development Master Plan up to 2020



Source: Urban Planning Institute of HCMC

Figure 4.3.2 HCMC's Master Plan Indications for Urban Development



Source: UPI

2) Urban Development Master Plan for Adjacent Provinces

Bing Duong Province: Figure 4.3.3 indicates the future development direction of the southern area of Binh Duong province up to 2020, as approved by the Provincial PC in 1996. According to this map, industrial areas are designated, along Provincial Road No.743 and the northern boundary of Thu Dau Mot Town where many industrial parks and large-scale manufacturing facilities have already developed up to the present. Areas along NH13 are designated as urban areas for residential, business, and commercial purposes. Three administrative units in the study area are expected to be the center of industrialization and urbanization in Binh Duong province.

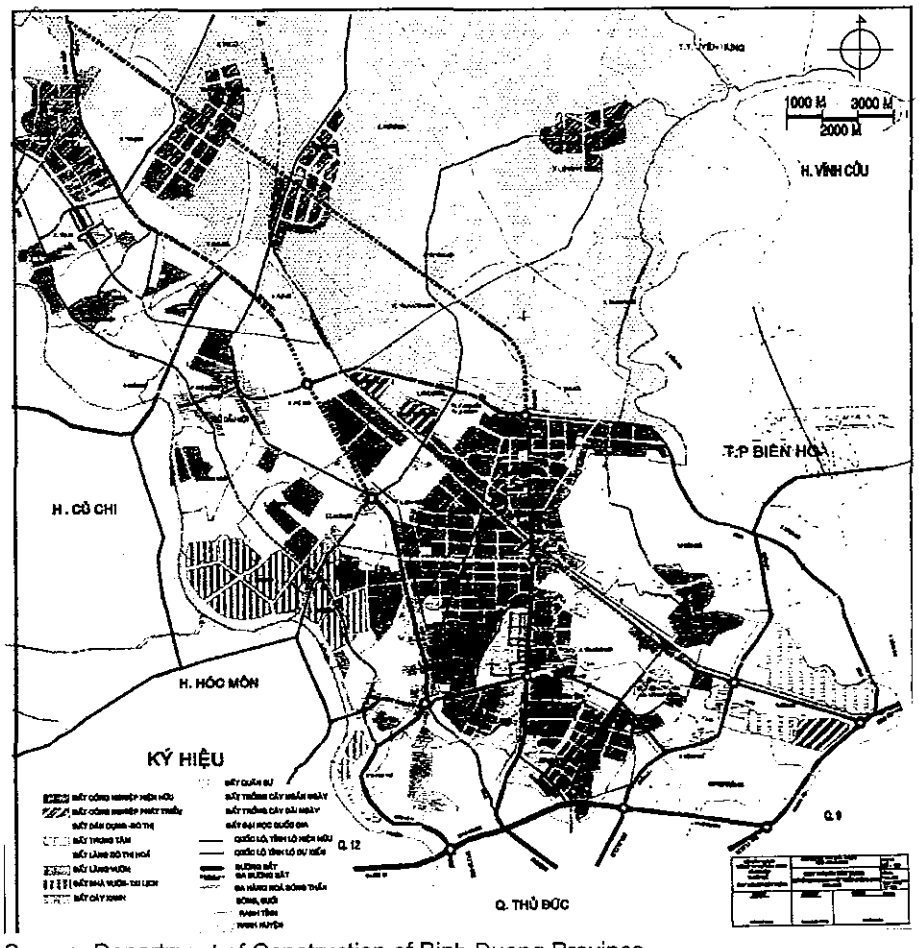
Currently, the provincial authority is emphasizing urban development in the central area of the province, around the northern area of Thu Dau Mot Town and the southern area of Tan Uyen and Ben Cat districts. In September 2003, the provincial authority announced a large-scale urban development project to be located in the northeastern part of Thu Dau Mot Town, where industrial, residential, and recreational areas are planned on a 4,300ha land. The provincial authority is now formulating a new urban development master plan, which will include these new urban development policies and projects.

Dong Nai Province: Currently, there is no officially approved urban development master

plan in Dong Nai province. According to the province's Department of Construction, three administrative units in the study area are expected to be the centers of urbanization and industrialization. Of the three, Bien Hoa City has already been developed as the eastern regional center of the HCM metropolitan area. In Long Thanh and Nhon Trach districts, several official industrial parks are planned, together with residential and commercial areas. In particular, Nhon Trach is expected to be a new industrial and urban center in southern Vietnam, where large-scale industrial areas on the scale of 3,500ha, with residential and school facilities, are planned. The formulated urban development master plan is to be approved by the Prime Minister by the end of 2004.

Long An Province: The provincial authority is currently formulating its urban development master plan. According to the draft master plan, several urban centers and industrial areas will be developed along NH1 and provincial roads and waterways that connect directly to HCMC. Tan An Town will be the provincial center, with relatively large-scale commercial and residential areas. Eight administrative units in the study area, which include these urban centers and industrial areas, are planned. Particularly, large-scale industrial areas are planned along Nha Be River in Can Giuoc District, along Van Co River in Be Luc District and around the boundary with HCMC in Duc Hoa District.

Figure 4.3.3 Urban Development Master Plan of Southern Binh Duong Province up to 2020



Source: Department of Construction of Binh Duong Province

4.4 Assessment of Development Conditions of Existing Urban Areas

1) Factors Affecting Urban Development Activities

There are considerable differences in land conditions between rapidly urbanizing areas and modestly or slowly urbanizing areas. In rapidly urbanizing areas, for example, natural conditions such as geological features and frequency of flood are relatively good. Large areas are not flood-prone and have firm soil suitable for foundation works for urban development. In addition, accessibility to the inner-city area is good, with well-developed urban infrastructure (i.e. water supply, drainage and roads) and land prices not so high. On the other hand, most modestly or slowly urbanizing areas are consistently flood-prone due to loose soil that is not suitable for urban development. In summary, the following are factors that affect urban development activities, among which natural conditions are considered to be the most influential:

Natural conditions:

a. Soil condition
b. Flood-prone area / Topography

Other conditions:

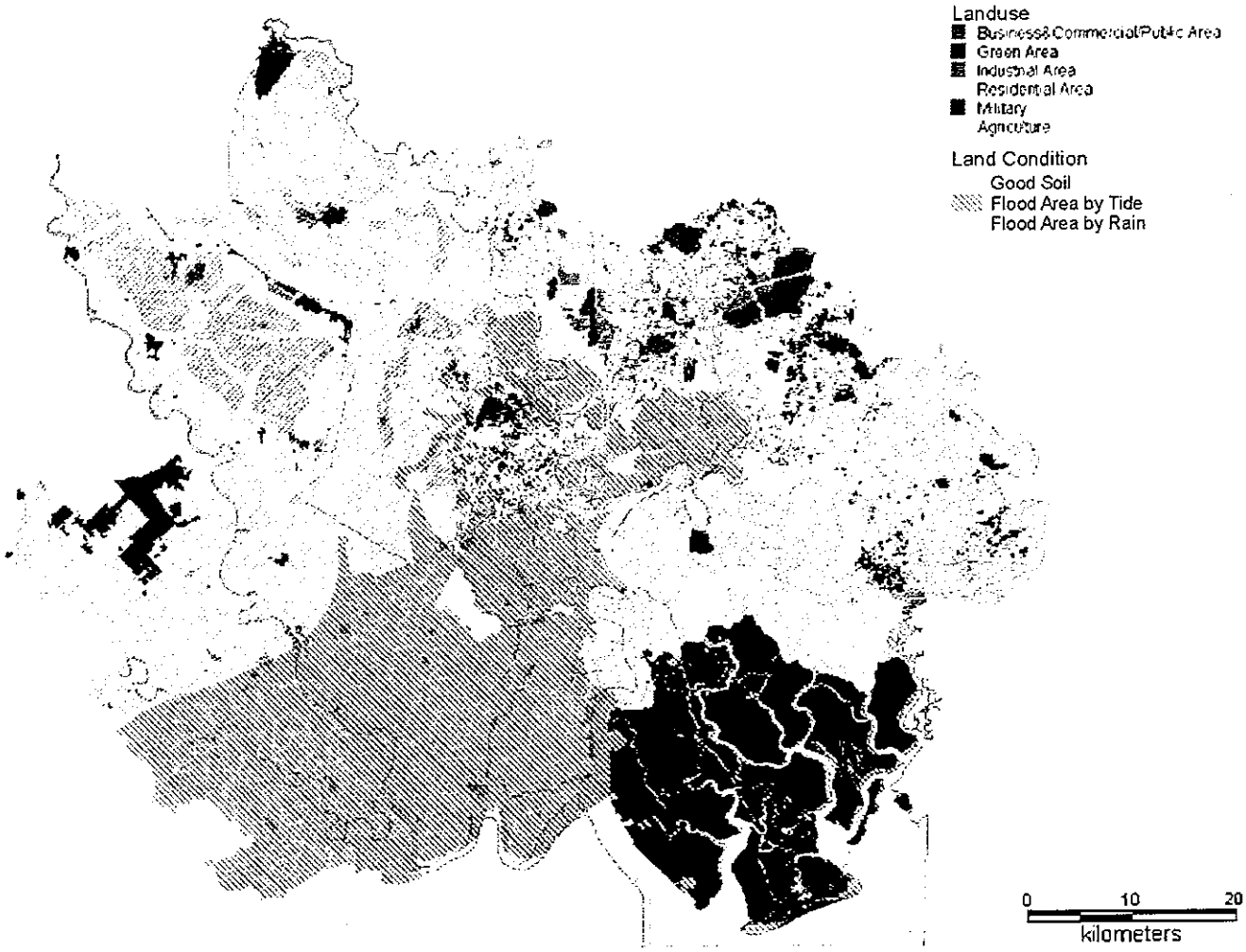
c. Accessibility to urban centers
d. Urban service provision (water supply, drainage, roads, etc.)
e. Land price

2) Assessment of Existing Urban Areas

Existing urban areas were assessed based on available indicators, such as natural conditions including soil condition and flood susceptibility, and coverage of urban services including water supply and drainage as well as road density (see Table 4.4.1). In general, land conditions of rapidly urbanizing areas are relatively good, while those of slowly urbanizing areas particularly in the south and southeast directions are not as good as the former (see Figures 4.4.1 and 4.4.2).

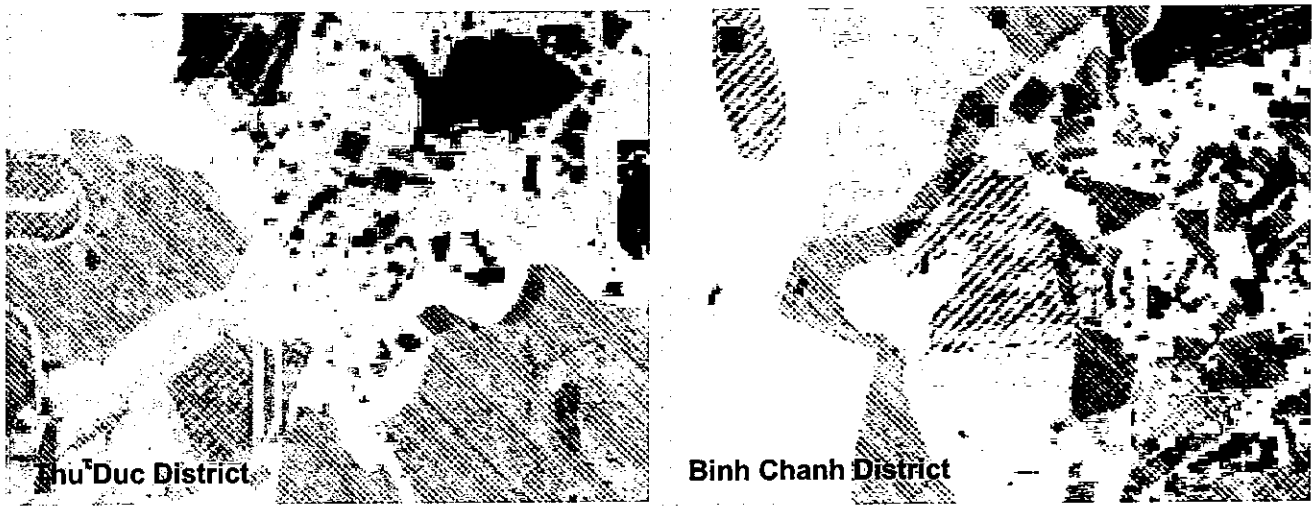
In collaboration with the Task Force members from HCMC's APD and UPI, the urban areas were further assessed to work out general development directions (Table 4.4.2).

Figure 4.4.1 Land Conditions



Source: UPI, Study Team

Figure 4.4.2 Comparison of Land Conditions and Current Land Uses



Source: UPI, Study Team

Table 4.4.1 Evaluation of Land Conditions

		Natural Condition		Flood- free Areas[3] (ha)	Areas with Good Soil (ha)	Urban Service Coverage		
		Flood-prone Areas[1] (%)	Good Soil [2] (%)			Water Supply (%)	Drainage Coverage (%)	Road Density (km/km^2)
Inner Core	District 1	5.8	71.8	677	555	99.4	88.3	5.69
	District 3	14.8	82.5	411	406	97.8	97.5	5.23
	District 4	10.5	0.0	301	0	70.1	86.1	3.02
	District 5	36.1	76.9	262	328	83.5	93.0	6.67
	District 6	57.2	34.4	258	247	88.1	79.8	2.85
	District 10	13.8	102.7	490	587	102.6	97.9	3.45
	District 11	24.7	101.9	379	524	101.8	90.6	3.27
	Phu Nhuan	9.0	84.6	440	413	90.9	63.5	2.45
	Subtotal	**22.2**	**69.5**	**3,219**	**3,061**	**92.8**	**86.9**	**4.08**
Inner Fringe	District 8	43.3	0.0	860	0	28.4	20.9	1.65
	Binh Thanh	45.2	39.0	800	810	68.2	22.1	1.81
	Tan Binh	29.0	86.0	2,714	3,307	34.5	28.9	1.30
	Go Vap	51.4	87.3	913	1,723	26.4	27.6	1.96
	Subtotal	**39.7**	**59.5**	**5,287**	**5,839**	**38.8**	**25.6**	**1.61**
Emerging Peripheral	Thu Duc	31.1	29.3	3,038	1,401	19.3	1.0	0.69
	District 12	52.4	37.5	2,258	1,977	0.0	0.0	0.71
	Binh Chanh	83.7	10.6	4,243	3,221	0.3	0.4	0.43
	District 2	52.5	0.0	1,100	0	20.2	0.4	0.79
	District 7	43.3	0.0	667	0	27.6	15.9	0.60
	District 9	60.0	19.7	2,269	2,246	5.0	0.6	0.23
	Subtotal	**67.4**	**14.6**	**13,574**	**8,846**	**5.9**	**1.4**	**0.48**
Suburban	Hoc Mon	78.1	38.4	2,103	4,189	0.0	0.0	0.45
	Nha Be	74.7	0.0	322	0	0.6	0.0	0.25
	Subtotal	**76.5**	**20.0**	**2,425**	**4,189**	**0.3**	**0.0**	**0.35**
Rural	Cu Chi	42.8	53.0	23,487	23,012	0.0	0.0	0.23
	Can Gio	70.6	0	0	0	0.0	0.0	0.05
	Subtotal	**60.0**	**20.2**	**16,633**	**23,012**	**0.0**	**0.0**	**0.12**
HCMC Total		**62.0**	**21.5**	**41,139**	**44,947**	**5.5**	**3.4**	**0.40**
Satellite Urban	Thu Dau Mot	(75.0)	77.2	1,784	6,781	17.2	11.7	0.14
	Bien Hoa	(75.0)	63.4	2,744	9,803	38.9	14.7	0.32
	Tan An	100.0	0.0	1,625	0	6.3	0.0	0.21
	Subtotal	**75.0**	**51.7**	**6,153**	**16,584**	**25.0**	**10.3**	**0.24**
Suburban	Thuan An	(75.0)	65.4	1,826	5,508	0.0	0.0	0.34
	Di An	(75.0)	90.8	1,382	5,474	3.0	21.6	0.52
	Subtotal	**75.0**	**76.0**	**3,207**	**10,982**	**1.2**	**9.0**	**0.42**
Rural	Long Thanh	(75.0)	80.1	12,224	43,116	0.0	0.0	0.09
	Nhon Trach	(75.0)	30.2	4,189	12,367	2.1	0.0	0.02
	Can Giuoc	100.0	0.0	2,341	0	0.0	0.0	0.18
	Can Duoc	100.0	0.0	2,676	0	0.0	0.0	0.27
	Chau Thanh	100.0	0.0	3,057	0	0.0	0.0	0.06
	Thu Thua	100.0	0.2	6,612	61	0.0	0.0	0.03
	Ben Luc	100.0	0.0	4,653	0	0.0	0.0	0.27
	Duc Hoa	100.0	43.4	9,819	17,878	0.0	0.0	0.09
	Tan Tru	100.0	0.0	2,031	0	0.0	0.0	0.18
	Subtotal	**(90.6)**	**29.1**	**47,601**	**73,423**	**0.3**	**0.0**	**0.11**
Surrounding Provinces Total		**75.0**	**33.8**	**56,961**	**100,989**	**3.0**	**1.5**	**0.14**
Study area Total		**69.7**	**28.7**	**98,100**	**145,936**	**4.1**	**2.3**	**0.25**

Source: The Study on Urban Drainage and Sewerage System for Vietnam (JICA), Long An, SEFZ Master Plan, Geological Survey of Vietnam

[1] Frequent flood ranging from 20 to 60cm (35cm on average) with an average duration of 6.5 hours, and the biggest flood corresponding to 10 years flood range from 20 to 100cm (40cm on average) with an average duration of 7.7 hours.

[2] Good Soil: Ancient alluvium of solid stratum.

[3] Flood-free Area: (Total Area) – (River & Canal) – (Flood-prone Area).

[4] Figures in parentheses are assumed values.

Table 4.4.2 Assessment of Existing Urban Areas

	Description	Evaluation				
		Natural condition	Institutional condition	Transportation condition	Overall Assessment[1)]	
District 1	• Already developed as an administrative and business-commercial center of HCMC with relatively high-population density. • Urban services are well developed, but most prime urban areas are already occupied.	Most of the area is not flood-prone and has good soil.		Road density is high. There is Ben Thanh bus terminal.	A	Area for redevelopment (prime development lands are occupied).
District 3	• Already developed as an administrative, business-commercial and residential area with high population density. • Urban services are well developed, but most prime urban areas are already occupied.	Most of the area is not flood-prone and has good soil.	Areas for railway facilities (station and repair yard) will be moved outside.	Road density is high. There is the Saigon railway station.	A	Area for redevelopment (prime development lands are occupied).
District 4	• Already developed as an industrial, business-commercial, and residential area with high population density. • Urban services are not well developed, but most prime urban areas are already occupied.	Low-lying area, but land conditions are relatively good for development.	Relocation of ports will produce new development areas and improve urban functions and landscape.	Relatively high road density; but service roads are not well developed in some areas.	C	Area for redevelopment (prime development lands are occupied).
District 5	• Already developed as HCMC's commercial (retail and wholesale) center with high population density. • Urban services are well developed, but most prime urban areas are already occupied.	Most of the area is not flood-prone and has good soil.	Social infrastructure (schools and hospitals) is well developed.	Road density is high. There is Cho Lon bus terminal.	A	Area for redevelopment (prime development lands are occupied).
District 6	• Greater parts are developed as relatively high-density residential and commercial areas, and there are many small-scale manufacturing facilities. Some agricultural areas remain. • Steadily growing in spite of poor land condition of non-built-up areas due to good accessibility to the city center.	Most lands are low-lying and become flooded due to rainfall.	Large areas are occupied by illegal settlers.	Relatively high road density, but service roads are not well developed in illegal settlements.	B	Due to good accessibility to city center, development will continue.
District 10	• Already developed as a high-density residential and commercial area with many administrative bodies. • Urban services are well developed, but most prime urban areas are already occupied.	Most of the area is not flood-prone and has good soil.	Large military areas are now being converted into residential areas.	Road density is high.	A	Area for redevelopment (prime development lands are occupied).

(Continuation of Table4.4.2)

	Description	Evaluation				
		Natural Condition	Institutional Condition	Transportation Condition	Overall Assessment[1)]	
District 11	• Already developed as a high-density residential and commercial area with cultural facilities. Many small and medium manufacturing facilities are located here, which cause environmental pollution. • Urban services in some areas are not well developed, but most prime urban areas are already occupied.	Most of the area is not flood-prone and has good soil.		Road density is high.	A	Area for redevelopment (prime development lands are occupied).
Phu Nhuan	• Already developed as a high-density residential and commercial area with some industrial and public facilities. • Urban services are well developed, but most prime urban areas are already occupied.	Most of the area is not flood-prone and has good soil.	Military area exists.	Relatively high road density, but roads in some areas are not paved.	A	Area for redevelopment (prime development lands are occupied).
District 8	• Major parts are developed as a middle-density residential area with many industrial and warehouse facilities alongside canals. Large agricultural areas remain, which are potential places for settlers from outside the city. • Urban services are not well developed, but due to the close location to the city center, development and redevelopment activities will steadily continue.	Some parts are low-lying become flooded due to rising tide.		Road density is low and provided mainly in the southern area. There is Can Giuoc bus terminal.	C	Due to good accessibility to city center, development and redevelopment will continue.
Binh Thanh	• Previous bare lands have been developed as middle-density residential areas. In some areas (28 ward), there remains a relatively large agricultural land. Slowly developing, because majority of non-built-up areas are low-lying and become flooded due to rising river levels.	Eastern part is low-lying and become flooded due to rising tide.	Area along Saigon River can be developed as a tourist spots.	There is Mien Dong bus terminal.	B	Most parts of non-built-up areas are low-lying and become flooded.
Tan Binh	• A big chunk of land in the east is developed as a middle-density residential area with many large-scale commercial and industrial facilities. Large agricultural areas are now being converted into urbanized areas illegally. • Although urban service coverage is small, due to the good land condition and close location to the city center, population is rapidly increasing. Settlers from outside the city have settled here.	Soil condition is good. Only a relatively small area becomes flooded due to rainfall.	Large areas are occupied by the airport and military camp.	Access route to NH22 is always congested. Road density is low in the west.	A	Will continue growing. The airport and military areas could be utilized for development.

(Continuation of Table4.4.2)

	Description	Evaluation				
		Natural Condition	Institutional Condition	Transportation Condition	Overall Assessment[1)]	
Go Vap	• Big land areas in south are developed as middle-density residential areas. Some agricultural areas remain. Small manufacturing facilities are causing environmental pollution. • In spite of the existence of large flood-prone areas and small urban service coverage, population is rapidly increasing due to its relative proximity to the city center and relatively inexpensive land prices. Settlers from outside the city have settled here.	Many parts along the river become flooded due to rainfall and rising tide.	Large military camp exists, but some parts are utilized as residential areas.	Main routes to the city center are always congested. Roads in residential areas are narrow.	B	Some areas could be developed by exploiting the good accessibility to the city center.
Thu Duc	• Elevated land in the northeast has developed as a middle-density residential area with many industrial facilities. Agricultural land in the west is affected by flood from rising tide. • Steady growth mainly in the northeast. This trend will continue, but developing flood-control measures can promote growth of western part.	Western part is low-lying become flooded due to rising tide, while land conditions in the northeast are good for development.		There are well-developed arterial roads including national roads, but lower-level roads are not well developed. There is the Binh Trieu railway station.	C	Land conditions of the northern highland area is good for industrial development.
District 12	• Along arterial roads, including the national roads, low-density residential areas are developed. • One of the fastest-growing areas in the city because of the good access to the national roads and good land conditions in the west. • Development will continue in the west, but the east needs flood-control measures to promote development.	East part is low-lying and become flooded due to rising tide, while land conditions in the west are good for development.	Area along NH22 is occupied by illegal settlers.	There are well-developed arterial roads including NH22 and NH1A, but lower-level roads are not well developed.	C	Overall, land conditions are good for development.
Binh Chanh	• The fastest-growing district in HCMC, but greater part of the west are agricultural areas. • Along NH1A, residential and industrial facilities are being developed, due to good transportation and land conditions for development. • Development will continue in the east, but the west needs flood-control measures to promote development.	Western part is low-lying and become flooded due to rainfall, while land conditions in the east are good for development.		In the west, north-south arterial roads are necessary for development. There is Mien Tay bus terminal.	D	Eastern part has advantageous conditions for development, compared to the western part.

(Continuation of Table4.4.2)

	Description	Evaluation				
		Natural Condition	Institutional Condition	Transportation Condition	Overall Assessment[1)]	
District 2	• Along the national road, several residential and industrial facilities are developed with low population density. • In order to promote development as a new urban center, urban services, including transportation and flood-control measures have to be developed.	Greater part of the district is low-lying and become flooded due to rising tide.		Several access roads and railways to the city center are planned, including E-W highway.	D	Most parts are low-lying and flood-prone.
District 7	• In the north and along the arterial roads, low-density residential areas are developed. In Tan Tuan large-scale IPs (EPZs) are being developed, which are integrated with port facilities. • Development will continue in and around the steadily growing planned area (Saigon South New City). But due to poor land condition, area will not accommodate high-density population.	Greater part of the district is low-lying and southern part is become flooded due to rising tide.		Access roads and bridges to the city center are now being developed. Many port facilities exist.	C	Most parts are low-lying and flood-prone.
District 9	• Along and near the national road, several low-density residential and industrial facilities are developed, but greater part is agricultural area affected by flood. • Development will continue in the steadily growing northern highland area. But rest of the district requires flood-control measures to promote development.	Except for the elevated land along the national road, greater part is low-lying and become flooded due to rising tide.		Currently, there is no arterial road in the district, except for the national road in the northern border (several arterial roads and railway are planned).	C	Land conditions of the northern highland area are good, but the rest of the district are low-lying flood-prone areas.
Hoc Mon	• Greater part is agricultural area. Along the arterial roads, several low-density residential and industrial facilities are developed. • Currently steadily growing, and in areas along the arterial roads with good land conditions, development will continue due to good accessibility to the national roads.	Northern part is low-lying, and large areas along the rivers become flooded due to rainfall and rising tide.		NH22 and several provincial roads run through the district. There is An Suong bus terminal.	C	Overall, land conditions are good for development.
Nha Be	• Greater part is agricultural area. Along the provincial road, low-density residential and several industrial facilities are developed. • Currently steadily growing, but due to poor land conditions, development will progress at a slow pace.	Greater part is low-lying and become flooded due to rising tide.		Currently, there are almost no arterial roads in the south.	D	Most parts are low-lying flood-prone areas.

(Continuation of Table4.4.2)

	Description	Evaluation				
		Natural Condition	Institutional Condition	Transportation Condition	Overall Assessment[1)]	
Cu Chi	• Greater part is agricultural area. Along the arterial roads, mainly NH22, several low-density residential and industrial facilities are developed. • Currently slowly growing. In spite of the long distance to the city center, development will progress steadily due to the relatively good land conditions.	Areas bordering Hoc Mon and Long An are low-lying and become flooded due to rainfall, but land conditions of large areas are good for development.	Large military camp exists.	NH22 connecting the Cambodian border and several provincial roads run through the district.	C	Land conditions are relatively good for development.
Can Gio	• Greater part is agricultural and reserved forest area. Only small low-density residential areas are developed along the seashore. • Slowly but steadily growing. Slow pace of development will continue due to the distance to the city center and poor land conditions.	Almost all areas are low-lying and become flooded due to rainfall and rising tide.	Large part is designated as a forest reserve.	Connection to other district is poor.	D	Most parts are either low-lying flood-prone areas or conservation areas.
Thu Dau Mot	• As provincial capital, the area has been steadily growing as an administrative, commercial and industrial center. • Due to good land conditions and accessibility to other regional centers, development of industrial and residential areas will continue.	Except area along Saigon River, land conditions are good.		Via NH13, accessibility to HCMC is good.	C	Land conditions are relatively good for development.
Bien Hoa	• The city has already been developed as a regional center in the eastern HCM metropolitan area, where administrative, business-commercial, and industrial areas have been established with good urban services. • Due to important transportation location and relatively good land conditions, development of industrial and regional level business-commercial areas will continue.	Except area along Dong Nai River, land conditions are good.	The airport for military use is located here.	NHA1 and NH51 connect to Ba Ria-Vung Tau and HCMC.	B	Land conditions are good for development.

(Continuation of Table4.4.2)

	Description	Evaluation				
		Natural Condition	Institutional Condition	Transportation Condition	Overall Assessment[1)]	
Tan An	• As provincial capital, the area has been steadily growing as an administrative and commercial center with relatively good urban services. Several industrial facilities mainly for food processing have been developed. • But due to poor land conditions, development of planned industrial and residential areas will be slow.	Large parts are flood-prone.		NHA1 connects to HCMC.	D	Land conditions are poor for development.
Thuan An	• Due to good land conditions and accessibility to HCMC and other regional centers, industrial areas with residential facilities have rapidly developed. • Because of advantageous development conditions, development will continue steadily.	Most of the area is not flood-prone and has good soil.		With NH13, accessibility to HCMC is good.	B	Land conditions are good for development.
Di An	• Due to good land conditions and accessibility to HCMC and other regional centers, industrial areas with residential facilities have rapidly developed. • Because of advantageous development conditions, development will continue steadily.	Most of the area is not flood-prone and has good soil.		With NH 1A, accessibility to HCMC and Bien Hoa is good.	B	Land conditions are good for development.
Long Thanh	• Due to the relatively good land conditions and accessibility to Bien Hoa and Ba Ria-Vung Tau, industrial areas along the national road have steadily developed. • Industrial development along the arterial roads will continue, but not rapidly.	Except area along Dong Nai River, land conditions are good.		NH51 connects to Ba Ria-Vung Tau and Bien Hoa.	C	Land conditions are relatively good for development.
Nhon Trach	• Due to the relatively good land conditions and accessibility to Bien Hoa and Ba Ria-Vung Tau, industrial areas along the national road have steadily developed. • Industrial development near the arterial roads will continue, but not rapidly.	Except area along Dong Nai River, land conditions are good.		NH51 connects to Ba Ria-Vung Tau and Bien Hoa.	C	Land conditions are relatively good for development.

(Continuation of Table4.4.2)

	Description	Evaluation				
		Natural Condition	Institutional Condition	Transportation Condition	Overall Assessment[1)]	
Can Giuoc	• Due to poor land conditions and accessibility to regional and commercial centers, development is slow. • Slowly and steadily growing, the slow pace of development will continue.	Most parts are low-lying and become flooded due to rising tide.		Accessibility to regional and commercial centers is poor.	D	Land conditions are not suitable for development.
Can Duoc	• Due to poor land conditions and accessibility to regional and commercial centers, development is slow. • Slowly and steadily growing, the slow pace of development will continue.	Most parts are low-lying and become flooded due to rising tide.		Accessibility to regional and commercial centers is poor.	D	Land conditions are not suitable for development.
Chau Thanh	• Due to poor land conditions and accessibility to regional and commercial centers, development is slow. • Slowly and steadily growing, the slow pace of development will continue.	Most parts are low-lying and become flooded due to rising tide.		Accessibility to regional and commercial centers is poor.	D	Land conditions are not suitable for development.
Thu Thua	• Development is moderate. Land conditions and accessibility to regional and commercial centers are relatively poor. • Steady growth will continue.	Most parts are low-lying and become flooded due to rising tide.		Transport accessibility to economic centers is poor.	D	Land conditions are relatively not suitable for development.
Ben Luc	• In spite of relatively poor land conditions, development is moderate, because of good accessibility to HCMC via the national road. Certain industrial facilities have already been established along the arterial roads. • Industrial development along the national road will continue.	Most parts are low-lying and flood-prone.		NHA1 connects to HCMC.	D	
Duc Hoa	• Due to relatively good land conditions, certain industrial and residential facilities have steadily been developed along the provincial roads. • Development of industrial parks (Duc Hoa I, II and III) will continue steadily.	Flood-prone but soil condition is good.		Provincial Road No.9 and 223 connect to HCMC.	C	
Tan Tru	• Due to poor land conditions and accessibility to the regional and commercial centers, development is slow. • Slowly and steadily growing, the slow pace of development will continue.	Most parts are low-lying and flood-prone.			D	

Source: Study Team

[1)] The assessed value (A, B, C. and D) was estimated based on natural conditions including susceptibility to floodings, soil condition and coverage of urban services including water supply, drainage, road density (see Appendix 4-A)

4.5 Future Socio-economic Framework

The future socio-economic framework of the study area for 2020 is set as follows:

(1) Population / Average Household Number: With consideration of the past natural and social growth, current and estimated future age structure, the total population of HCMC for 2020 was estimated to be 10 million, including temporary residents who stay in the country for more than six months. Since it was difficult to project the future number of temporary residents staying less than six months, they were excluded from the estimate.

The future population of adjacent provinces was forecast to be 3.5 million based on the official forecasts of concerned districts. This figure also excludes short-term temporary residents.

It was estimated that the average number of household members would decrease from 4.1 and 3.8 to 3.6 for HCMC and adjoining provinces.

(2) Number of Students: Based on existing statistical data for the primary/secondary school and university/college enrolments, the future number was forecast by considering the fact that the population pyramid would change in the future wherein the number of children would decrease and enrolments in higher education would increase.

(3) Number of Workers / Employment: With reference from neighboring ASEAN countries, it was assumed that the future labor force and employment rates would be 60% and 90%, respectively. For industrial sector composition, the future GDP composition officially announced in HCMC's Socio-economic M/P was used. In adjoining provinces, it was assumed that the primary and secondary sectors will remain relatively high.

Table 4.5.1 Future Socio-economic Framework for 2020

Indicators	2002			2020			Growth Rate(%/year)		
	HCMC	Province	Study Area Total	HCMC	Province	Study Area Total	HCMC	Province	Study Area Total
Area (km^2)	2,093	3,097	5,191	2,093	3,09	5,191	-	-	-
No. of Households (000)	1,335	593	1,928	2,778	972	3,750	4.2	2.8	3.8
Population (000)	5,409	2,244	7,653	10,000	3,500	13,500	3.5	2.5	3.2
Average HH member	4.1	3.8	4.0	3.6	3.6	3.6	-	-	-
No. of Students (000)[1]	1,187	445	1,632	1,865	565	2,430	2.5	1.3	2.2
(% to Population)	(21.9)	(19.8)	(21.3)	(18.6)	(16.1)	(18.0)	-	-	-
Elementary (000)	438	212	650	564	230	794	1.4	0.5	1.1
Middle (JH) (000)	306	161	467	495	203	698	2.7	1.3	2.3
Secondary (SH) (000)	156	63	219	280	115	395	3.3	3.4	3.3
College/Univ. (000)	287	9	296	526	17	543	3.4	3.6	3.4
No. of Workers (000)	2,370	990	3,360	5,400	1,890	7,290	4.7	3.7	4.4
(% per Population)	(43.8)	(44.1)	(43.9)	(54.0)	(54.0)	(54.0)	-	-	-
Employment structure (%)	100.0	100.0	100.0	100.0	100.0	100.0	-	-	-
Primary	4.7	16.6	8.2	1.0	10.0	3.3	-	-	-
Secondary	32.6	36.0	33.6	32.0	40.0	34.1	-	-	-
Tertiary	62.7	47.4	58.2	67.0	50.0	62.6	-	-	-
Vehicle Ownership (% to Household)							-	-	-
Car	1.7	1.4	1.6	19.2	17.4	18.7	-	-	-
Motorcycle	92.6	88	91.2	76.4	77.7	76.7	-	-	-
- More than 1	58.8	41	53.4	58.0	59.2	58.3	-	-	-
- One	33.8	47	37.8	18.4	18.5	18.4	-	-	-
Bicycle Only	4.4	10	6.0	2.7	3.2	2.8	-	-	-
Non-motorized Vehicle	1.3	1	1.3	1.7	1.7	1.7	-	-	-

Source: HOUTRANS HIS
[1] Student structure is from 2001 statistics.

(4) Vehicle Ownership: Vehicle ownership was estimated by comparing future per capita GDP level of the study area and neighboring cities with their vehicle ownership characteristics. Results showed that a high level of motorcycle ownership in the future would be likely.

(5) Per Capita GDP: According to HCMC's Socio-economic M/P, the city's GDP is expected to grow 11% per annum in 2000-2005 and 13% in 2005-2010. Assuming an 11% annual growth rate in 2010-2020, the city's GDP per capita would reach about US$ 5,000.

4.6 Comparison of Urban Growth Scenarios

1) Alternative Growth Scenarios

Three scenarios were prepared, and these are:

(1) Trend Scenario: This is the case where the current urbanization and population increase trends will continue. Urbanization will progress along arterial roads and areas adjacent to existing urbanized areas. The population density of HCMC's inner-city districts will increase further (the population of 12 inner-city districts will increase from 3.6 to 5.7 million).

(2) Master Plan Scenario: This refers to the future land use and population frame indicated in the M/P. Aiming for a polycentric urban structure, the population will be dispersed into suburban areas and green belts will be formed in the fringe areas. The population density of HCMC's inner-city districts will be maintained (the population of 12 inner-city districts will not change).

(3) Third Scenario: Based on the socio-economic framework of Trend Scenario, an adjustment was made by considering the development of selected growth corridors. The population density of HCMC's inner-city districts will increase as per the Trend Scenario. The basic concept of the Third Scenario is given below.

The following three corridors are considered growth corridors which have high development potentials considering current urbanization trends and land conditions:

- Northwest Corridor (NH 22 to Hoc Mon and Cu Chi)
- West Corridor (PR10 from Binh Chanh to Duc Hoa)
- Northeast Corridor (Hanoi Highway between HCMC and Bien Hoa City including the districts of Thu Duc, 9, Thuan An, and Di An)

Furthermore, sizes and contents of urban development projects, including industrial parks, new towns, and education areas were amended by considering land conditions and their feasibilities.

2) Estimate of Socio-economic Indicators for Each Growth Scenario

Detailed methods of making socio-economic indicators are given below.

(1) Distribution of Night-time Population: The distribution of night-time population in Trend Scenario was amended by considering the following factors:

- Increase the population increase ratio for areas along selected growth corridors (referring to the population framework indicated in the M/P).
- Increase the population increase ratio for areas where accessibility to the inner-city districts and level of urban services will be improved by large-scale infrastructure and urban development projects now being implemented (districts 2, 7 and 9).

Furthermore, since night-time population densities of some areas in Trend Scenario were unrealistically high, the population was controlled by setting maximum densities when referring to current residential areas. The maximum densities to be set are given below.

(a) Inner-city districts to be less than 800 persons/ha.
(b) Inner-fringe districts to be less than 500 persons/ha.
(c) Emerging peripheral districts to be less than 250 persons/ha.

(2) Distribution of Workers and Students (Daytime Population)

(a) Distribution of Primary Sector Workers

The distribution of primary sector workers was changed in accordance with the conversion of agricultural areas. Except for HCMC's inner-city districts, the change, however, in the distribution of agricultural areas was not so big.

(b) Distribution of Secondary Sector Workers

The distribution of secondary sector workers was assumed based on changes in industrial areas accompanied by industrial park development projects. Industrial park development schemes were amended by considering land conditions and projects' feasibility. For estimating the number of workers, workers at small and medium-size factories were also included because figures were calculated based on the actual number of workers at present.

(c) Distribution of Tertiary Sector Workers

For assuming the distribution of tertiary sector workers, workers were divided into two categories: workers for community-level service industries and workers for regional-level service industries who serve a wider region including the city, provinces, and southern Vietnam. The number of workers in community-level service industries was in proportion to the night-time population, but workers in regional-level service industries belong to the collective business and commercial areas listed below. The sizes of these business and commercial areas are set by considering the feasibility of planning schemes illustrated in the M/P.

- Existing inner-city urban centers (districts 1, 3, 10 and 5, 6)
- Thu Thiem new urban center (District 2)
- New business center of universities and R & D area (District 9)
- Saigon South urban center (District 7)
- Business center of Quan Trung software park (District 12)
- New urban complex (Cu Chi and Hoc Mon)
- Business center of Tan Tao high-tech park (Binh Chanh)
- Provincial capitals (Tu Dau Mot Town, Bien Hoa City, Tan An Town)

(d) Distribution of Students

The distribution of elementary and junior high school students was proportionate to the night-time population, but the distribution of students in higher-level education was associated with the locations of these institutions. In the districts of 2 and 9, Thu Duc and Di An, the national government has been developing a large-scale university area, so that the distribution of students of higher-level education is expected to change.

3) Characteristics of Three Growth Scenarios

The three urban growth scenarios stated above are summarized in Table 4.6.1. The scenarios are examined from the urban planning and development perspectives. To begin with, the Trend Scenario is a realistic scenario because it follows the current urban development trend driven by market forces. It was assumed that the current urban development trend would continue, unless land conditions, including accessibility to the city center, are not changed. However, the living environment in HCMC's inner city area will deteriorate, due to the lack of open and green spaces and the negative effects of polluting industries.

The Master Plan Scenario is an idealistic scenario for creating the living environment of HCMC's inner and fringe areas. However, judging from the fact that current urban development situations are different from M/P indications, the practicability of this scenario is low. This is because effective laws and regulations and their enforcement mechanism to control and guide urban development have not been established and the future land use and urban development projects do not thoroughly consider land conditions.

The Third Scenario can be regarded as a practical scenario because it was based on the Trend Scenario that follows market forces but it considered the development of selected growth corridors. Large-scale development projects have also been amended in scale by considering land conditions and their feasibility. The living environment of the inner-city area will be mitigated by the effect of population and industrial distribution to the corridor areas.

Table 4.6.1 Summary of Three Urban Growth Scenarios

	A: Trend Scenario	B: Master Plan Scenario	C: Third Scenario
Urban Structure	Monocentric pattern	Polycentric pattern	Based on Trend Scenario, several selected growth corridors will develop strategically.
Development Direction	Sprawling to the fringe areas of HCMC's inner-city districts	Population of inner-city area will be controlled, while suburban development will progress.	Urbanization of the fringe area and areas along growth corridors are progressed
Population Distribution	Night-time population of 8 inner-city districts will be 2.5 million (600per/ha). Small increase in suburban population.	Night-time population of 8 inner-city districts will be 2.0 million (470per/ha). Suburban population will increase in the northeast, east and south of the city core.	Night-time population of 8 inner-city districts will be 2.3 million (560per/ha). Suburban population will increase along growth corridors (northeast, northwest, and west of the city core).

Source: Study Team

Table 4.6.2 Population in Three Urban Growth Scenarios, 2020

		2020(trend)				2020(master plan)				2020(3rd Scenario)			
		Population (000)		Population Density[1] no./ha		Population (000)		Population Density[1] no./ha		Population (000)		Population Density[1] no./ha	
		Night	Day[2]	Night	Day[2]	Night	Day[2]	Night	Day[2]	Night	Day[2]	Night	Day[2]
HCMC	Inner Core	2,531	3,090	603	736	1,989	2,973	474	708	2,332	3,084	555	734
	Inner Fringe	3,502	3,210	378	346	2,011	1,356	217	146	3,226	2,068	348	223
	Emerging Peripheral	2,952	2,711	53	49	3,889	3,684	70	67	3,256	3,384	59	61
	Suburban	443	425	24	23	889	1,014	49	55	408	590	22	32
	Rural	573	563	6	6	1,222	973	14	11	778	874	9	10
	Subtotal	**10,000**	**10,000**	**57**	**57**	**10,000**	**10,000**	**57**	**57**	**10,000**	**10,000**	**57**	**57**
Surrounding Provinces	Satellite Urban	1,116	1,180	36	38	1,246	1,160	40	37	1,116	1,123	36	36
	Suburban	599	533	43	38	468	434	34	31	599	577	43	42
	Rural	1,785	1,787	7	7	1,786	1,906	7	8	1,785	1,800	7	7
	Subtotal	**3,500**	**3,500**	**12**	**12**	**3,500**	**3,500**	**12**	**12**	**3,500**	**3,500**	**12**	**12**
Study Area Total		**13,500**	**13,500**	**29**	**29**	**13,500**	**13,500**	**29**	**29**	**13,500**	**13,500**	**29**	**29**

Source: Study Team
[1] Population density was calculated with the land area excluding river area.
[2] Including workers at workplace, students at school, the unemployed, housewives, etc.

4) Remaining Issues of Third Scenario

As compared with the Trend Scenario and the Master Plan Scenario, the Third Scenario is the most balanced in terms of practicability and in consideration of living environment (see Table 4.6.3). However, there are still several shortcomings in the Third Scenario as listed below:

a. In HCMC's inner-city districts, residents are expected to move to suburban areas expecting more spacious housing accompanied by increased incomes. Also, urban redevelopments will progress due to the increase in demand for business and commercial facilities. Considering these situations, the Third Scenario's population and population density in the city's inner-city area are too big.

b. Manufacturing facilities located in HCMC's inner-city area are affecting the living environment. Therefore, the city government now has a policy to relocate these facilities to suburban areas by allocating relocation funds and preparing incentives to reconstruct facilities. In addition, accompanied by the expansion of business and commercial areas, industrial facilities are expected to be transformed into other facilities. Considering these situations, the industrialized portion of inner-city districts will decrease. In the Third Scenario, however, many industrial areas will remain.

c. In the Third Scenario, many manufacturing facilities are located along NH1A. However, the future areas surrounding NH1A are expected to become urbanized and included in the metropolitan urban core. Therefore, industrialized areas have to be amended in consideration of the future urbanization area and metropolitan urban structure.

d. The HCM metropolitan area is expected to become a megalopolis with more than 10

million inhabitants. In the Third Scenario, the urban structure still has a monocentric pattern. Referring to other megalopolises, however, metropolitan core functions are distributed into sub-CBDs or satellite areas. For the future HCM metropolitan area, therefore, the functional distribution of business, commercial, and industrial functions has to be examined.

Table 4.6.3 Comparative Assessment of Three Urban Growth Scenarios

Evaluation Indicator	Trend Scenario	Master Plan Scenario	Third Scenario
Practicability of Future Land Use and Development Project	Practicability is high because the scenario follows the current urban development trend driven by market forces.	Practicability is low because of the lack of required institutions and respective enforcement mechanisms and unrealistic land use.	Practicability is comparatively high because the scenario is made based on Trend Scenario with the realistic amendment of growth corridors.
Living Environment	Living environment is not good due to the lack of open and green spaces and negative effects of polluting industries.	Idealistic living environment by demarcation between living and industrial areas and abundant open and green spaces.	Environmental issues are mitigated by the effect of population and industrial distribution to the corridor areas to be selected.

Source: Study Team

4.7 Recommended Scenario

1) Adjustment of Third Scenario (Development of Fourth Scenario)

As discussed in the previous section, although it is the most balanced scenario among the three, the Third Scenario still has several imperfections. Therefore, a Fourth Scenario is proposed, which is formulated based on the framework of Third Scenario and improved by addressing the above imperfections. The Fourth Scenario will show the strategic development directions, which will be promoted by efficient transport development. Areas for improvement in the Fourth Scenario are given below.

(1) Population in inner core and inner fringe will decrease[1] (compared with the Third Scenario, population will decrease by about 1 million and population density will become less than 340 per/ha, which conforms to the city government policy).

(2) The decreased population of the inner core and inner fringe will be distributed in suburban areas along selected growth corridors. For the distribution in suburban areas, new urban core areas will be emphasized and which will become satellite towns and sub-CBDs of the metropolis.

(3) Industrial facilities in HCMC's inner city will be relocated to suburban areas, considering the government relocation policy and urban redevelopment movements.

(4) NH 51 of Dong Nai province will be regarded as an industrialization growth corridor, which will connect the regional industrial cores of Bien Hoa and Vung Tau. Along this corridor, ports and an international airport are planned for development. In Nhon Trach district, large-scale industrial park development projects will be implemented.

Table 4.7.1 indicates the future population framework for the Fourth Scenario, which is regarded as the most appropriate scenario among the four scenarios examined for the following reasons:

- It is practicable because the scenario was made based on the Trend Scenario that follows market forces and was amended by growth corridors which will be developed strategically.
- It is considered reasonable to select NH51 as an industrialization growth corridor because the area's urban development potential is high, considering its accessibility to arterial roads and ports and good natural conditions.
- It seems reasonable to control the population of HCMC's eight inner-city districts (1.7 million, 400 per/ha) which is smaller than that of the Master Plan Scenario (2.0 million, 470 per/ha), with reference to other megalopolises in the ASEAN, including Manila and Jakarta.
- Compared with the Third Scenario, the living environment is improved due to the controlled population in HCMC's inner city and clear demarcation between living areas and industrial areas.

[1] In the inner core, current population density will be maintained (except for agricultural areas) and population of overcrowded areas will be controlled. In the inner fringe, population along growth corridors will increase and overcrowded areas will be controlled as well.

Table 4.7.1 Fourth Scenario Population Framework

		Population (000)		Day/Night Ratio	Population Density[1] (per./ha)	
		Night	Day[2]		Night	Day[2]
HCMC	Inner Core	1,691	2,898	1.71	403	690
	Inner Fringe	2,899	1,929	0.67	313	208
	Emerging Peripheral	3,904	3,517	0.90	71	64
	Suburban	584	652	1.12	32	36
	Rural	922	1,004	1.09	10	11
	Subtotal	**10,000**	**10,000**	**1.00**	**57**	**57**
Surrounding Provinces	Satellite Urban	1,194	1,137	0.95	38	37
	Suburban	516	520	1.01	37	37
	Rural	1,791	1,843	1.03	7	7
	Subtotal	**3,500**	**3,500**	**1.00**	**12**	**12**
Study Area Total		**13,500**	**13,500**	**1.00**	**29**	**29**

Source: Study Team
[1] Population density was calculated with the land area excluding river area
[2] Including workers at workplace, students at school, the unemployed, housewives, etc.

2) Spatial Development Concept for Fourth Scenario

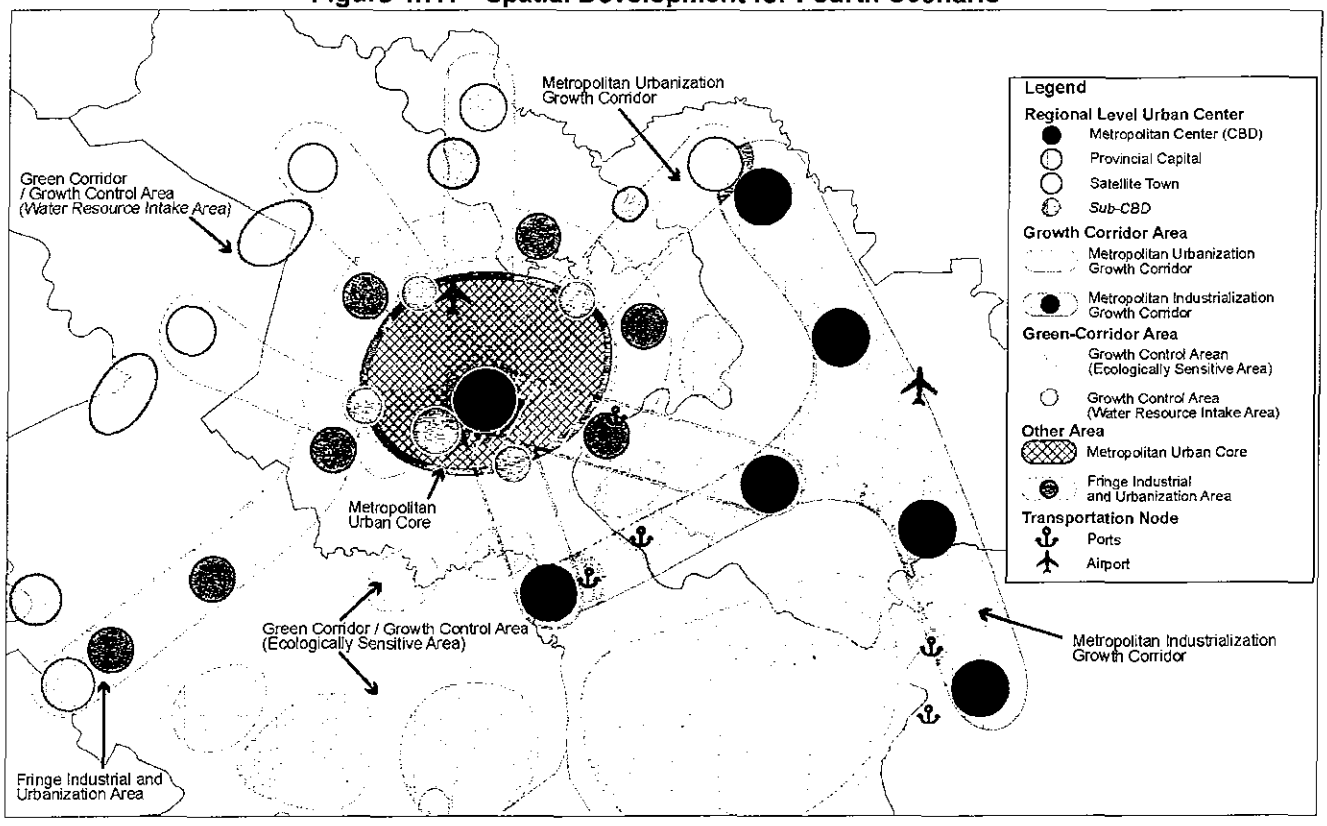
Figure 4.7.1 illustrates the preliminary future development direction of the Fourth Scenario. The core area of the HCM metropolitan area is expected to expand around NH1A in the west and districts 9 and Thu Duc in the east.

Urbanization in suburban areas is expected to progress along several major corridors. The following corridors are regarded as major growth corridors: (1) northeast corridor between HCMC and Bien Hoa (NH1A [east direction]); (2) north corridor from HCMC to Thu Dau Mot (NH13); (3) northwest corridor from HCMC to Cu Chi/Hoc Mon (NH 22); and (4) west corridor from HCMC to Duc Hoa (PR10). In addition to these main corridors, the following corridors are regarded as complementary growth corridors: (1) southwest corridor from HCMC to Long An (NH1A [west direction]; (2) south corridor from HCMC to Can Giuoc (NH50); (3) southeast corridor from HCMC to Hiep Phuoc (PR15); and (4) east corridor from HCMC to Nhon Trach (PR25). Furthermore, the corridor along NH51 and between Hiep Phuoc and Nhon Trach is regarded as a metropolitan industrialization growth corridor, where industrial development is expected to progress.

On the other hand, corridors between Can Gio and south of Long An province and between districts 9, Nhon Track, and Nha Be are located in ecologically sensitive areas. Thus, these corridors are regarded as green corridors where urbanization should be controlled and only limited development activities allowed. In addition, upstream areas of main rivers, which are intake points for the metropolitan water supply system, are also regarded as urbanization control areas.

The fringe area of metropolitan urban core and areas between HCMC and Tan An Town in Long An province are not regarded as areas where urbanization will continue but areas where intermittent urban and industrial development will occur.

Figure 4.7.1 Spatial Development for Fourth Scenario



Source: Study Team

3) Urban Structure of the Study Area

Figure 4.7.2 illustrates the basic concept of metropolitan urban structure and land use in the Fourth Scenario. As a basic land use policy, urbanization in green corridor areas will be controlled and limited only for agriculture or resort development whose environmental impact will be small. On the other hand, urbanization will be promoted in growth corridor areas wherein satellite towns and sub-CBDs will be developed to create a well-balanced urban structure. Definitions and location policies of satellite towns and sub-CBDs are given below.

(1) Satellite Towns: Satellite towns are defined as agglomerations with comprehensive urban functions such as residential, industrial, business, and commercial. Most commuting travels are made within a town and the areas are functionally less dependent on other urbanized areas. The approximate size of night-time population is more than 50,000.

The candidates will be areas within the study area and include the following:

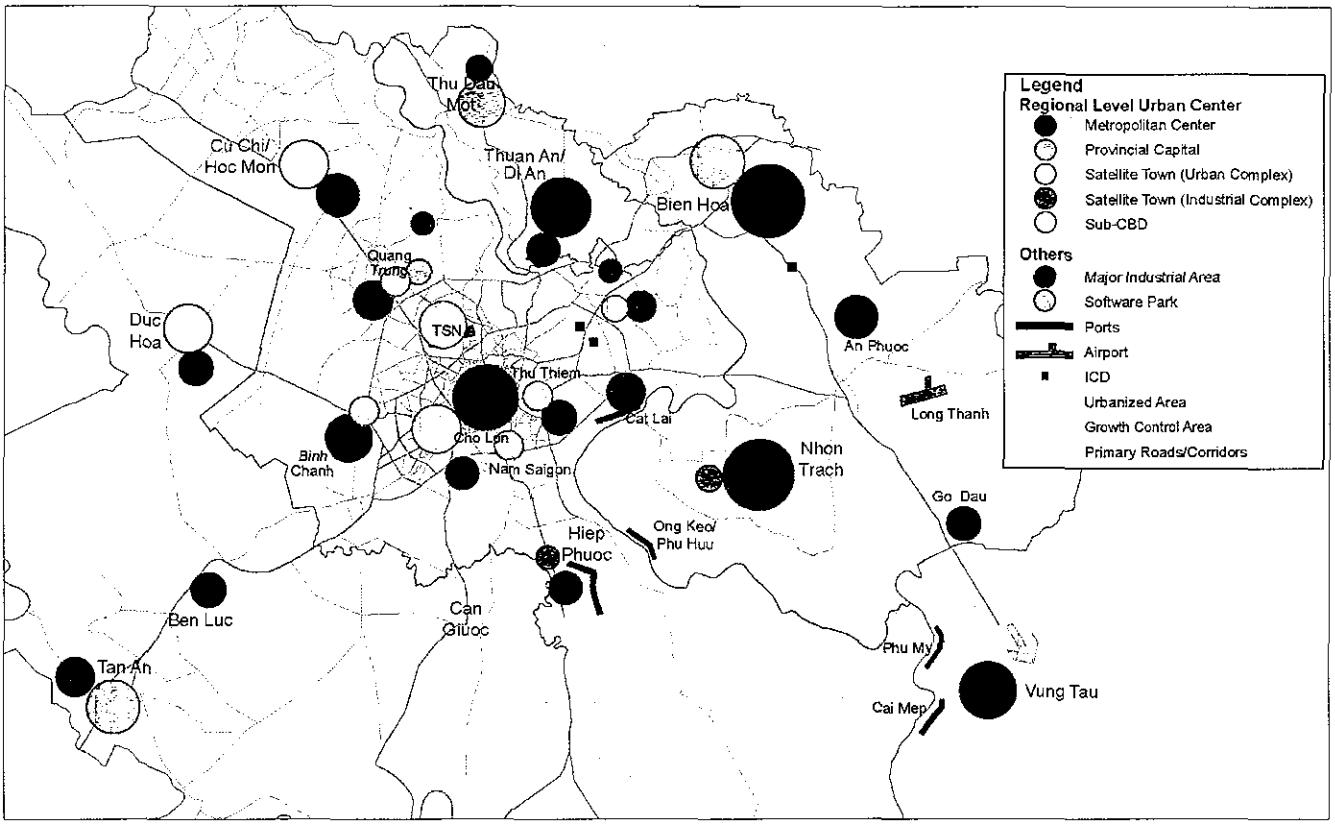
a) Provincial capitals (Bien Hoa City, Thu Dau Mot Town, Tan An Tawn)
b) Chu Chi / Hoc Mon New Urban Complex
c) Duc Hoa New Urban Complex
d) Hiep Phuoc Industrial Complex (Nha Be District)
e) Nhon Trach Industrial Complex

(2) Sub-CBDs: Sub-CBDs are located within or in the periphery of existing urban centers. They will mainly have business and commercial functions. Together with existing urban core areas, sub-CBDs share business and commercial functions with a metropolis and complement the functions of an existing urban core. The approximate size of sub-CBDs covers more than 30ha and a daytime population of more than 50,000.

The candidate areas within the study area will be:

a) Area within the HCM metropolitan area
b) Saigon South
c) Thu Thiem New Urban Center
d) New Business Area of District 9 (along Hanoi Highway)
e) New Business Area of District 12 (near NH22 and NH1A)
f) New Business Area of District Binh Chanh (near PR No.10 and NH1A)
g) Tan Son Nhat (relocation site of the airport)

Figure 4.7.2 Proposed Future Metropolitan Structure of the Study Area



Source: Study Team

Table 4.7.2 Sub-CBDs and Satellite Towns in the Study Area

	Location	Classification		Function	Assumed Scale (approx.)	
					Area Size (km^2)	Pop. (000) Night/Day
HCMC						
1. HCM City Center	District 1, 3, 10	Metropolitan CBD	A	Administrative, business, commercial and tourism center of the HCM metropolitan area and the southern Vietnam	15	500 /1,300
2. Cho Lon	District 5, 6	Sub-CBD	B	Commercial (retail and wholesale) center of the HCM metropolitan area	5	300 /400
3. Thu Thiem New Urban Center	District 2/ Thu Thiem	Sub-CBD	B	New business and commercial center (Sub-CBD), closely to be located in the existing city center	5	150 /250
4. Saigon South	District 7/ Saigon South	Sub-CBD	B	Sub-CBD in the newly developing residential, business, commercial and industrial area	5	100 /150
5. Tan Son Nhat New Business Center	Tan Binh/ Tan Son Nhat	Sub-CBD	B	New urban center (business and commercial center) at the relocation area of the TSN airport	8	200 /300
6. New Business Area of District 9	District 9/ Along Hanoi Highway	Sub-CBD	B	New urban center (business and commercial center), integrated with high-tech and software industrial areas and the university areas	3	60 /100
7. New Business Area of District 12	District 12/ NH No.22 and 1A	Sub-CBD	B	New urban center (business and commercial center) of District 12, integrated with Quang Trung software park	3	60 /100
8. New Business Area of Binh Chanh	Binh Chanh/ PR No.10 and NH 1A	Sub-CBD	B	New urban center (business and commercial center) of Binh Chanh District, integrated with Tan Tao high-tech industrial area	3	60 /100
9. Cu Chi / Hoc Mon New Urban Complex	Cu Chi & Hoc Mon/ Along NH No.22	Satellite Town (Urban and Industrial Complex)	D	New urban complex of residential, business & commercial, recreational and industry, including relocation factories from the inner city area	60	300 /300
10. Hiep Phuoc Industrial Complex	Nha Be/ Hiep Phuoc	Satellite Town (Industrial and Urban Complex)	D	Industrial, business and housing complex to be integrated with the newly developing harbor in Hiep Phuoc	20	150 /150
Adjacent Provinces						
1. Urban and Distribution Center of Binh Duong Province	Thu Dau Mot Town	Provincial Capital	C	Business, commercial and distribution center of manufacturing and agricultural industries / administrative center of Binh Duong Province	10	100 /100
2. Regional Center of Eastern HCM metropolitan area	Bien Hoa City	Eastern Metropolitan CBD / Provincial Capital	A	Business and commercial center in the eastern region of HCM metropolitan area (center of industry) / administrative center of Dong Nai Province	15	300 /150
3. Urban and Distribution Center of Long An Province	Tan An Town	Provincial Capital	C	Business, commercial and distribution center of manufacturing, agricultural and marine industries / administrative center of Long An Province	10	100 /100
4. Duc Hoa New Urban Complex	Duc Hoa	Satellite Town (Urban and Industrial Complex)	D	Newly developing industrial and residential complex with the existing district center of Duc Hoa / partly commuting communities of HCMC	15	200 /100
5. Nhon Trach Industrial Complex	Nhon Trach	Satellite Town (Urban and Industrial Complex)	D	Newly developing business, commercial and residential complex to be integrated with large-scale industrial areas	50	300 /300

Source: Study Team
Classification: (A) Metropolitan CBD, (B) Sub-CBD, (C) Provincial capital, (D) Satellite town

4) Location Policy for Industrial Parks

Figure 4.7.3 illustrates the location of industrial parks in the study area. Major industrial locations are categorized into four types, as follows:

(1) Along NH51 of Dong Nai Province and Southern Area of HCMC (Metropolitan Industrialization Growth Corridor): Mainly in areas along NH51 of Dong Nai province, export-oriented, heavy, light, and high-tech industries are to be developed, utilizing ports and the international airport to be located within or near the corridor. Bien Hoa, an existing developed industrial center, and Nhon Trach, where large-scale industrial park development projects are currently being implemented by the national government, will be regional industrial cores of the growth corridor (main industrial types: chemicals, metallic /steel, machinery, building materials, textile /garment, rubber).

(2) Fringe Area of HCMC: In the fringe areas of HCMC, non-polluting light and high-tech industries will be located mainly in existing and newly developing industrial parks, which will include the factories from the inner city area and Quang Trung software park (main industrial types: electronics, machinery, foods/beverage, chemicals, textile /garment, leather, footwear).

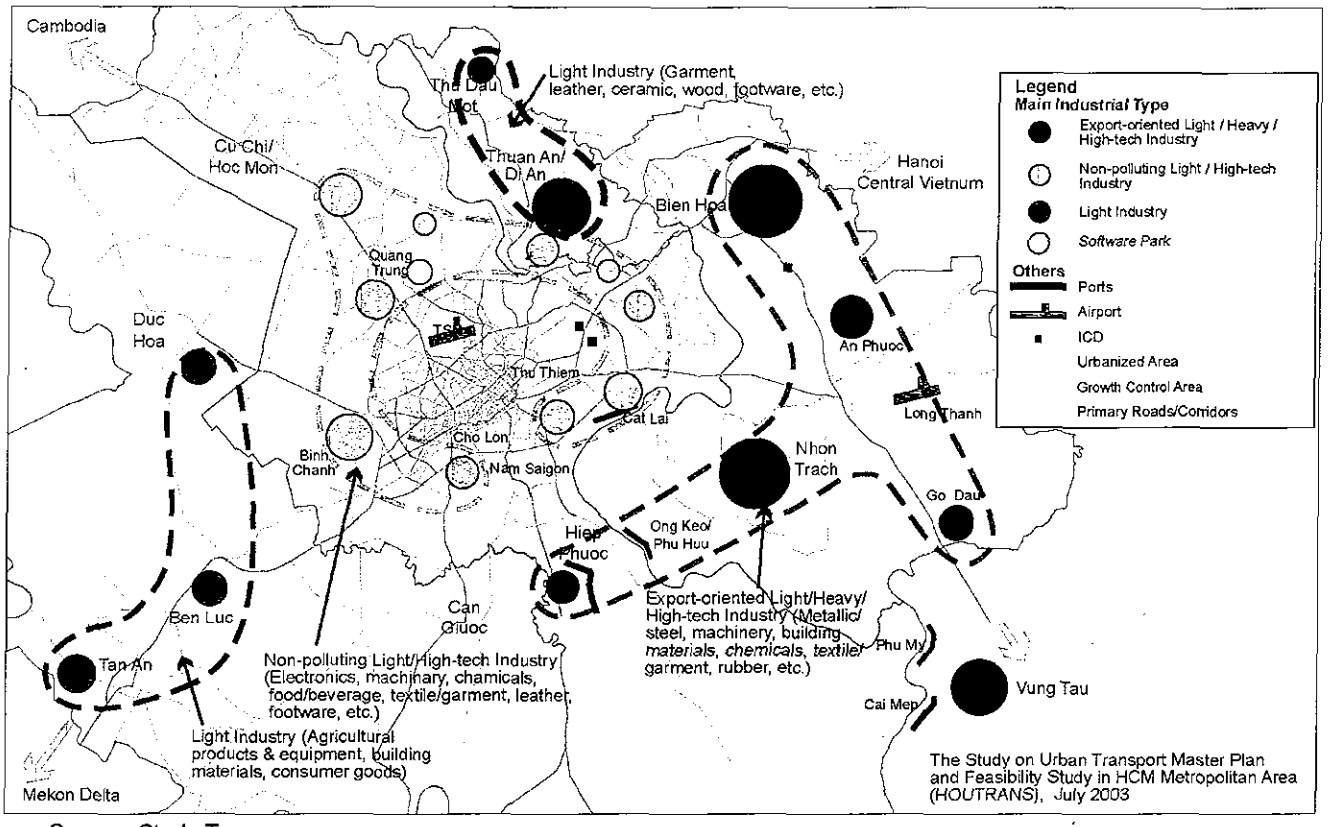
(3) Along NH 13 of Bing Duong Province: In areas along NH13, light industry, which includes industries related to agricultural products produced in surrounding areas and traditional handicrafts, is to be located in existing and newly developing industrial parks (main industrial types: agricultural products, garment, leather, ceramic, wood, footwear).

(4) Along NH1A of Long An Province and Around Duc Hoa: In areas along NH1A and around Duc Hoa, light industry, which includes industries for agricultural and marine products produced in surrounding areas and consumer goods, is to be located in existing and newly developing industrial parks (main industrial types: agricultural products and equipment, building materials, consumer goods).

5) Future Urban Growth Pattern

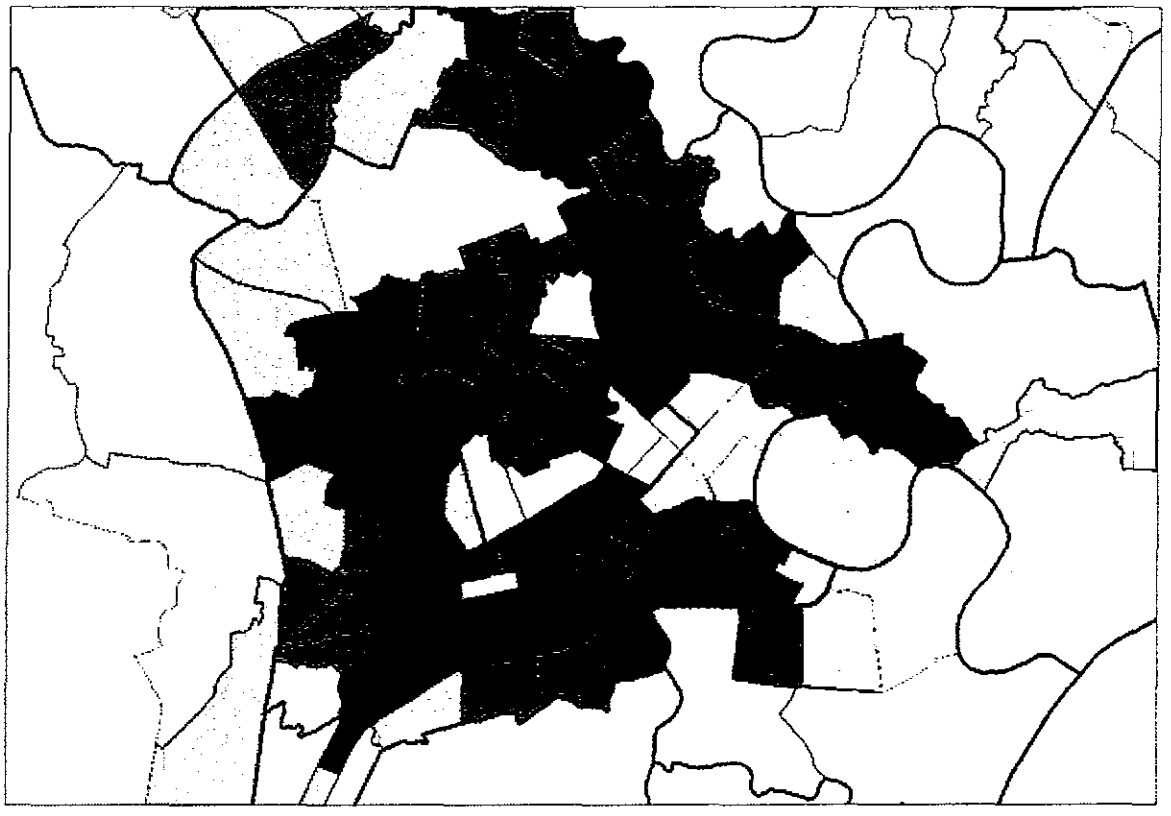
Table 4.7.3 and Figure 4.7.4 show the urbanization and future land use pattern and population density under the Fourth Scenario. Urbanization and population increase will progress mainly in the fringe areas of HCMC's inner-city districts and along selected growth corridors. As a result, the high-density metropolitan core area will expand around NH1A in the west and north and District 9 and Thu Duc district in the east. Along major growth corridors, industrial and residential development and population increase will progress, particularly around satellite towns and sub-CBDs. Along secondary growth corridors, the speed of urbanization and population increase will be modest.

Figure 4.7.3 Location of Industrial Parks in the Study Area



Source: Study Team

Figure 4.7.4 Population Density under Fourth Scenario



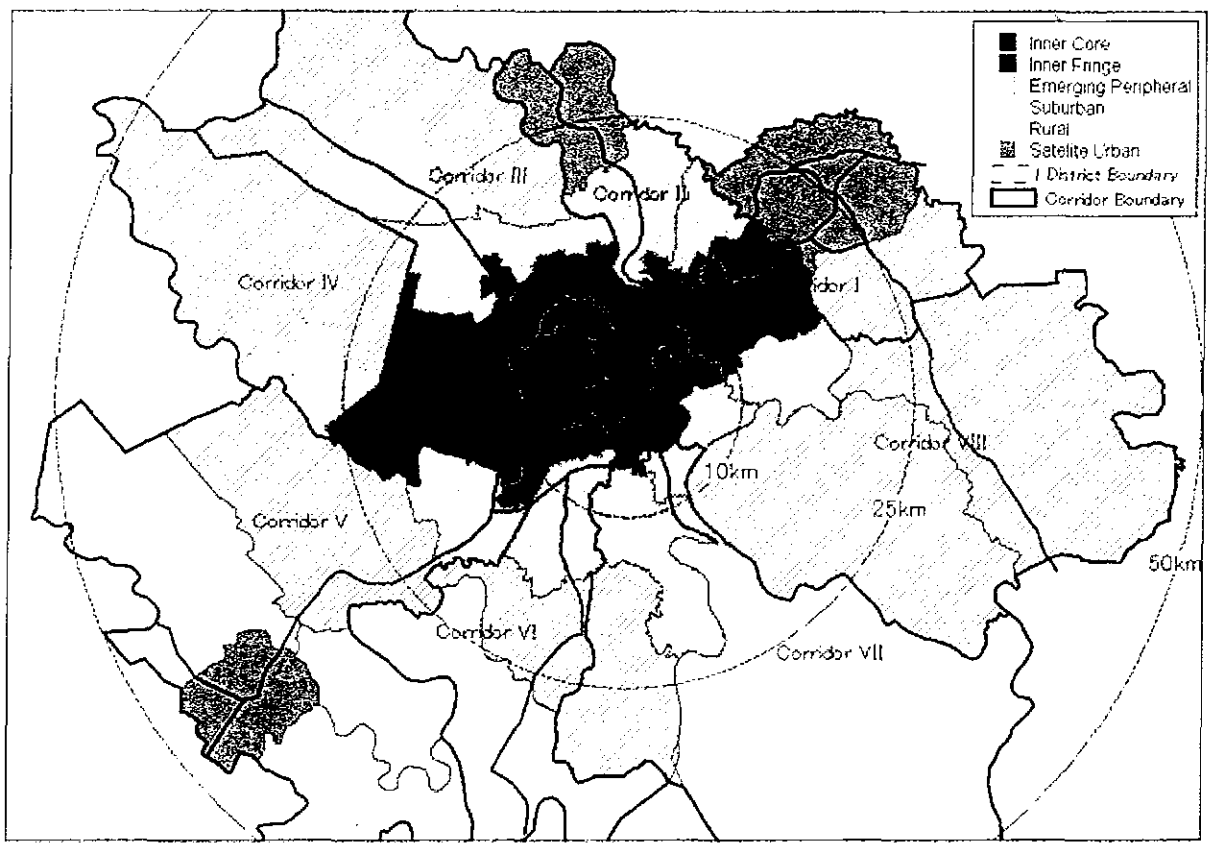
Source: Study Team

Table 4.7.3 Expected Urban Development/Land Use by Classified Area

Corridor	Area Classification	Description on Future Urbanization and Land Use
CBD	Inner Core	• Metropolitan urban core is expected to expand around NH1A. Around the fringe area, business and commercial functions will accumulate, making it a sub-CBD. • Although many inhabitants will move to suburban areas accompanied by urban redevelopments, areas with high population density will remain.
I: North-east (NH1A)	Inner Fringe / Suburban	• The most urbanized corridor within the HCM metropolitan area. • Along NH1A, a sub-CBD, including high-tech IZ and university area, will develop. Almost all areas will be urbanized.
	Satellite Urban	• As a regional center of the eastern HCM metropolitan area, administrative, business and commercial facilities will be established, together with large-scale IZs. • Residential areas with certain population density will develop.
II: North (NH13)	Inner Fringe	• In areas adjacent to HCMC, agricultural land will be converted to residential land.
	Satellite Urban	• Thu Dau Mot Town and its surroundings will become a regional core, where many business, commercial and residential facilities will be established.
	Emerging Peripheral	• Factories of light industry will be established mainly in existing IZs in Thuan An and Di An districts.
III: North-west (NH22)	Inner Fringe	• In areas adjacent to HCMC, residential and industrial developments will progress.
	Emerging Peripheral	• Along the corridor, residential and industrial developments will progress, but outskirts of corridor areas will remain agricultural lands.
	Suburban	• Along the corridor in Cu Chi and Hoc Mon, the satellite town, including business, commercial, residential, and amusement, will develop. • Adjacent to the satellite town, large-scale IZs of light and high-tech industries will develop, but outskirts of corridor areas will remain agricultural land.
IV: West (PR10)	Inner Fringe	• Along NH1A, large-scale, high-tech IZs together with a sub-CBD will develop.
	Suburban	• Around the district center, Duc Hoa, a satellite town with large-scale residential areas and IZs of light industry will develop. • Along the corridor, many residential areas will develop for commuters traveling to HCMC, but outskirts of corridor areas will remain agricultural lands.
V: South-west (NH1A)	Inner Fringe/ Emerging Peripheral	• In areas adjacent to HCMC, residential and industrial developments will progress along the corridor.
	Satellite Urban	• Tan An Town becomes a regional core, where business, commercial, residential facilities, and light industry of agricultural and marine products will accumulate.
	Suburban	• Around the district center, Ben Luc, agriculture-related light industries and residential and commercial facilities will develop, but other areas will be agricultural land.
	Rural	• Mostly agricultural land.
VI: South (NH50)	Emerging Peripheral	• In areas adjacent to HCMC, residential and industrial developments will progress along the corridor.
	Suburban/ Rural	• Urbanization will not progress, and agricultural and swamp land will be retained. • In ecologically sensitive areas, land use and urbanization will be controlled.
VII: South-east (PR15)	Inner Fringe	• In corridor areas, residential and industrial developments will progress.
	Emerging Peripheral	• Utilizing the newly developing Hiep Phuoc Port, IZs and its related business, commercial and residential facilities will be established.
	Suburban	• In ecologically sensitive areas, urbanization will be strictly controlled (most areas are agricultural and forest reserves). Although allowed, resort development will also be controlled.
	Rural	• Urbanization will not progress, and agricultural and swamp lands will be retained.
VIII: East (NH51)	Inner Fringe	• In the south, large-scale IZs and residential areas will develop, but in many parts urbanization will be controlled (green areas and agricultural land will be retained).
	Emerging Peripheral	• In large ecologically sensitive areas, urbanization will be controlled and green areas and agricultural land will be retained.
	Suburban	• In Nhon Trach and along NH51, large-scale heavy, light and high-tech IZs will be located, together with related business, commercial, and residential facilities.

Source: Study Team

Figure 4.7.5 Future Urban Area by Type



Source: Study Team

6) Impact of Three Growth Scenarios on Traffic

For the three scenarios, the future traffic demand was assigned and the network's performance assessed (see Tables 4.7.4 and 4.7.5). The results are briefly as follows:

- The recommended scenario is the most economical and provides the least congestion.
- The recommended scenario shows better performance in the CBD as well as in most road sections.

7) Preliminary Conceptual Land Use Plan

On the basis of the foregoing findings, a preliminary conceptual land use plan for the study area was worked out as shown on Figure 4.7.7.

Table 4.7.4 Network Performance by Urban Growth Scenario

		Scenario		
		Recommended	Trend	MP
Transport Cost (mil. US$/day)	Vehicle Operating Cost	5.2	5.2	5.5
	Travel Time Cost	22.8	23.0	24.6
	Total	28.0	28.1	30.1
Ave. Travel Speed (km/h)		28.7	27.8	27.9
Ave. Volume/Capacity Ratio (V/CR)		0.84	0.88	0.85

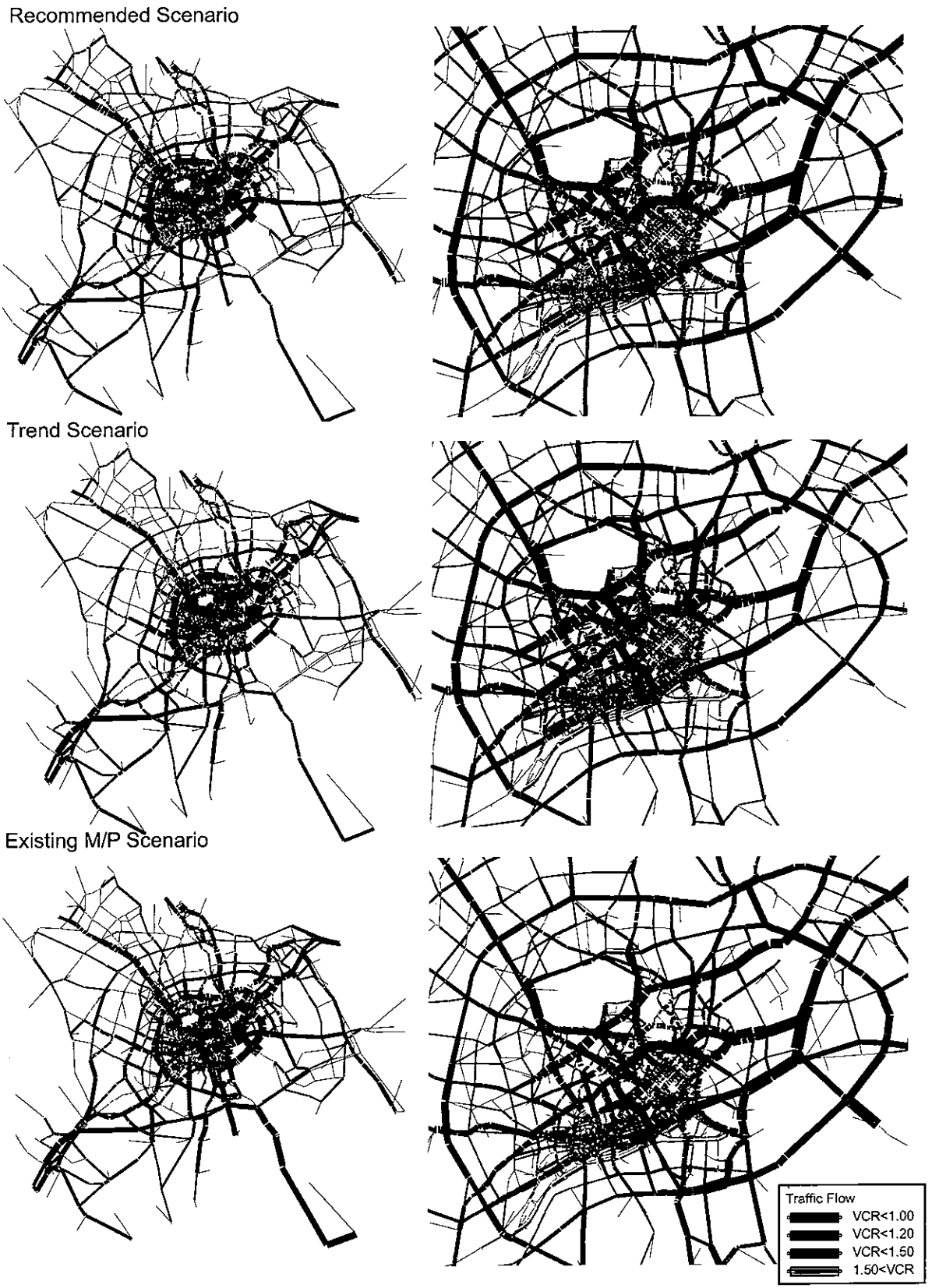
Source: Study Team

Table 4.7.5 Corridor Volume Capacity Ratio by Urban Growth Scenario

Corridor/Section	Recommended						Trend		MP	
	Section			Area			Section	Area	Section	Area
	Capacity (000 PCU/day)	Volume (000 PCU/day)	V/CR	Capacity (000 PCU-km/ day)	Volume (000 PCU-km/ day)	V/CR	V/CR	V/CR	V/CR	V/CR
CBD										
Saigon	403	529	1.3	4,017	4,587	1.1	1.2	1.2	1.4	1.2
Cho Lon	567	649	1.1	3,881	4,000	1.0	1.3	1.2	1.1	1.0
1. NH1A (east)										
Area 1 (inner)	352	332	0.9	6,903	5,548	0.8	0.8	0.8	1.0	0.8
Area 2 (inner-outer)	203	160	0.8	3,596	2,527	0.7	0.8	0.6	0.8	0.8
Area 3 (outer-inner)	221	134	0.6	3,787	1,768	0.5	0.7	0.5	0.7	0.5
Area 4 (outer)	49	46	0.9	2,068	586	0.3	1.0	0.3	1.0	0.3
2. NH13										
Area 1 (inner)	41	37	0.9	1,468	1,044	0.7	1.0	0.7	0.9	0.7
Area 2 (inner-outer)	126	89	0.7	4,021	2,256	0.6	0.7	0.5	0.8	0.6
Area 3 (outer-inner)	135	62	0.5	2,459	1,081	0.4	0.4	0.4	0.6	0.6
3. NH22										
Area 1 (inner)	253	234	0.9	5,815	5,243	0.9	1.0	1.0	0.8	0.8
Area 2 (inner-outer)	216	223	1.0	5,292	3,796	0.7	1.0	0.7	1.0	0.6
Area 3 (outer-inner)	140	103	0.7	3,482	2,176	0.6	0.5	0.4	0.6	0.5
Area 4 (outer)	146	91	0.6	4,043	2,408	0.6	0.4	0.4	0.5	0.4
4. PR10										
Area 1 (inner)	246	179	0.7	1,861	1,283	0.7	0.8	0.8	0.6	0.5
Area 2 (inner-outer)	141	102	0.7	3,778	2,613	0.7	0.7	0.7	0.6	0.6
Area 3 (outer-inner)	127	42	0.3	4,061	2,117	0.5	0.2	0.5	0.3	0.5
Area 4 (outer)	20	14	0.7	769	384	0.5	0.6	0.4	0.7	0.5
5. NH1 (west)										
Area 1 (inner)	158	120	0.8	556	387	0.7	0.8	0.9	0.7	0.7
Area 2 (inner-outer)	131	65	0.5	1,555	1,050	0.7	0.6	0.7	0.5	0.6
Area 3 (outer-inner)	143	88	0.6	2,977	1,770	0.6	0.7	0.6	0.7	0.7
Area 4 (outer)	51	44	0.9	5,626	3,505	0.6	0.9	0.7	0.9	0.7
6. NH50										
Area 1 (inner)	179	108	0.6	1,587	1,245	0.8	0.6	0.9	0.7	0.8
Area 2 (inner-outer)	74	47	0.6	968	588	0.6	0.7	0.7	0.7	0.7
Area 3 (outer-inner)	63	62	1.0	5,405	2,349	0.4	1.1	0.5	1.1	0.5
Area 4 (outer)	24	18	0.8	263	203	0.8	0.9	0.9	0.8	0.8
7. PR15										
Area 1 (inner)	116	115	1.0	3,224	2,627	0.8	0.8	0.7	1.4	1.1
Area 2 (inner-outer)	69	55	0.8	446	338	0.8	0.7	0.5	1.2	1.3
Area 3 (outer-inner)	133	94	0.7	3,845	2,353	0.6	0.6	0.6	1.2	1.1
8. PR20 (NH51)										
Area 1 (inner)	76	67	0.9	1,063	964	0.9	0.4	0.6	1.0	1.1
Area 2 (inner-outer)	84	63	0.8	1,168	812	0.7	0.5	0.4	0.7	0.7
Area 3 (outer-inner)	142	67	0.5	7,607	2,497	0.3	0.3	0.2	0.4	0.3
Area 4 (outer)	59	43	0.7	4,438	893	0.2	0.6	0.1	0.7	0.2

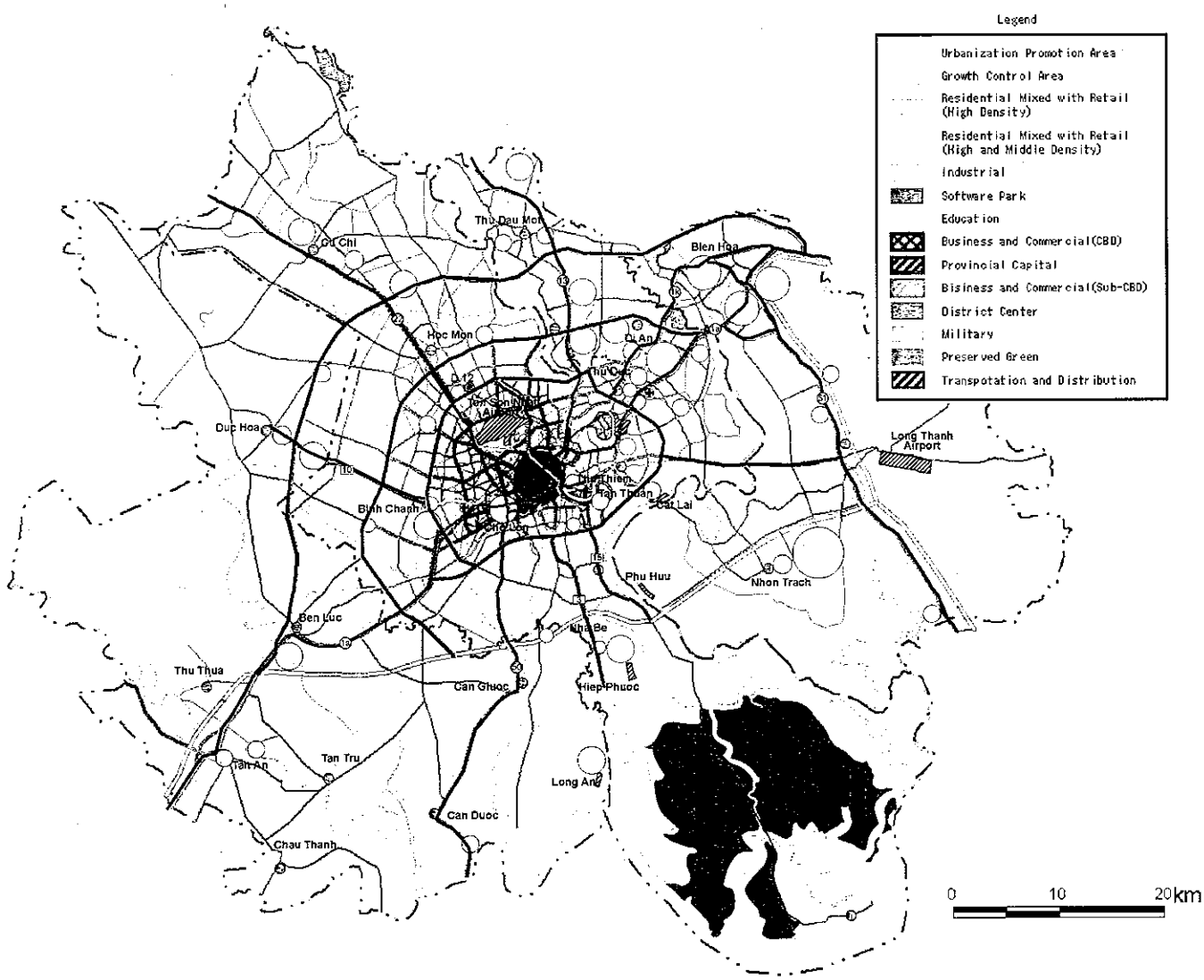
Source: Study Team

Figure 4.7.6 Results of Traffic Assignment by Urban Growth Scenario



Source: Study Team

Figure 4.7.7 Preliminary Conceptual Land Use Plan



Source: Study Team

5 TRANSPORT DEMAND FORECAST

5.1 Methodology

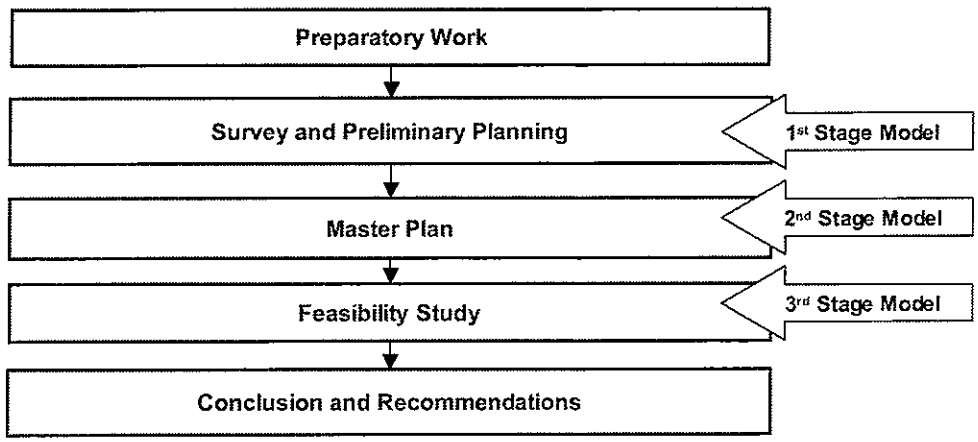
1) Multi-stage System of Transport Demand Forecast

The traffic demand forecasting system for this study was developed incrementally, depending on the necessity at each stage of the study's progress. This is a multi-stage approach and there are three stage models developed as shown in Figure 5.1.1.

The 1st stage model aimed at understanding and evaluating the impact of future socio-economic conditions on the metropolis. This model was developed at the early stage of the study in order to understand the approximate directions of future infrastructure developments. For this model, districts were used as zones for analysis (36 zones for the study area) together with selected major roads as corridors. The model components of the 1996 Ho Chi Minh Transport Study were adapted and the HOUTRANS traffic survey data were used for the calibration of the model.

The 2nd stage model was developed to assess the demand for a master plan and a preliminary feasibility study. In this model, zones were set based on the boundary of wards (*phuong* or *xa* in Vietnamese) and they were either combined or split based on geographical and social conditions (265 zones in the study area). The road network incorporated in the model is described in detail in the next subsection. In order to assess the urban growth scenarios and many other travel growth indices, a strategic, but parameter-responsive model was developed. The 2nd stage model's development and preliminary results became the bases for the development of the 3rd stage model, which is explained in subsequent subsections.

Figure 5.1.1 Overall Study Framework and Demand Forecast Models



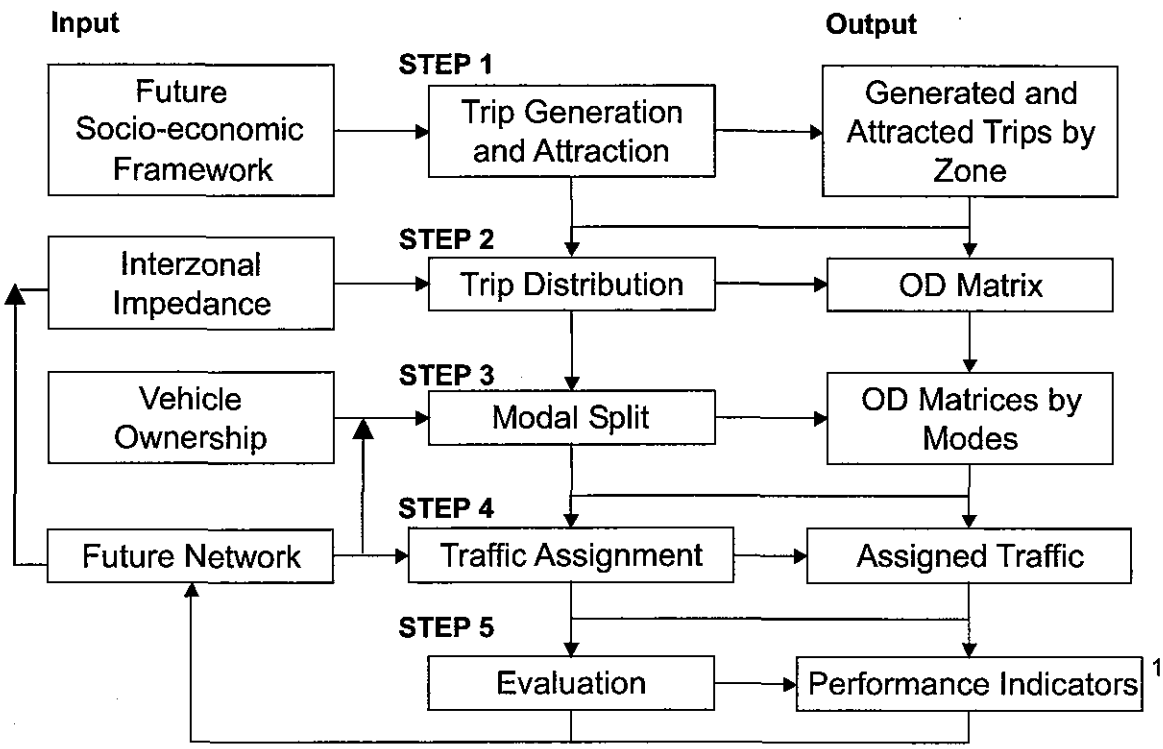
Source: Study Team

The 3rd stage model examined and evaluated the feasibility of each development project and transport policies: improved public transport, traffic demand management, parking, area licensing, staggered work-time, –and similar programs. The model was detailed and responsive to analyses required for the assessment of feasibility of strategic projects.

2) Description of 2nd Stage Model

The conventional four-step model using JICA STRADA[1] (System for Traffic Demand Analysis) was adopted for the demand forecast. The steps are: (1) Trip Generation and Attraction Model – to estimate the number of trips generated by and attracted to each zone; (2) Trip Distribution Model – to estimate the number of trips traveling between zones; (3) Modal Share Model – to estimate the number of trips made using different transport modes; and (4) Traffic Assignment Model – to estimate the number of trips on the road by different transport modes (see Figure 5.1.2). To analyze traffic, the study area was divided into a total of 265 zones[2] (see Figure 5.1.3).

Figure 5.1.2 Transport Demand Forecast Procedure



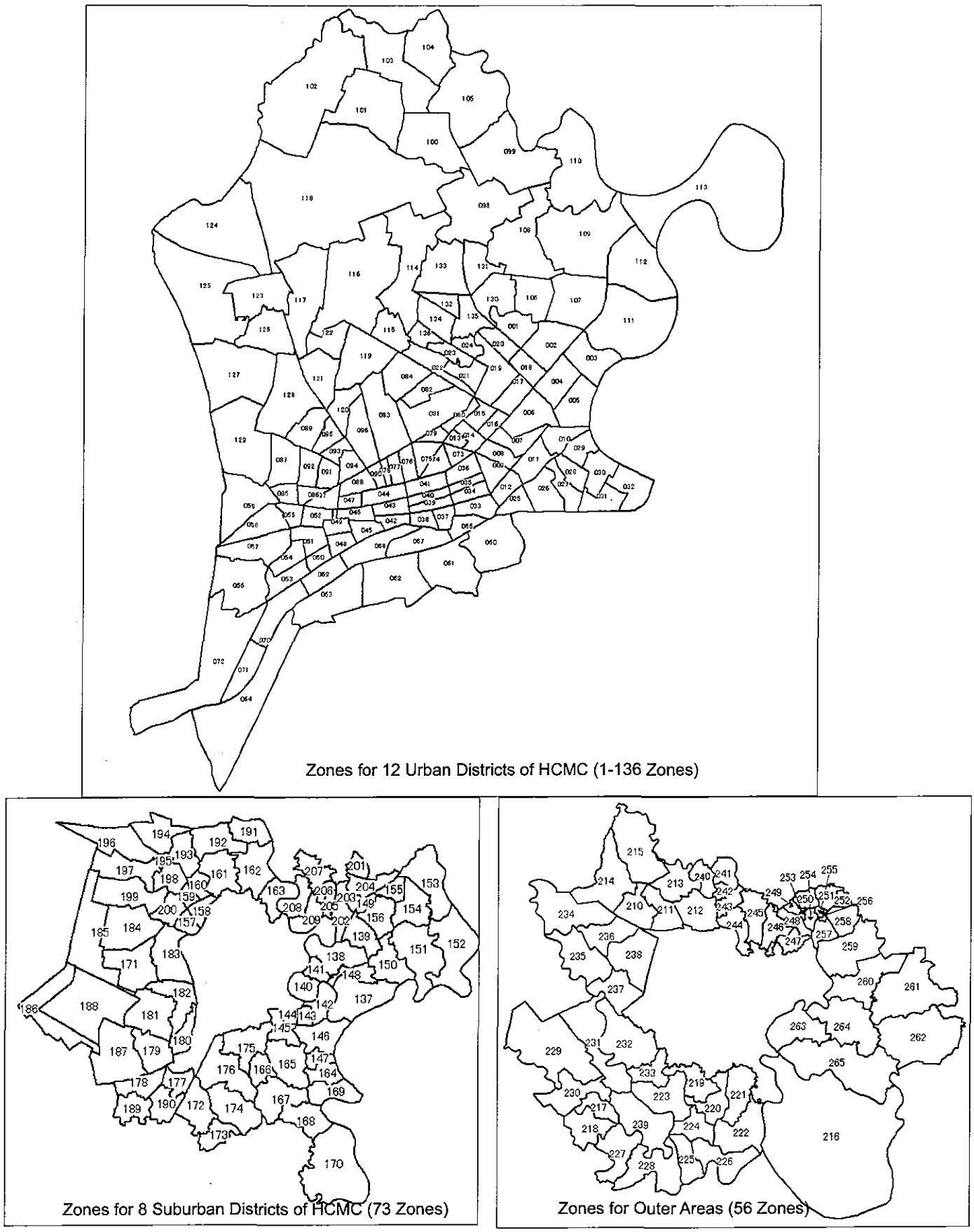
Source: Study Team

[1)] Adopting capacity restraint assignment procedure involving V/CR, travel speed, etc.

[1] JICA STRADA is a computer software developed by JICA for application in transport demand analysis and assignment.

[2] The zoning system used for HOUTRANS was basically the same as that used in the 1996 DfID study conducted by MVA, a traffic and transportation consultancy, to allow comparisons.

Figure 5.1.3 Traffic Zone System for the Study Area



Source: Study Team

(1) Trip Generation and Attraction Model

A multiple linear regression model was developed as follows:

Generation $G_i = \sum a_k x_{ki} + C$

Attraction $A_j = \sum b_k x_{kj} + D$

Where,
- x_{ki} : Explanatory variables of zone *i*
- x_{1i} : Population
- x_{2i} : Number of workers at workplace
- x_{3i} : Number of students at schools
- a_k, b_k : Parameter
- C, D : Constant

Table 5.1.1 Estimated Parameters of Generation and Attraction Model

Variable	Generation		Attraction	
	Coefficient	t-value	Coefficient	t-value
Population	1.404	14.5	1.429	14.5
No. of Workers at Workplace	2.627	12.8	2.524	12.1
No. of Students at Schools	2.284	7.1	2.333	7.1
Constant	-1054.0	-0.4	-869.5	-0.3
Correlation Coefficient	0.931		0.928	

Source: Study Team

(2) Trip Distribution Model

The Trip Distribution Model has two types, i.e. intrazonal and interzonal.

Intrazonal Trip Distribution Model:

$$Ti = I_i * G_i$$

Where:
- T_i : No. of intrazonal trips by zone *i*
- I_i : Intrazonal trip ratio for zone *i*

Considering that the high rate of present intrazonal trips is due to the short trip lengths as compared with other cities, two types of future intrazonal ratio – present value and adjusted value – were considered because of the changing urban structure.

Table 5.1.2 Intrazonal Trip Rate by Urban Area Type

Area Description		No. of Zones	Area (ha)	Intrazonal Trip Ratio	
				Present	Adjusted
HCMC	*Inner Core*	91	46	0.19	0.19
	Inner Fringe	45	206	0.32	0.2
	Emerging Peripheries	56	989	0.50	0.3
	Suburban	17	1,077	0.45	0.3
	Rural	7	12,745	0.70	0.5
Province	Satellite Urban	17	1,826	0.64	0.5
	Suburban	4	3,473	0.70	0.5
	Rural	28	8,828	0.83	0.5
Total Study Area		265	1,768	0.41	-

Source: Study Team

Interzonal Trip Distribution Model: The model is a typical gravity model of the form given below:

$$T_{ij} = \kappa * G_i^{\alpha} * A_j^{\beta} * d_{ij}^{\gamma} \quad (i \neq j)$$

Where: T_{ij} : No. of interzonal trips between zones *i* and *j*

d_{ij} : Interzonal impedance between zones *i* and *j*

k, α, β, γ : Parameters

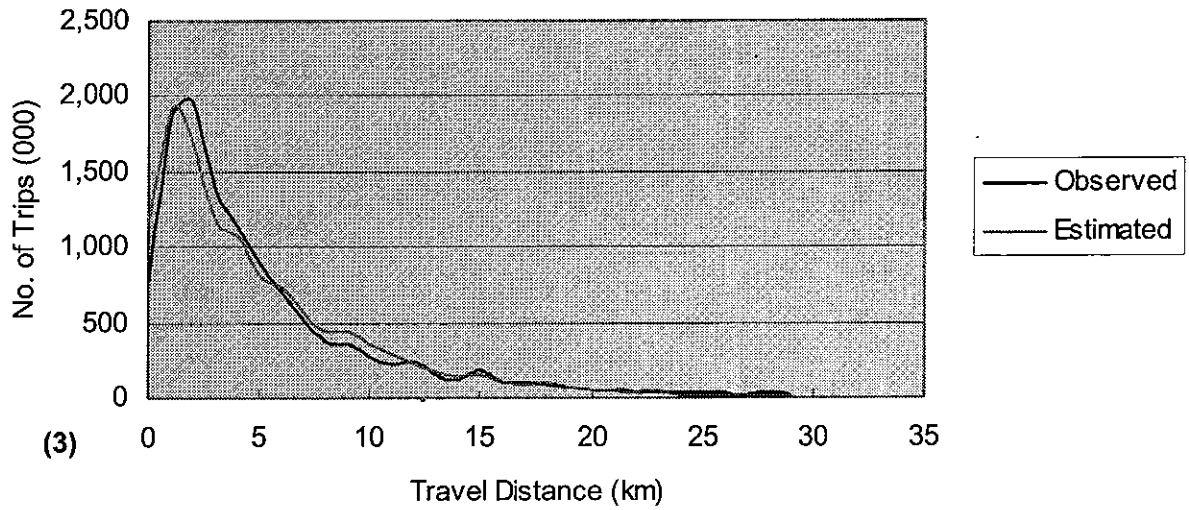
Table 5.1.3 Estimated Parameters of Interzonal Distribution Model

Parameter	Coefficient	t-value
α	0.584	43.0
β	0.598	44.0
γ	-0.728	-76.9
κ	0.0027	31.2
Correlation Coefficient		0.51

Source: Study Team

Figure 5.1.4 compares the observed and synthesized trip length frequency distribution result. The trip length distribution chi-square value resulted in 0, which implies that the fitness of observed and synthesized values is significant.

Figure 5.1.4 Comparison of Trip Length Distribution



Source: Study Team

(3) Modal Share Model

The modes of transport were categorized into six groups: walk, bicycle, motorcycle, car, bus, and truck. First, the number of walk trips was estimated by a step function of interzonal distance using the same rate as the present one. Second, the remaining five modes were explained by a logistic function of generalized travel cost between zones, as follows:

$$P_{ij}^{m} = \frac{1}{1+e^{\alpha C_{ij}^{m}+\beta}}$$

$$\text{s.t.} \sum_{m \in M} P_{ij}^{m} = 1$$

$$C_{ij}^{m} = t_{ij}^{m} * VT^{m} + \frac{d_{ij} * VC^{m} + PC^{m}}{OP^{m}}$$

Where,
- P_{ij}^{m} : Probability of choosing mode *m* between zones *i* and *j*
- C_{ij}^{m} : Generalized cost of mode *m* between zones *i* and *j*
- t_{ij}^{m} : Travel time of mode *m* between zones *i* and *j*
- VT^{m} : Value of time of user of mode *m*
- VC^{m} : Vehicle operating cost of mode *m (for bus, fare)*
- PC^{m} : Parking cost of mode *m*
- OP^{m} : Average Occupancy of mode *m*
- α, β : Parameter

Table 5.1.4 Generalized Cost Parameters by Mode

Mode	Value of Time ($/hour)	Vehicle Operating Cost ($/km)	Fare ($)	Parking Cost ($/trip)	Average Occupancy (person/vehicle)
Bicycle	0.464	0.0034	-	0.039	1.14
Motorcycle	0.823	0.0268	-	0.083	1.51
Car	1.723	0.0705	-	0.314	1.96
Truck	1.025	0.1535	-	0.350	1.98
Bus	0.525	-	<4km: 0.067 4km>: 0.067+0.016/km	-	-

Source: Study Team

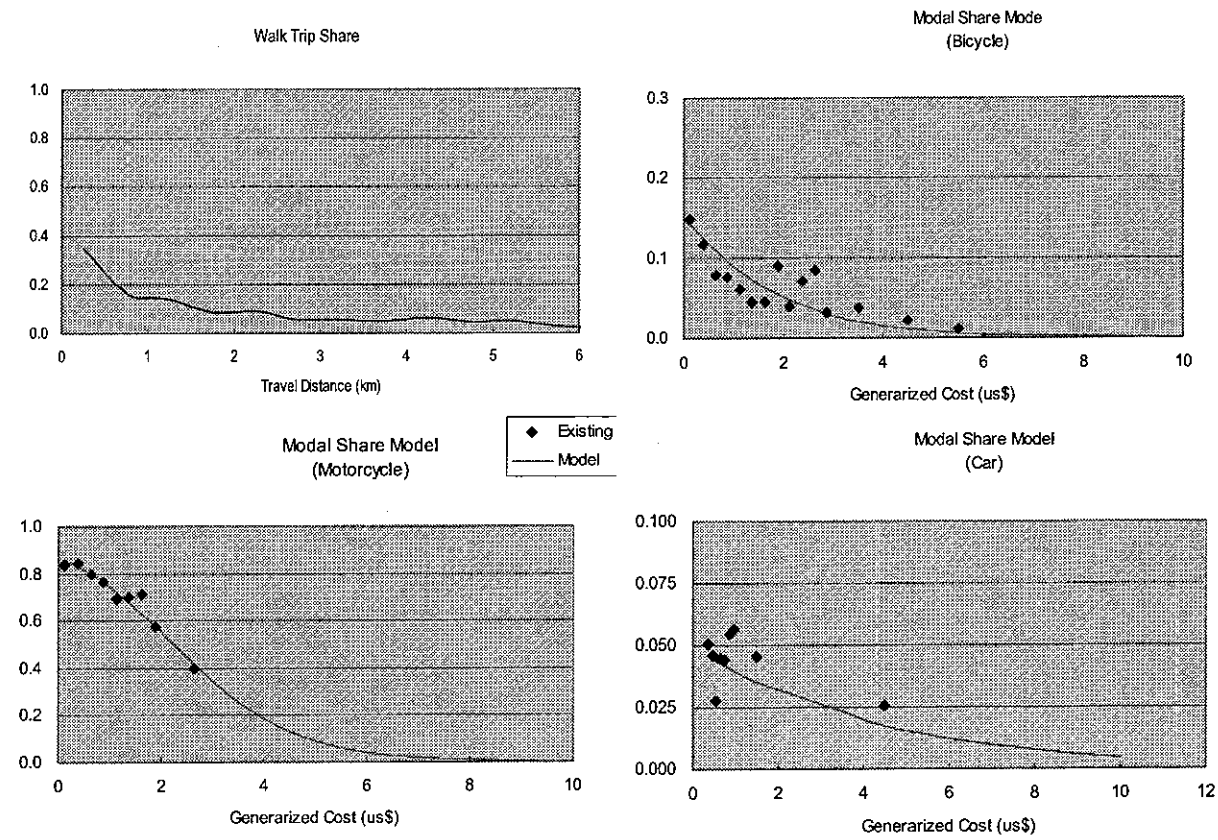
Table 5.1.5 Estimated Parameters of Modal Share Model

Mode	Parameter		Multiple Correlation
	α	β	
Bicycle	0.598	1.814	0.87
Motorcycle	0.829	-1.907	0.97
Car	0.139	2.950	0.62
Bus	0.513	3.052	0.64
Truck	0.133	3.963	0.97

Source: Study Team

Figure 5.1.5 and Table 5.1.6 compare the observed and modeled modal share. The chi-square value for the entire modal share is 1.56 which means that the fitness of observed and estimated values is significant. Trip length frequency distribution by mode, the fitness of "by motorcycle" mode, which accounts for almost 80% of all trips, is significant, while modeled values for some other transport modes indicated differences between observed and synthesized results (see Figure 5.1.6).

Figure 5.1.5 Comparison of Trip Length Distribution by Mode



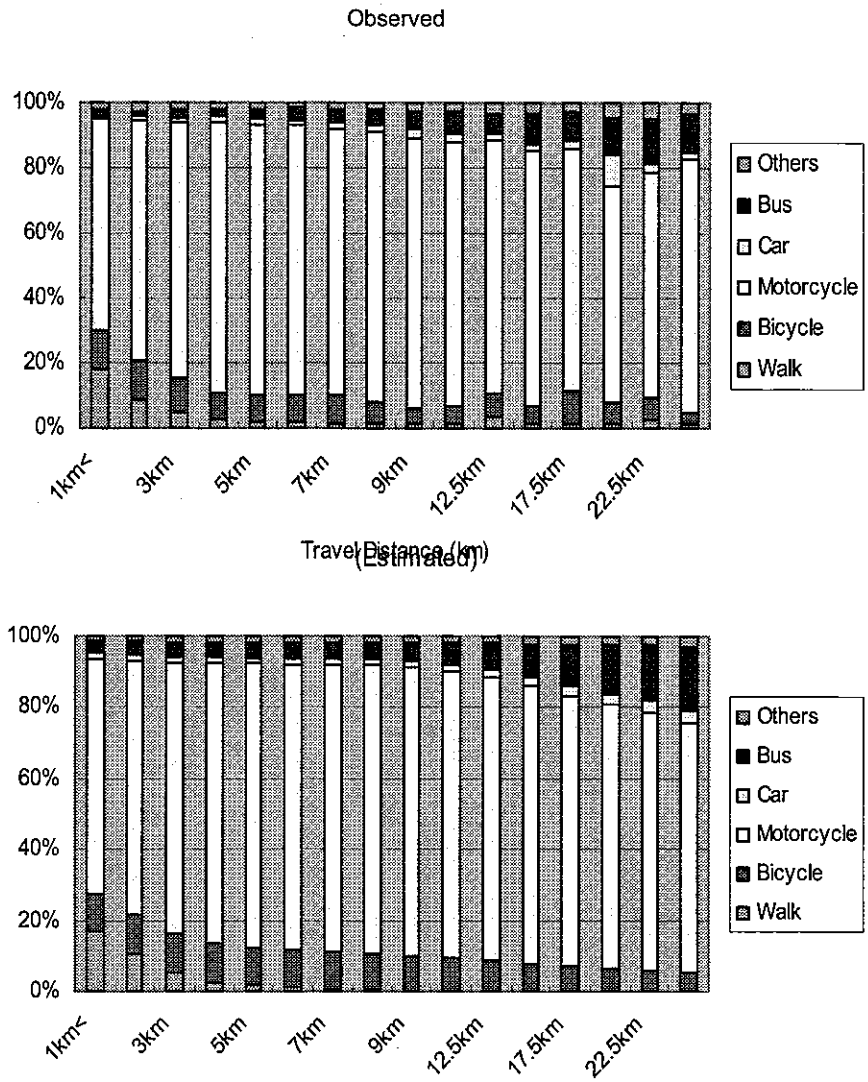
Source: Study Team

Table 5.1.6 Estimated Modal Share[1)]

	Observed		Estimated	
	No. of Trips (000)	Modal Share (%)	No. of Trips (000)	Modal Share (%)
Walk	550	4.6	560	4.5
Bicycle	1,080	9.0	1,224	9.9
Motorcycle	9,429	78.1	9,367	76.1
Car	214	1.8	215	1.8
Bus	485	4.0	744	6.0
Truck	313	2.6	197	1.6
Total	**12,072**	**100.0**	**12,307**	**100.0**

Source: Study Team
Note: Excluding intrazonal trips.

Figure 5.1.6 Comparison of Modal Share by Trip Length



Source: Study Team

(4) Road Capacity

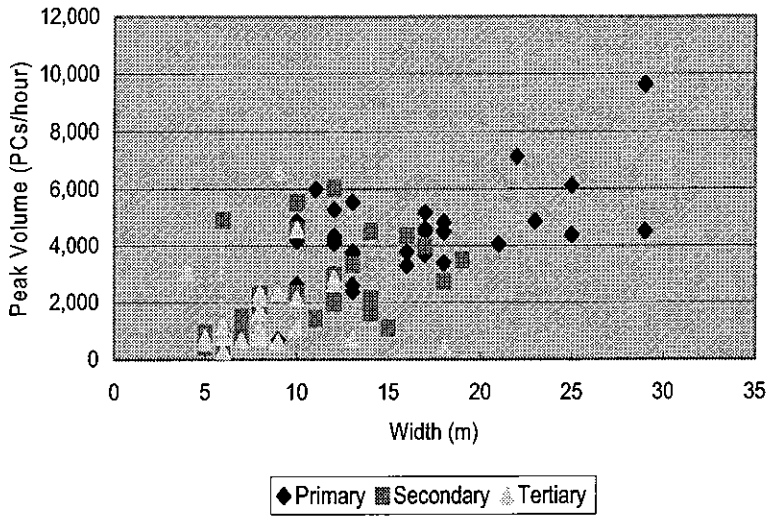
Road capacity is an important factor in determining traffic volume and congestion. Capacity is defined by road structure, traffic condition, and environment. Road capacity assumptions employed in the HOUTRANS were based on Japanese standards and the assumptions were updated according to the situation observed in HCMC.

Based on Japanese standards, the possible capacity of a road section is 2,200 PCUs/hour/lane in multiple lanes or 2,500 PCUs/hour in two-way two lanes. However, the actual capacity observed in HCMC is often higher than the possible capacity due to the following reasons:

- PCU of motorcycles in Japanese standards can not be applied.
- Motorcycles can travel on the shoulder of a road section.

The former parameter was determined by a micro-simulation test and the latter was included in the capacity estimate.

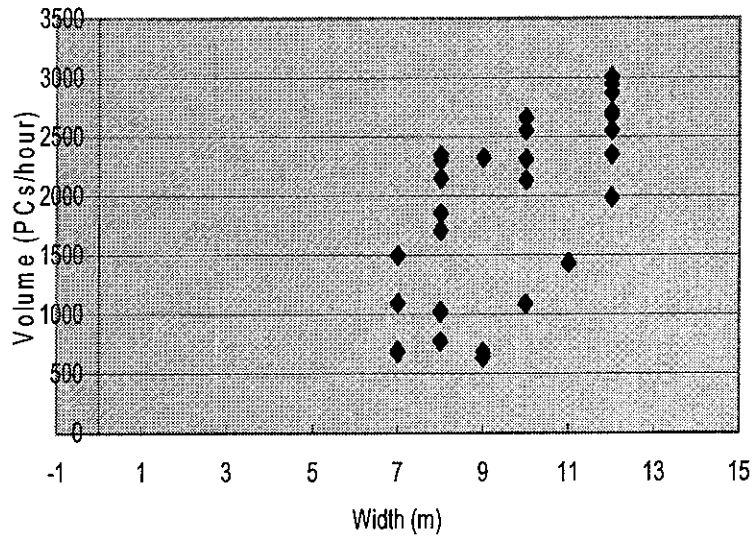
Figure 5.1.7 Observed Traffic Volume by Road Width



Source: Study Team

The number of motorcycles which travel along the road's shoulder can be assumed as 200 PCUs/hour/m width of shoulder based on a regression analysis of the observed data between 7m to 12m of the road width as shown in Figure 5.1.8.

Figure 5.1.8 Observed Traffic Volume by Road Width (7m-12m Width Road)



Source: Study Team

Possible capacity was defined based on the following assumptions:

- A road section of up to 10m width is equivalent to two lanes of road.
- A road section of up to 20m width is equivalent to four lanes of road.
- Lane width is assumed based on road class. And width of shoulder is calculated.
- Possible capacity is calculated by the number of lanes and width of shoulder.

Road capacity was calculated by multiplying possible capacity with reduction factors in which the following factors were considered:

- Class of road (highway, primary, secondary, and tertiary)
- Area (urban or rural)
- Roadside condition
- Signalized junction
- Road surface condition

Based on the road network surveys and the calibrated parameters, road capacities were estimated for all the roads in the study area network (see Table 5.1.7).

3) Description of 3rd Stage Model

The 3rd stage disaggregate model was developed to provide forecasts required for the evaluation of projects and schemes at feasibility level.

As described earlier, the model structure was designed to evaluate network feasibility and transport policies such as traffic demand management (TDM), pricing, and exclusive bus lane. The major difference between the 2nd stage model and the 3rd stage model was that in the latter trip distribution and the modal split models were developed according to five trip purposes and seven household (HH) types. The principal features are described as follows:

(1) Household Groups

Based on the analysis of the HIS, four household groups showed differences in trip behavior based on vehicle ownership. Trip characteristics further differed even within the same household group based on vehicle availability. As a result, models were developed for the following household groups:

- Car-owning households, by vehicle availability
- Households owning 2 or more motorcycles, by vehicle availability
- Households owning 1 motorcycle, by vehicle availability
- Households without motorized transport

(2) Trip Purposes

Trips were categorized into five trip purposes, as follows:

- To-work
- To-school
- Private trips
- Business
- To-home

(3) OD Matrix

All OD matrices thus developed represented daily average trips in the study area for five different purposes by seven different household groups via five different modes of travel.

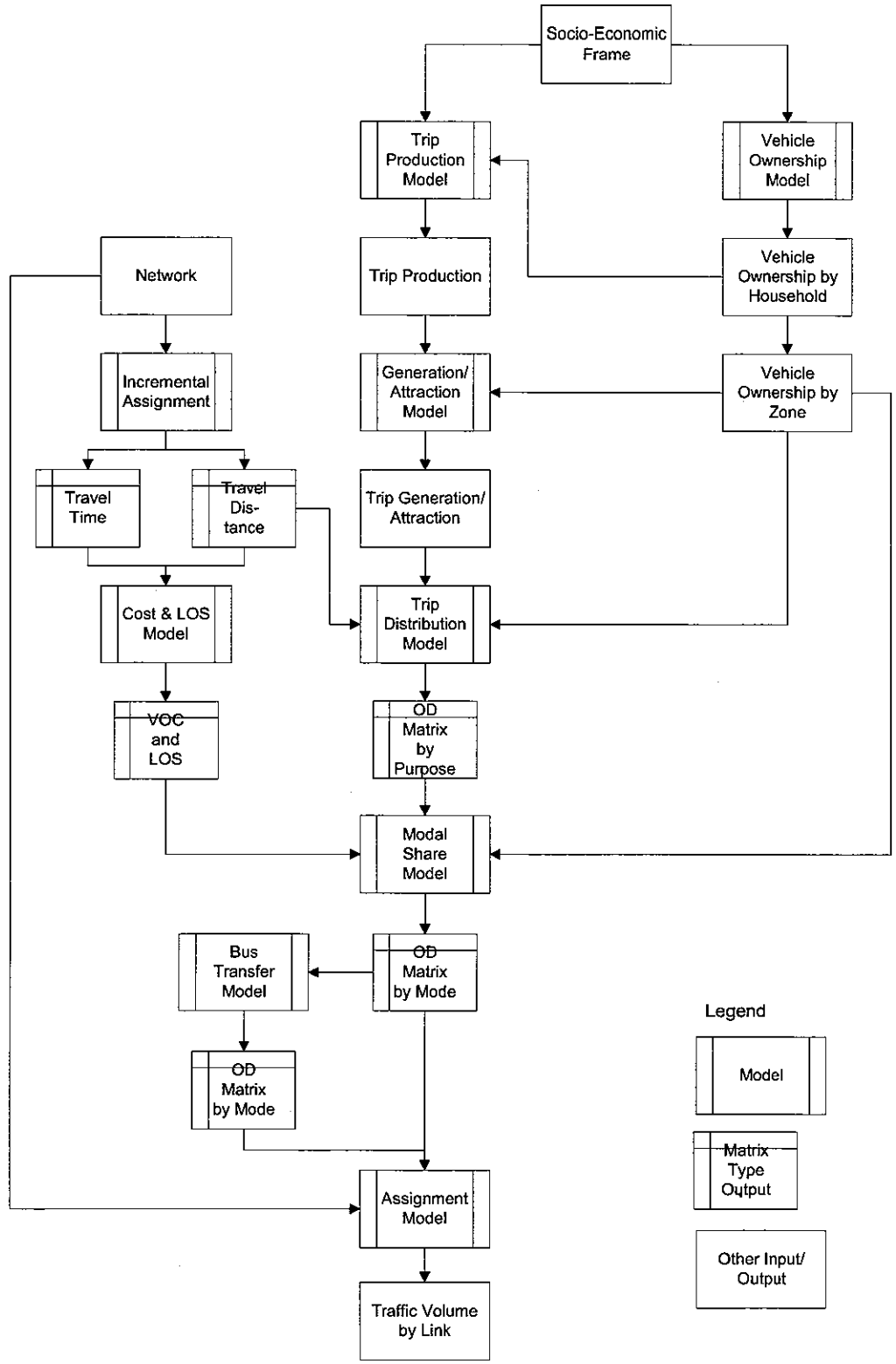
The overall process for forecasting transport demand using the 3rd stage model is illustrated in Figure 5.1.9.

Table 5.1.7 Estimated Road Capacity in Study Area

Class	Urban/ Rural	Vmax	Carriage-way Min	Carriage-way Max	No. of Lanes	Cross Section (max)	Fixed	per m	Qmax/hour Service Level 1	Qmax/hour Service Level 2	Qmax/hour Service Level 3	Qmax/day Service Level 1	Qmax/day Service Level 2	Qmax/day Service Level 3
Car Exclussive	Urban	80			2		1,300		2,600			26,000		
		100			4		2,200		8,800			88,000		
		100			6		2,200		13,200			132,000		
	Rural	70			2		1,000		2,000			20,000		
		80			4		1,760		7,000			70,000		
		80			6		1,760		10,600			106,000		
Primary	Urban	30		<6m	2	3m	2,500		1,300	1,400	1,600	16,250	17,500	20,000
		35	7m	<12m	2+α	3.5+2.5m	2,500	250	1,300	1,400	1,600	16,250	17,500	20,000
		40	13m	<20m	4+α	3.5+3.5+2.0m	2,200	300	4,500	5,100	5,600	56,250	63,750	70,000
		45	21m	<28m	6	3.5+3.5+3.5+2.0	2,200	300	6,800	7,600	8,400	85,000	95,000	105,000
		50	29m<		8	3.5+3.5+3.5+3.5+2.0	2,200		9,000	10,100	11,300	112,500	126,250	141,250
	Rural	40		<6m	2	3m	2,500		1,700	1,900	2,300	17,000	19,000	23,000
		45	7m	<12m	2+α	3.5+2.5m	2,500	250	1,700	1,900	2,300	17,000	19,000	23,000
		50	13m	<20m	4+α	3.5+3.5+2.0m	2,200	300	5,900	6,700	7,900	59,000	67,000	79,000
		55	21m	<28m	6	3.5+3.5+3.5+2.0	2,200	300	8,900	10,100	11,900	89,000	101,000	119,000
		60	29m<		8	3.5+3.5+3.5+3.5+2.0	2,200		11,900	13,500	15,800	119,000	135,000	158,000
Secondary	Urban	30		<6m	2	3m	2,500		1,100	1,300	1,400	13,750	16,250	17,500
		35	7m	<12m	2+α	3.5+2.5m	2,500	200	1,100	1,300	1,400	13,750	16,250	17,500
		40	13m	<20m	4+α	3.5+3.5+2.0m	2,200	220	3,900	4,400	4,900	48,750	55,000	61,250
		45	21m	<28m	6	3.5+3.5+3.5+2.0	2,200	220	5,900	6,700	7,400	73,750	83,750	92,500
		50	29m<		8	3.5+3.5+3.5+3.5+2.0	2,200		7,900	8,900	9,900	98,750	111,250	123,750
	Rural	40		<6m	2	3m	2,500		1,300	1,500	1,800	13,000	15,000	18,000
		45	7m	<12m	2+α	3.5+2.5m	2,500	200	1,300	1,500	1,800	13,000	15,000	18,000
		50	13m	<20m	4+α	3.5+3.5+2.0m	2,200	220	4,600	5,200	6,200	46,000	52,000	62,000
		55	21m	<28m	6	3.5+3.5+3.5+2.0	2,200	220	6,900	7,900	9,200	69,000	79,000	92,000
		60	29m<		8	3.5+3.5+3.5+3.5+2.0	2,200		9,200	10,500	12,300	92,000	105,000	123,000
Tertiary	Urban	25		<6m	2	3m	2,500		1,100	1,200	1,400	13,750	15,000	17,500
		30	7m	<12m	2+α	3+2.5m	2,500	200	1,100	1,200	1,400	13,750	15,000	17,500
		35	13m	<20m	4+α	3.5+3.5+2.0m	2,200	200	3,800	4,300	4,800	47,500	53,750	60,000
	Rural	35		<6m	2	3m	2,500		900	1,100	1,300	9,000	11,000	13,000
		40	7m	<12m	2+α	3.5+2.5m	2,500	200	900	1,100	1,300	9,000	11,000	13,000
		45	13m	<20m	4+α	3.5+3.5+2.0m	2,200	200	3,300	3,700	4,400	33,000	37,000	44,000

Source: Study Team

Figure 5.1.9 Configuration of 3rd Stage Model

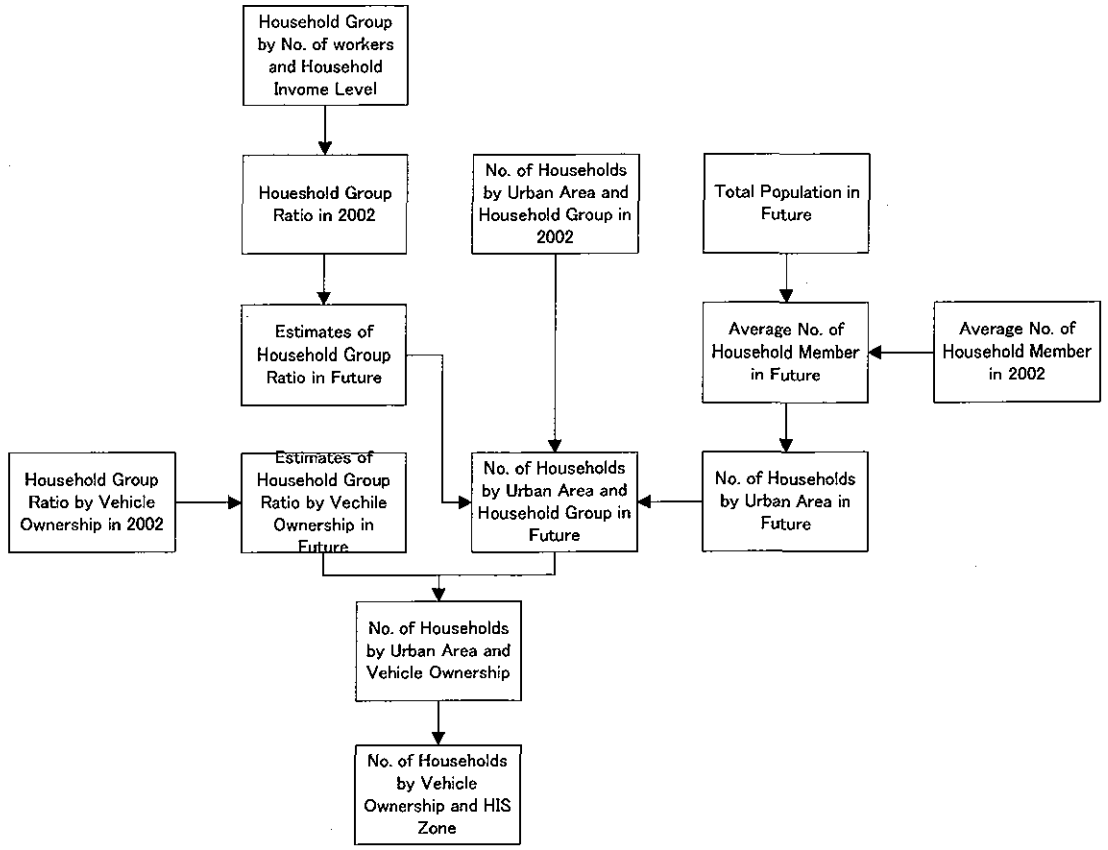


Source: Study Team

(4) Vehicle Ownership and Household Model

The procedure to estimate the number of households by vehicle ownership is shown in Figure 5.1.10.

Figure 5.1.10 Procedure for Estimating Vehicle Ownership and Household Model



Source: Study Team

The vehicle ownership and household model estimated the number of households owning vehicles per household group by breaking down the total population and households in the study area into HIS zones.

(5) Trip Production Model

The trip production model was used to calculate the control total, which is the total number of trips produced in the study area by household group and trip purpose. The trip rates by household group and trip purpose are given in Table 5.1.8.

Table 5.1.8 Trip Rate/Person by Household Group and Trip Purpose

Household Group	Availability of Vehicle for Use	Trip Purpose				
		To work	To school	Private	Business	To home
Owning car	Available	0.879	0.172	1.466	0.406	2.125
	Not-Available	0.190	0.485	0.792	0.079	1.341
Owning 2 M/Cs	Available	0.757	0.214	0.863	0.069	1.615
	Not-Available	0.180	0.378	0.718	0.020	1.207
Owning 1 M/C	Available	0.639	0.208	0.926	0.067	1.562
	Not-Available	0.211	0.364	0.737	0.017	1.235
Population of Non-motorized HHs		0.420	0.258	0.716	0.023	1.289

Source: Study Team

(6) Trip Generation/Attraction Model

Multiple linear regression analysis was used to develop trip generation/attraction models by household group. Calibrated model parameters are given in Table 5.1.9 and Table 5.1.10.

Table 5.1.9 Trip Generation Model Parameters

Trip Purpose	Variable	Household Group			
		Owning Car	Owning 2 M/Cs	Owning 1 M/C	Non-motorized
To Work	Resident primary workers	-	-	1.292	-
	Resident secondary workers	-	1.306	1.150	-
	Resident tertiary workers	-	1.179	0.875	-
	Resident workers total	1.392	-	-	1.054
	Constant	33.1	31.9	28.6	-
To School	Resident primary students	-	1.331	1.042	-
	Resident secondary students	-	1.243	1.102	-
	Resident tertiary students	-	0.927	1.388	-
	Resident students total	1.195	-	-	1.076
	Constant	-	-	-	-
Private	Population	0.989	0.726	0.667	0.668
	Workers total	1.125	0.331	0.237	-
	Constant	-	-	-	106.5
Business	Secondary workers	-	0.072	0.035	-
	Tertiary workers	0.787	0.154	0.104	0.053
	Constant	55.5	32.2	178.6	22.9
To Home	Population	0.077	-	0.348	0.673
	Tertiary workers	-	0.269	-	-
	Worker total	3.152	2.667	2.256	1.456
	Constant	248.1	-	1298.2	51.9

Source: Study Team

Table 5.1.10 Trip Attraction Model Parameters

Trip Purpose	Zonal Variable	Household Group			
		Owning Car	Owning 2 M/Cs	Owning 1 M/C	Non-motorized
To Work	Primary workers	0.174	-	1.228	1.453
	Secondary workers	2.682	1.356	1.202	0.995
	Tertiary workers	1.057	1.276	0.951	0.791
	Constant	53.7	39.5	-	6.3
To School	Primary students	-	0.997	1.085	-
	Secondary students	-	1.367	1.176	-
	Tertiary students	-	1.286	1.000	-
	Students total	1.115	-	-	1.108
	Constant	10.0	-	-	-
Private	Population	0.989	0.340	0.308	0.510
	Tertiary workers	1.125	1.846	2.166	0.580
	Constant	159.1	-	708.0	185.5
Business	Population	-	-	-	0.008
	Secondary workers	-	0.097	0.051	-
	Tertiary workers	0.492	0.153	0.097	-
	Workers total	65.9	-	-	-
	Constant	-	-	171.4	21.7
To Home	Population	2.040	-	1.403	1.225
	Resident workers total	0.075	1.604	-	0.238
	Constant	2.1	-	604.9	-

Source: Study Team

The models developed by household group and vehicle ownership were analyzed. However, since the grouping was too detailed, the size of data became too small for the analysis. Hence, the models were later developed by household group, and estimated trips by model were distributed according to vehicle availability.

(7) Trip Distribution Model

The trip distribution model calculates the number of trips from generated zone to attracted zone. In general, trip volume between zones has a strong correlation to trip generation and attraction. The formula below is known as the gravity model and is often applied to generate trip distribution. HOUTRANS employed a similar gravity model and the estimated parameters are shown in Table 5.1.11.

$$T_{ij} = K \cdot G_i^{\alpha} \cdot A_j^{\beta} \cdot d_{ij}^{\gamma}$$

An important factor in the formula is impedance. For this analysis, the distance traveled via the shortest route between zones and the generalized travel cost were examined. The distance traveled using the shortest route between zones was selected due to the following reasons:

- Good fitness could be obtained in case of usage of travel distance.
- Change of network was sensitively reflected on the distribution.
- Generalized travel cost required an assumption of mode used before modal choice.

As shown in Table 5.1.11, parameters of gamma in the business trip models indicated a positive value which appeared to be unreliable and unreasonable due to the limited information obtained from the HIS. Therefore, the private trip models were applied instead in estimating the distribution of business trips.

An OD matrix by household group, vehicle ownership and purpose was estimated using the above-mentioned models which output the total number of trips made per day.

Table 5.1.11 Trip Distribution Model Parameters

Household Group	Availability of Personal Vehicle	Trip Purpose	Parameters				
			K	Alpha	Beta	Gamma	R^2
Owning Car	Available	To Work	1.392	0.332	0.309	-0.018	0.525
		To School	2.780	0.413	0.190	-0.030	0.636
		Private	0.968	0.414	0.320	-0.041	0.612
		Business	1.068	0.446	0.442	0.009	0.831
		To Home	1.385	0.259	0.343	-0.017	0.489
	Not Available	To Work	3.022	0.329	0.316	-0.026	0.594
		To School	0.859	0.497	0.324	-0.038	0.657
		Private	3.222	0.310	0.287	-0.030	0.617
		Business	1.000	0.000	1.000	0.000	1.000
		To Home	3.149	0.268	0.263	-0.021	0.413
Owning 2 M/Cs	Available	To Work	0.732	0.326	0.266	-0.290	0.351
		To School	3.587	0.249	0.164	-0.115	0.319
		Private	1.306	0.321	0.224	-0.179	0.287
		Business	2.844	0.297	0.188	0.112	0.366
		To Home	0.247	0.334	0.368	-0.340	0.377
	Not Available	To Work	0.634	0.283	0.369	-0.029	0.369
		To School	1.289	0.338	0.197	-0.244	0.313
		Private	0.793	0.303	0.327	-0.132	0.320
		Business	0.815	0.362	0.477	0.133	0.752
		To Home	0.362	0.315	0.357	-0.271	0.310
Owning 1 M/C	Available	To Work	0.434	0.407	0.297	-0.144	0.362
		To School	1.756	0.472	0.162	-0.032	0.540
		Private	0.290	0.474	0.303	-0.021	0.404
		Business	1.697	0.287	0.382	0.093	0.555
		To Home	0.112	0.359	0.499	-0.212	0.398
	Not Available	To Work	0.382	0.377	0.357	-0.048	0.416
		To School	0.291	0.396	0.357	-0.220	0.366
		Private	0.127	0.467	0.406	-0.174	0.447
		Business	0.631	0.528	0.398	0.019	0.768
		To Home	0.024	0.501	0.505	-0.301	0.415
Non-motorized HHs		To Work	1.206	0.298	0.339	-0.081	0.471
		To School	1.624	0.272	0.333	-0.043	0.522
		Private	0.882	0.359	0.332	-0.022	0.468
		Business	0.794	0.538	0.447	-0.101	0.830
		To Home	0.449	0.380	0.349	-0.145	0.405

Source: Study Team

(8) Modal Share Model

Dis-Aggregate Model for Walk Trips: The modal share of walking between zones *i* and *j* were calculated by trip purpose and household group, to wit:

$$P_{ij}^{lk} = \frac{1}{1+e^{\alpha d_{ij}+\beta}}$$

Where:
- P_{ij}^{lk} : Probability of walk trips of purpose *k* and ownership *l* between *zones i* and *j*
- d_{ij} : Interzonal impedance
- α, β : Parameter

Here, walk trips were classified into 10 groups, and models were calibrated for each group. The calibrated parameters are given in Table 5.1.12.

Table 5.1.12 Walk Trip Model Parameters

Purpose	To Work		To School		Private		Business		To Home	
Personal Vehicle Availability	Available	Not Available	Available	Not Available	Available	Not Available	Available	Not Available	Available	Not Available
α	0.364	0.289	1.335	0.254	0.512	0.239	1.151	0.170	0.364	0.344
t-Value	*5.12*	*2.64*	*6.11*	*4.72*	*6.49*	*7.25*	*2.19*	*2.73*	*5.59*	*4.54*
β	2.076	0.201	1.324	0.412	1.294	0.064	1.467	0.787	1.781	-0.240
t-value	*4.79*	*1.42*	*2.63*	*1.26*	*4.74*	*1.19*	*1.94*	*2.57*	*4.99*	*-1.58*
R^2	*0.97*	*0.97*	*0.95*	*0.88*	*0.96*	*0.96*	*0.92*	*0.84*	*0.96*	*0.95*

Source: Study Team

Aggregated Logit Model for Other Modes: Next, the modal shares of remaining modes were expressed as follows:

$$P_{ij}^{mk} = \frac{e^{\lambda V_{ij}^{mk}}}{\sum_{q} e^{\lambda V_{ij}^{qk}}}$$

Where

P_{ij}^{mk} : Probability of mode *m* for purpose *k* between *zones i* and *j*

V_{ij}^{mk} : Indirect utility function by mode *m* for purpose *k* between *zone i* and *j*

γ : Parameter

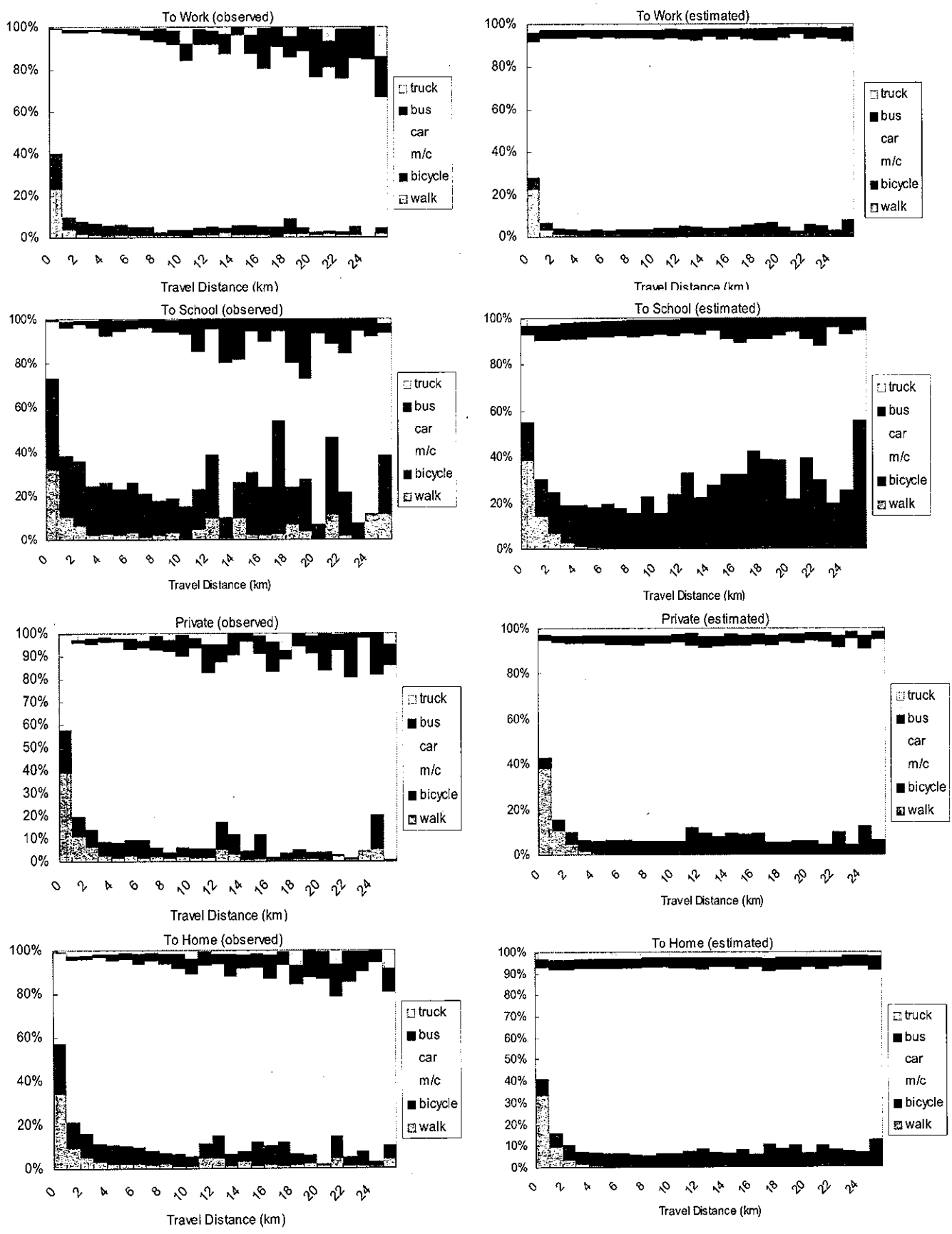
As an explanatory variable, generalized costs, described in the previous subsection, were used. Table 5.1.13 shows the result of estimating the parameters.

Table 5.1.13 Modal Share Model Parameters

Model & Modal Split Model Parameters		Trip Purpose				
Mode	**Parameter**	To Work	To School	Private	Business	To Home
Bicycle	Constant	0.7000	0.7000	0.7000	0.7000	0.7000
	Time	-	-	-	-4.0144	-
	Distance	-0.1500	-0.1500	-0.1500	-0.1500	-0.1500
	VoC (VND)	-0.0069	-0.0151	-0.0116	-	-0.0108
	Single M/C HH (0/1)	1.7450	2.0072	2.4524	-	2.2113
	No Vehicle HH (0/1)	2.3793	2.1256	1.2833	-	1.6730
	Veh-Available (0/1)	-0.9700	-	-2.7932	-	-1.0446
Motorcycle	Constant	-0.2600	-0.2600	-0.2600	-0.2600	-0.2600
	Time	-	-	-	-3.7722	-
	VoC (VND)	-0.0010	-0.0025	-0.0018	-	-0.0017
	Multi-M/C HH (0/1)	1.1726	0.9392	2.2827	-	1.3537
	Single M/C HH (0/1)	1.5450	1.8338	2.7616	-	2.1930
	Veh-Available (0/1)	2.9246	3.5250	-	-	2.4340
Car	Time	-	-	-	-6.4922	-
	VoC (VND)	0.00030	0.00093	0.00060	-	-0.00057
	Car Own HH (0/1)	2.2974	-	-	-	2.2503
Bus	Constant	0.3250	0.3250	0.3250	0.3250	0.3250
	Bus Fare	-0.00096	-0.00359	-0.00225	-0.00018	-0.00228
	Bus Time	-	-	-	-9.6750	-
	Multi-M/C HH (0/1)	-1.2991	-	-	-	-
	Single M/C HH (0/1)	-0.9346	-	-	-	-
	Veh-Available (0/1)	-	-	-1.8453	-	-0.4152

Source: Study Team

Figure 5.1.11 Comparison of Modal Shares by Purpose and Trip Length

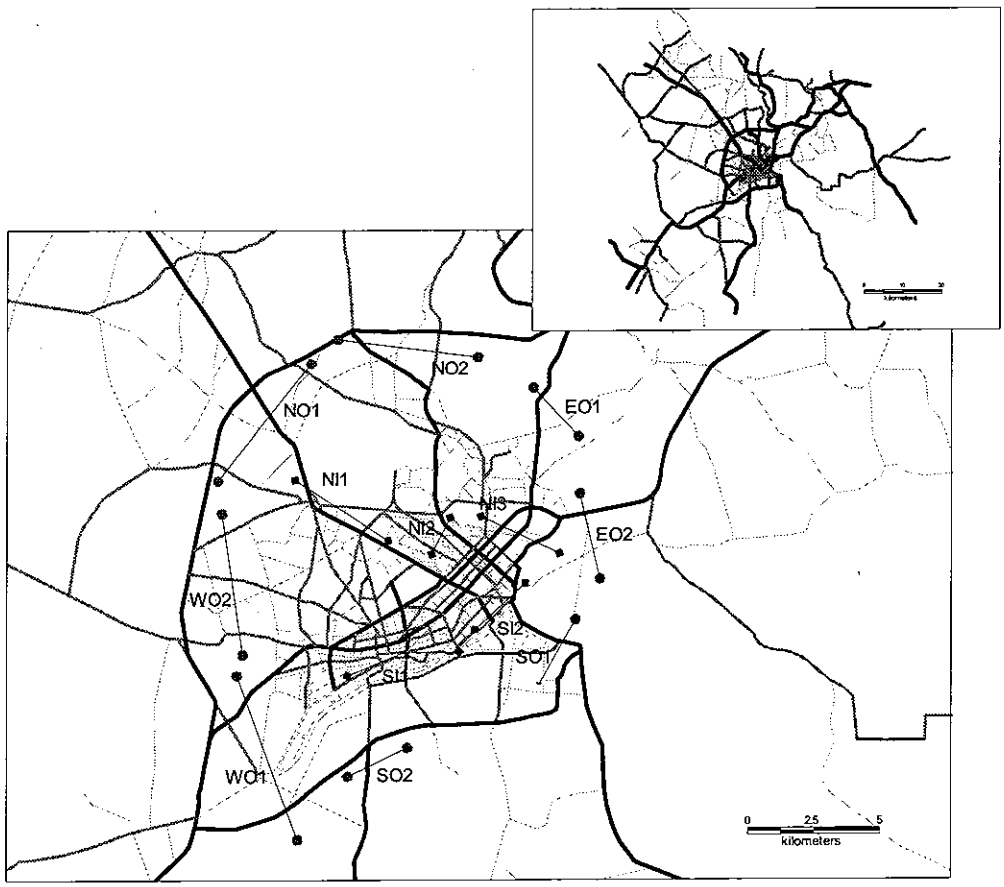


Source: Study Team

4) Calibration of Network Assignment Model

The road network depicted in Figure 5.1.12 was used for the traffic assignment analysis. Attributes, such as lane width, pedestrian lane width, road condition, and other information, were collected to calculate road capacities. For calibration of models, the observed traffic volume from surveys were compared to the assigned traffic volumes (Figure 5.1.13).

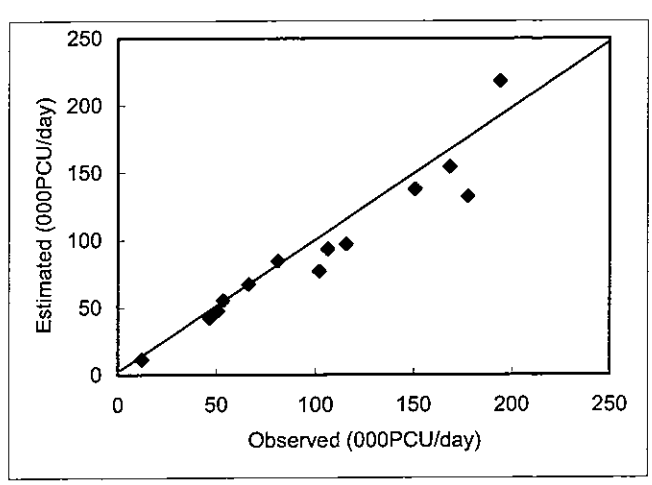
Figure 5.1.12 Network for Traffic Assignment



Source: Study Team

Figure 5.1.13 Comparison between Observed and Assigned Traffic Volume

Section		2002				
		Capacity (000PCU /day)	Observed		Estimated	
			PCU (000)	VCR	PCU (000)	VCR
North	In-1	173	168	0.97	155	0.89
	In-2	140	177	1.26	132	0.94
	In-3	299	194	0.65	218	0.73
	Out-1	84	102	1.22	77	0.92
	Out-2	53	53	1.00	55	1.04
East	Out-1	57	66	1.16	67	1.18
	Out-2	81	116	1.43	97	1.20
South	In-1	90	151	1.67	138	1.53
	In-2	89	106	1.19	94	1.05
	Out-1	49	51	1.04	47	0.98
	Out-2	13	12	0.94	11	0.89
West	Out-1	93	81	0.87	85	0.91
	Out-2	43	47	1.08	42	0.98
Total		1,265	1,324	1.05	1,220	0.96



Source: HOUTRANS Traffic Surveys

5.2 Future Flows of People and Goods

1) Total Demand

The future traffic demand in the recommended scenario of urban growth case was estimated using travel demand forecast models. Based on the HIS, the total travel demand in the study area in 2002, including walking, was 22 million trips and it is expected to increase to 41 million trips (1.86 times) by 2020. Excluding walking, total demand will be 36 million trips by 2020.

2) Trip Generation/Attraction

It is expected that future trip generation/attraction will still concentrate in the city center because the planned scenario of decentralization may not be sufficient both for night-time population and daytime socio-economic activities (refer to Figure 5.2.1 and Table 5.2.4). The CBD contributes to account for roughly a fourth of the total demand (refer to Table 5.2.2).

3) Trip Distribution

The total demand of 36 million trips was distributed over the study area which resulted in a high concentration in the CBD and within broadly classified areas (refer to Table 5.2.2 and Figure 5.2.3). Average trip length[3] will become longer from the existing 6.6km to about 9km in 2020, which is still shorter when compared to other mega cities in Southeast Asia.[4]

4) Modal Share

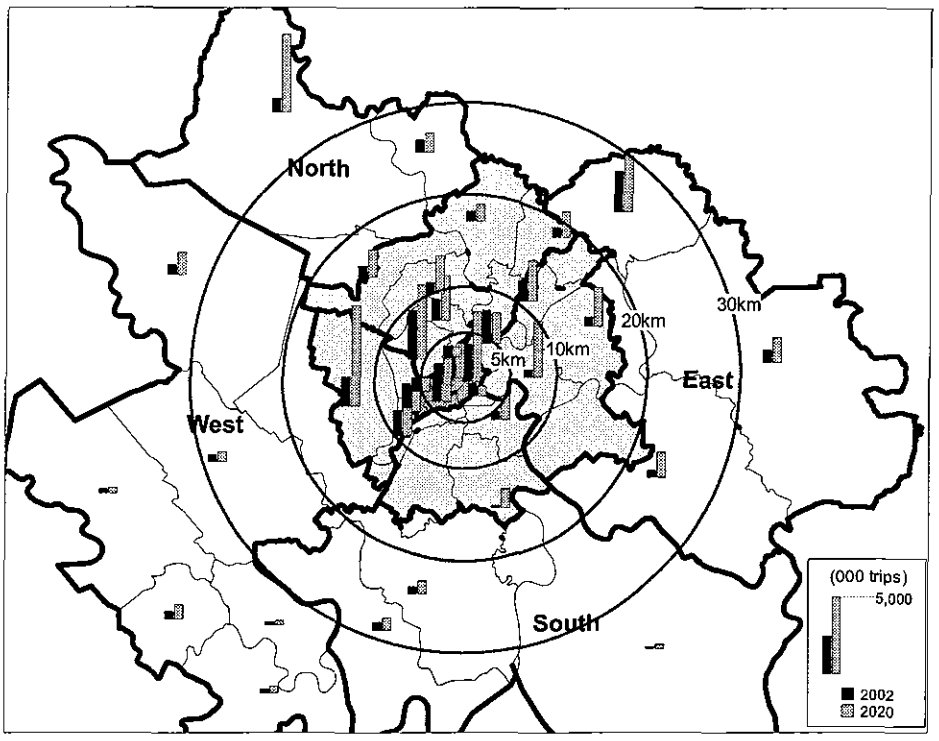
Future modal share due to the changes in vehicle ownership was examined. The result showed that the future modal share of travel by car will increase from 3% to 10-20%[5] when the ratio for car-owning households in the study area increases from 1.6% to 19%. As for bus usage, the rate will decrease from 3.1% to 2.6% due to a rapid growth in vehicle ownership.

[3] Excluding intrazonal trips.

[4] Present average trip length in Metro Manila is about 10km.

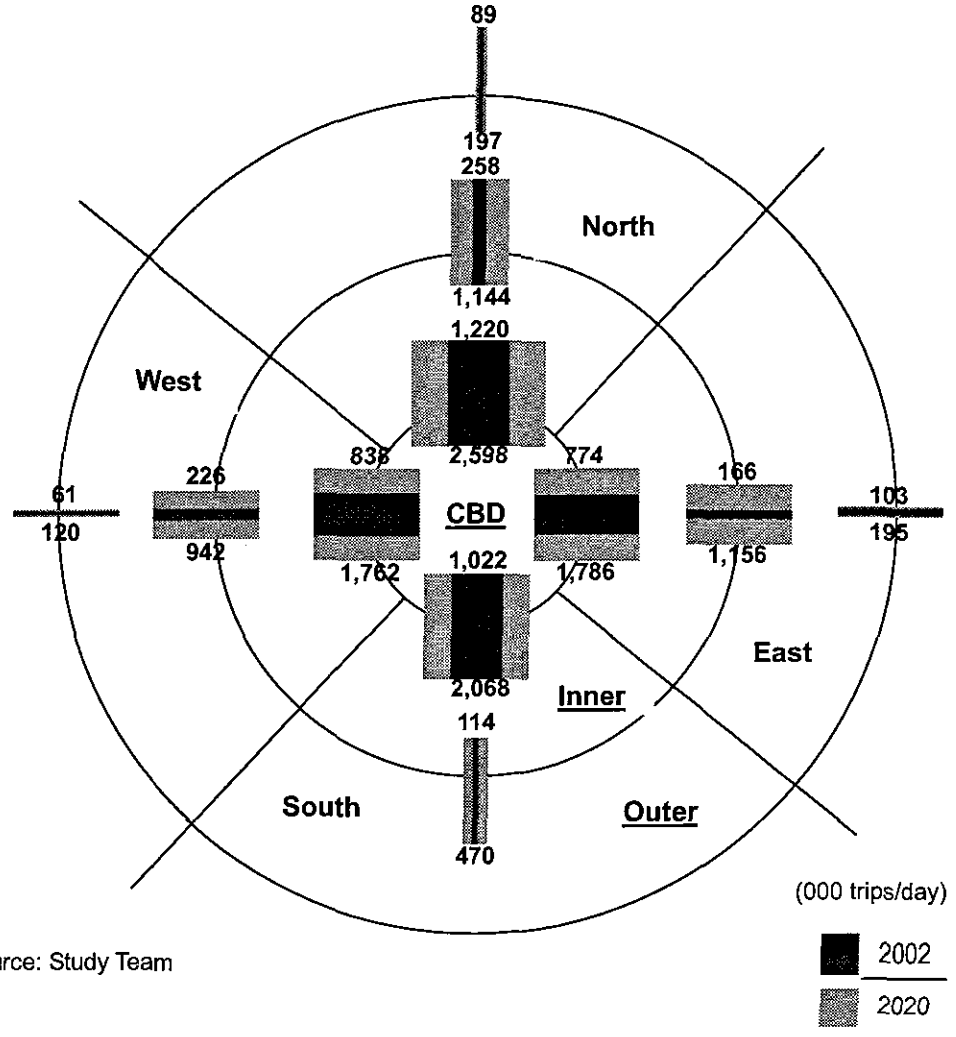
[5] If current modal share by trip purpose and current vehicle ownership will remain, the rate of car trips will be 10.9% due to the increase in car-owning households. On the other hand, this situation where 20% of households have car(s) is very similar to the case in Metro Manila in 1996 (19.7%) when the modal share of cars was 20.9%. In the case of Jakarta, car ownership was 17.2% and modal share of cars was 21% (except in NMT) in 2002.

Figure 5.2.1 Comparison of Trip Generation and Attraction, 2002 and 2020



Source: Study Team

Figure 5.2.2 Growth of Demand by Direction, 2002-2020



Source: Study Team

Table 5.2.1 Distribution of 2002 Demand

Total Daily Trips (,000/day)

Area		CBD	East		North		West		South		Out-side	Total
			Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer		
CBD		2,739	336	22	525	28	363	27	436	18	26	4,520
East	Inner	336	1,532	39	249	10	25	2	45	2	21	2,261
	Outer	22	39	1,851	17	2	2	0	3	1	17	1,956
North	Inner	525	249	17	2,463	82	155	5	52	1	21	3,570
	Outer	28	10	2	82	935	5	1	2	2	16	1,083
West	Inner	363	25	2	155	5	869	68	72	6	8	1,593
	Outer	27	2	0	5	1	68	1,506	11	17	4	1,641
South	Inner	436	45	3	52	2	72	11	1,121	28	9	1,779
	Outer	18	2	1	1	2	6	17	28	644	5	724
Outside		26	21	17	21	16	8	4	9	5	28	154
Total		4,520	2,261	1,956	3,570	1,083	1,593	1,641	1,779	724	154	19,281

Source: Study Team

Table 5.2.2 Distribution of Future Demand, 2020

Total Daily Trips (,000)

Area		CBD	East		North		West		South		Out-side	Total
			Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer		
CBD		2,933	699	52	950	94	651	88	740	39	11	6,257
East	Inner	699	2,954	331	758	88	117	19	269	14	36	5,285
	Outer	52	331	2,792	150	20	4	2	39	5	46	3,440
North	Inner	950	758	150	3,604	323	472	41	216	9	33	6,555
	Outer	94	88	20	323	2,812	37	9	17	13	67	3,480
West	Inner	651	117	4	472	37	1,543	270	209	32	11	3,347
	Outer	88	19	2	41	9	270	2,508	51	96	21	3,103
South	Inner	740	269	39	216	17	209	51	1,185	128	9	2,861
	Outer	39	14	5	9	13	32	96	128	977	22	1,335
Outside		11	36	46	33	67	11	21	9	22	10	266
Total		6,257	5,285	3,440	6,555	3,480	3,347	3,103	2,861	1,335	266	35,929

% of Total Daily Trips

Area		CBD	East		North		West		South		Out-side	Total
			Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer		
CBD		8.2	1.9	0.1	2.6	0.3	1.8	0.2	2.1	0.1	0.0	17.4
East	Inner	1.9	8.2	0.9	2.1	0.2	0.3	0.1	0.7	0.0	0.1	14.7
	Outer	0.1	0.9	7.8	0.4	0.1	0.0	0.0	0.1	0.0	0.1	9.6
North	Inner	2.6	2.1	0.4	10.0	0.9	1.3	0.1	0.6	0.0	0.1	18.2
	Outer	0.3	0.2	0.1	0.9	7.8	0.1	0.0	0.0	0.0	0.2	9.7
West	Inner	1.8	0.3	0.0	1.3	0.1	4.3	0.8	0.6	0.1	0.0	9.3
	Outer	0.2	0.1	0.0	0.1	0.0	0.8	7.0	0.1	0.3	0.1	8.6
South	Inner	2.1	0.7	0.1	0.6	0.0	0.6	0.1	3.3	0.4	0.0	8.0
	Outer	0.1	0.0	0.0	0.0	0.0	0.1	0.3	0.4	2.7	0.1	3.7
Outside		0.0	0.1	0.1	0.1	0.2	0.0	0.1	0.0	0.1	0.0	0.7
Total		17.4	14.7	9.6	18.2	9.7	9.3	8.6	8.0	3.7	0.7	100.0

Source: Study Team

Table 5.2.3 Growth of Distributed Demand, 2002 and 2020

Ratio of 2020/2002

Area		CBD	East		North		West		South		Out-side	Total
			Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer		
CBD		1.1	2.1	2.4	1.8	3.4	1.8	3.3	1.7	2.2	0.4	1.4
East	Inner	2.1	1.9	8.5	3.0	8.8	4.7	9.5	6.0	7.0	1.7	2.3
	Outer	2.4	8.5	1.5	8.8	10.0	2.0	-	13.0	5.0	2.7	1.8
North	Inner	1.8	3.0	8.8	1.5	3.9	3.0	8.2	4.2	9.0	1.6	1.8
	Outer	3.4	8.8	10.0	3.9	3.0	7.4	9.0	8.5	6.5	4.2	3.2
West	Inner	1.8	4.7	2.0	3.0	7.4	1.7	4.0	2.9	5.3	1.4	2.1
	Outer	3.3	9.5	-	8.2	9.0	4.0	1.7	4.6	5.6	5.3	1.9
South	Inner	1.7	6.0	13.0	4.2	8.5	2.9	4.6	1.1	4.6	1.0	1.6
	Outer	2.2	7.0	5.0	9.0	6.5	5.3	5.6	4.6	1.5	4.4	1.8
Outside		0.4	1.7	2.7	1.6	4.2	1.4	5.3	1.0	4.4	0.4	1.7
Total		1.4	2.3	1.8	1.8	3.2	2.1	1.9	1.6	1.8	1.7	1.9

Source: Study Team

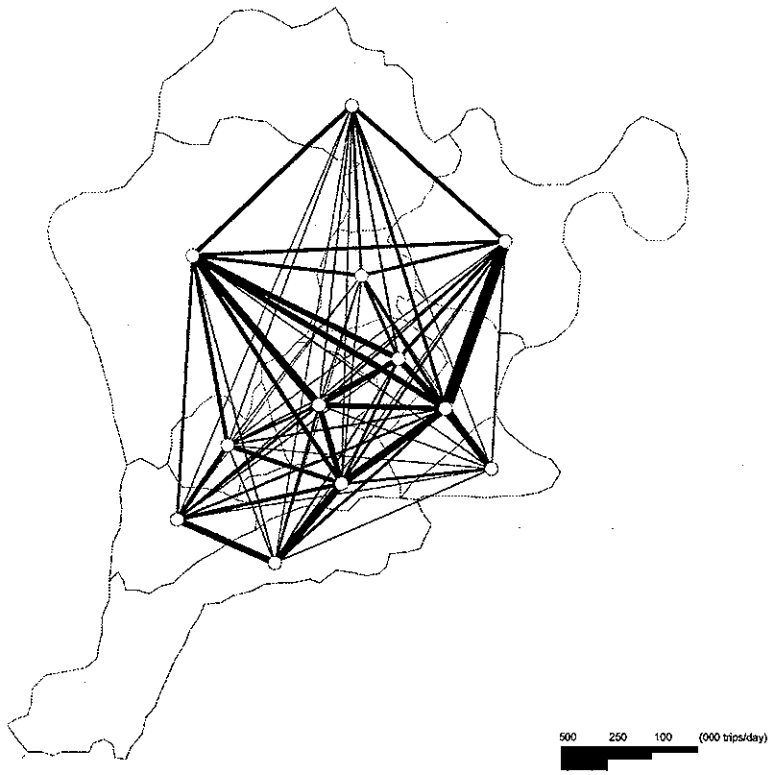
Table 5.2.4 Trip Generation and Attraction by District, 2002 and 2020

Area Type / District Name	Population (000)		Total (Generations + Attractions) Trips (,000/day)	
	2002	2020	2002	2020
HCMC Total	***5,410***	***10,000***	***28,007***	***53,886***
Inner Core	**1,810**	**1,691**	**11,610**	**14,707**
District 1	229	218	2,467	4,459
District 3	224	197	1,484	2,288
District 4	200	177	887	733
District 5	212	204	1,758	2,294
District 6	267	272	1,833	1,540
District 10	248	208	1,421	1,720
District 11	246	232	992	937
Phu Nhuan	185	184	769	736
Inner Fringe	**1,801**	**2,899**	**8,432**	**11,473**
District 8	348	410	1,670	1,880
Binh Thanh	417	522	2,190	2,006
Tan Binh	680	1,171	3,193	4,703
Go Vap	356	797	1,378	2,884
Emerging Peripheries	**1,198**	**3,904**	**5,763**	**19,282**
Thu Duc	228	523	1,279	2,615
District 12	198	592	785	2,434
Binh Chanh	384	1,444	1,914	6,429
District 2	109	657	483	3,619
District 7	120	279	584	1,611
District 9	160	409	717	2,573
Suburban	**282**	**584**	**1,033**	**3,107**
Hoc Mon	213	446	789	1,763
Nha Be	68	138	244	1,344
Rural	**319**	**922**	**1,168**	**5,318**
Cu Chi	258	829	949	5,003
Can Gio	61	92	219	316
Province Total	**2,244**	**3,500**	**10,246**	**17,439**
Satellite Urban	**781**	**1,194**	**4,114**	**6,017**
Thu Dau Mot	156	250	918	1,306
Bien Hoa	507	744	2,595	3,626
Tan An	118	200	601	1,085
Suburban	**244**	**516**	**1,352**	**2,780**
Thuan An	128	214	669	1,117
Di An	115	302	683	1,664
Rural	***1,219***	***1,791***	***4,781***	***8,642***
Long Thanh	201	300	897	1,710
Nhon Trach	114	300	512	1,668
Can Giuoc	159	205	569	849
Can Duoc	168	228	604	899
Chau Thanh	101	122	355	507
Thu Thua	88	107	313	422
Ben Luc	129	154	563	715
Duc Hoa	197	300	737	1,526
Tan Tru	62	74	231	346
Study Area Total	**7,653**	**13,500**	**38,253**	**71,325**

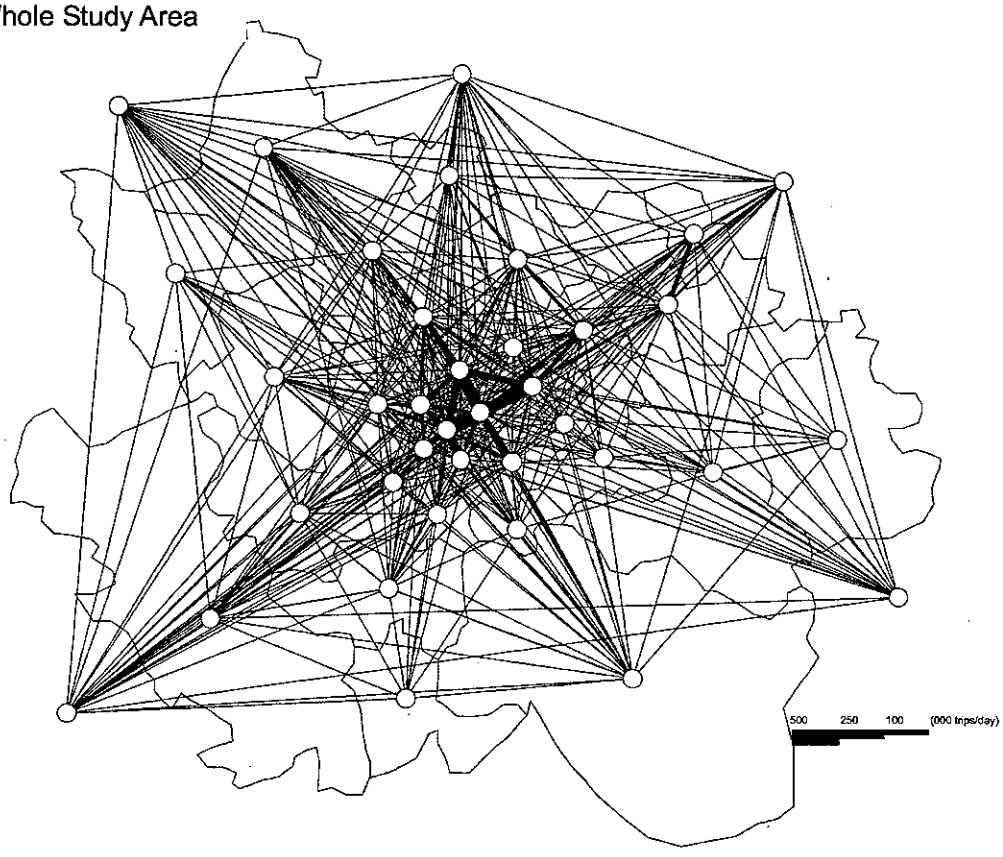
Source: Study Team

Figure 5.2.3 Present Trip Distribution, 2002

12 Urban Districts



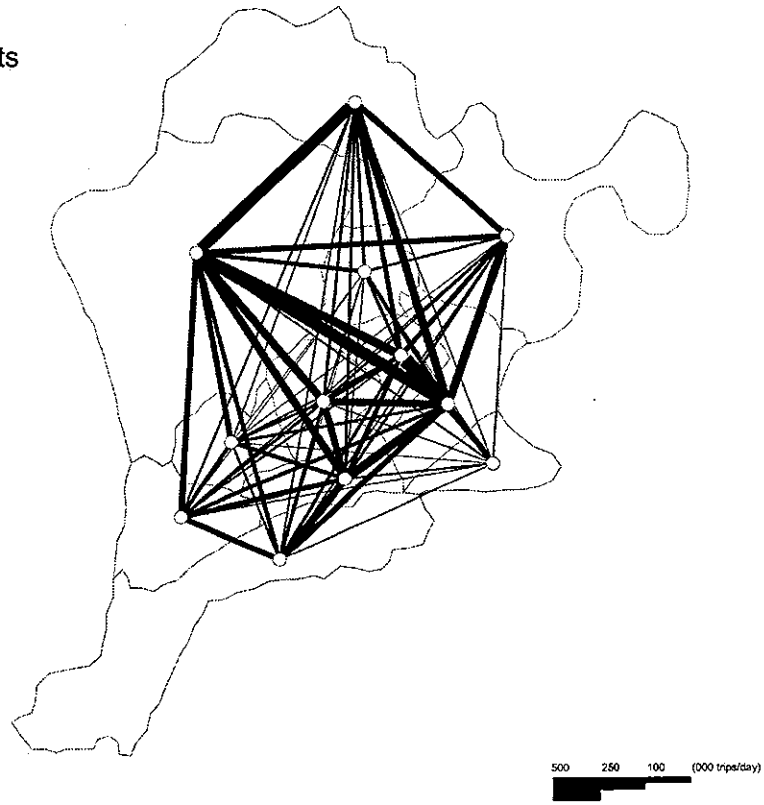
Whole Study Area



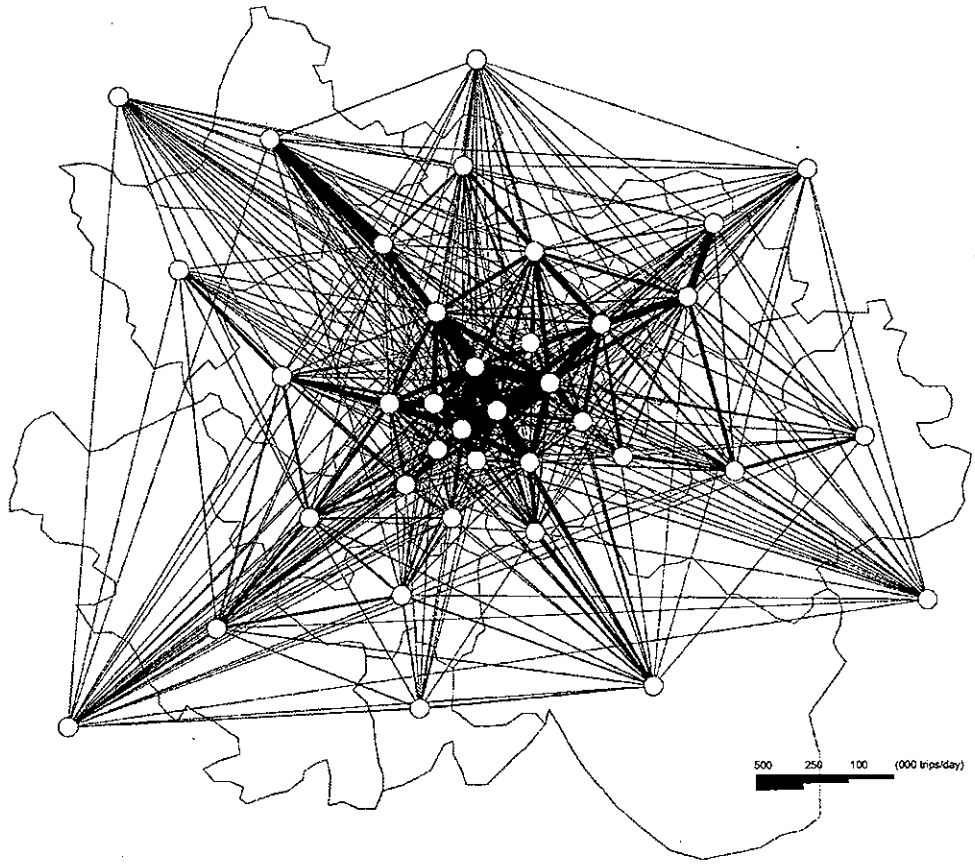
Source: Study Team

Figure 5.2.4 Future Trip Distribution, 2020

12 Urban Districts



Whole Study Area



Source: Study Team