Appendix 1 INDUSTRIAL DEVELOPMENT IN HCM METROPOLITAN AREA

1.1 Industrial Development Situation

1) HCMC

Up to 2003, city authorities had approved 22 development schemes for the city's industrial areas. However, business and operation licenses were issued only for 14 schemes, including 11 industrial zones (IZs) and three export processing zones (EPZs). Table 1.1.1 lists these developed or developing IZs and EPZs, which have a total land area of 2,295ha. Figure 1.1.1 shows the locations of these IZs and EPZs. In order to manage these IZs and EPZs and promote investments in these areas, the HCMC Export Processing and Industrial Zones Authority (HEPZA) was created through a Prime Minister's decree in 1996. The HEPZA, along with city authorities, also carries out investigations and supervisions on the environmental impacts made by the factories located inside the IZs and EPZs.

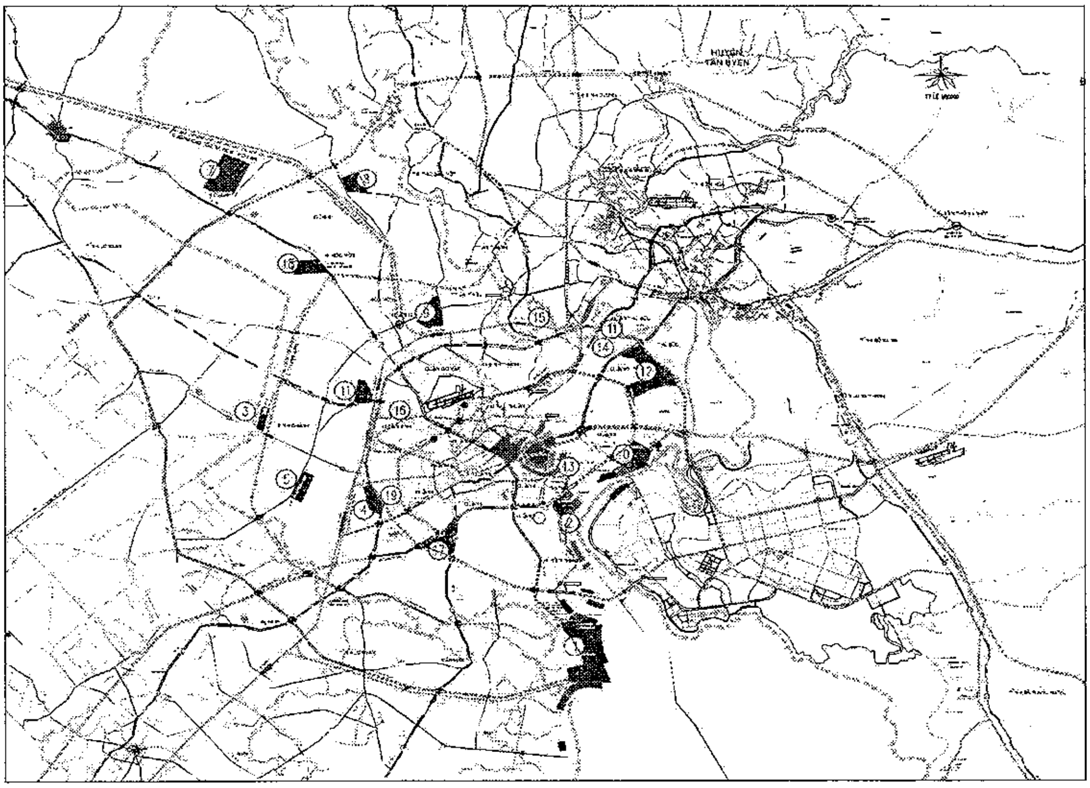
Currently, the IZs and the EPZs located relatively close to the city center have already occupied large areas, which include those in district 7, Thu Duc and Binh Chanh. In contrast, IZs with poor accessibility to the city center find difficulties in attracting investors. Particularly, the IZs located in the eastern and southern districts have not yet progressed. Over and above the official IZs and EPZs, the city government established in 2001 the first software park in Vietnam at Quang Trung in District 12, where more than 30 software enterprises have already opened their offices. Although the city government tries to promote development of industrial parks (IPs) and EPZs in suburban areas, there are still many factories that are located within the inner city area. According to a city government survey, the inner city has 23,000 factories, whose activities cause air, water and noise pollution.

Table 1.1.1 Development Situation of Official IZs and EPZs in HCMC

	Location	Total Planned Area[1] (ha)	Area for Rent (ha)	Occupied Area (ha)	Occupancy Rate (%)
1. Tan Thuan EPZ	District 7	300	195	135	69
2. Linh Trung EPZ	Thu Duc	60	45	43	95
3. Binh Chieu IZ	Thu Duc	27	21	20	95
4. Hiep Phuoc IZ	Nha Be	332	198	18	9
5. Tan Tao IZ	Binh Chanh	443	90	52	58
6. Tan Binh IZ	Tan Binh	231	95	13	14
7. Vinh Loc IZ	Binh Chanh	207	119	30	25
8. Tan Toi Hiep IZ	District 12	215(29)[2]	135	9	7
9. Cu Chi Northwest IZ	Cu Chi	216	140	11	8
10. Le Minh Xuan	Binh Chanh	100	66	10	15
11. Cat Lai I	District 2	117	78	–	–
12. Cat Lai II	District 2	20	–	–	–
13. Phung Phu IZ	District 9	149	–	–	–
12. Linh Trung II EPZ	Thu Duc	63	42	–	–

Source: HEPZA, DPI and Dep. of Industry (2003)
[1] Sizes indicated in the reports by the HEPZA and the Dept. of Industry (different from sizes in M/P).
[2] Original approved area was 215ha, but now the area was reduced to 29ha.

Figure 1.1.1 Locations of Official IZs and EPZs in HCMC



Source: UPI (2003)

According to the Deputy Minister of Industry, many IZs and EPZs in HCMC do not pay proper attention to the development of physical and social infrastructure, which include industrial waste treatment facilities, road networks, schools, and hospitals. In addition, many IZs have not prepared housing for workers and areas for supporting industries, which has resulted in illegal developments in areas surrounding the IZs.

2) Adjacent Provinces

In Binh Duong province, 13 industrial parks with an area of over 6,000ha have been developed along the provincial and national highways through three southern administrative units: Thuan An and Di An districts and Thu Dau Mot Town (the study area of the HOUTRANS). Table 1.1.2 illustrates the development situation of official IZs in Binh Duong province, most of which show high occupancy rates. These high occupancy rates are a result of the advantageous conditions in the IZs located in the above administrative units. These advantages include the relatively close location to HCMC, favorable soil conditions for factory construction, government policies on infrastructure development, and simple and efficient investment procedures. The IZs in Binh Duong mainly accepts light industry factories, including garments, leather, ceramics, footwear making, agricultural processing, wood, and traditional crafts.

Table 1.1.2 Development Situation of Official IZs in Binh Dung Province

	Location	Total Area (ha)	Area for Rent (ha)	Occupied Area (ha)	Occupancy Rate (%)
1. Viet Nam-Singapore IP	Thuan An	500	192 ha.	100 ha.	52 1)
2. Viet Hung	Thuan An	46	30	15	51
3. Song Than I	Di An	180	159	141	81
4. Song Than II	Di An	319	208	145	70
5. Binh Dung	Di An	24	20	18	92
6. Dong An	Thuan An	207	80	67	84
7. Tan Dong Hiep A	Di An	48	33	—	—
8. Tan Dong Hiep B	Di An	164	135	—	—
9. Trung Bong Bong	Thu Dau Mot	500	—	—	—
10. Bau Beo	Thu Dau Mot	300	—	—	—
11.New Urban Area 2)	Thu Dau Mot	2,000	—	—	—

Source: Bing Dung Province Website (2003) / Investment Opportunity in Binh Dunh (2002)
1) Occupancy rate of Phase 1 (300ha) is 90%.
2) The new urban area will be located across the boundary of Thu Dau Mot Town, Ben Cat and Tan Uyen District within a total development area of 4,300ha, of which the industrial area is 2,000ha and a high-tech park area of 200-400ha.

In the study area of Dong Nai province, there are 10 officially developed or developing IZs, which are located in the outskirts of Bien Hoa City and along National Highway 51. Major portions of these industrial parks have already been occupied by foreign and domestic enterprises (see Table 1.1.3), taking advantage of the ideal conditions, which are their location along the important transportation corridor connecting HCMC and Ba Ria-Vung Tau where port facilities are developed, and the area's soil and topographic conditions which are favorable for factory construction. In addition, land leasing costs in these industrial properties are relatively inexpensive compared with those in HCMC. Main industrial sectors that the IZs in Dong Nai have so far accepted include food and beverage, leather, textile, chemicals, and electric products.

Provincial authorities of Long An province are planning 10 industrial parks with a total area of 1,523ha. All of the industrial parks are to be located along the major transportation corridors, provincial and national highways, and waterways that connect to HCMC. Although investments in the province have increased in the past decade, the total amount of received investments is still low compared with other provinces in the study area. Since most of the lands in Long An province are habitually affected by flood, land suitable for industrial development is limited. Also, to develop industrial areas, a long compensation process is required before detailed plans and construction of infrastructure can be made. These conditions delay the development of planned IZs in the province.

Table 1.1.3 Development Situation of Official IZs and EPZs in Dong Nai Province

	Location	Total Area (area for rent) (ha)	Occupancy Rate (%)
1. Bien Hoa 1 IZ	Bien Hoa City	335 (231)	100
2. Bien Hoa 2 IZ	Bien Hoa City	365 (261)	100
3. Amata IZ	Bien Hoa City	760 (1st stage 129 [92])	89 (1st stage)
4. Loteco IZ including EPZ	Bien Hoa City	100 (72) (EPZ 30)	49
5. Nhon Trach 1IZ	Nhon Trach	430 (323)	66
6. Nhon Trach 2 IZ	Nhon Trach	350 (279)	47
7. Nhon Trach 3 IZ	Nhon Trach	368 (240)	100
8. Go Dau	Lonh Thanh	137	85
9. Tham Phuoc	Lonh Thanh	331	—
10. Long Thanh	Lonh Thanh	488	—

Source: Report by DPI of Dong Nai Province (2003)

1.2 Industrial Development Policy

1) HCMC

Currently, city authorities are making adjustments in their IZ and EPZ development schemes. This is because the city's socio-economic conditions have drastically changed since the initial industrial master plan was formulated in 1993, making current industrial development situations different from planned development directions. In addition, existing and newly developed factories have created negative environmental impacts on the surrounding living areas. The main points in this adjustment are as follows:

- Relocate polluting factories from the inner city areas to suburban IZs in adjacent provinces and not within HCMC.
- Adjust the sizes of the IZs and EPZs by considering land conditions, current development situations, and transportation development strategies.
- Transform the city's industrial structure from labor-intensive and polluting industries to value-added, high-tech, and non-polluting industries.

For the relocation of polluting factories, city authorities now have a policy to relocate targeted polluting factories in the inner city areas to the suburban districts of Binh Chanh, Cu Chi, Hoc Mon, and Nha Be. In addition, by virtue of a Prime Minister's suggestion, IZs in adjacent provinces are also being considered as new locations. In October 2003, the leaders of HCMC and Dong Nai provinces agreed that HCMC could develop an industrial park in Dong Nai (Vinh Cuu District) to promote the relocation of factories to the province. In order to facilitate relocation, city authorities have come up with several supporting policies, which include the following:

- For developing infrastructure in resettlement areas, the city government will assist investors to get loans without mortgages from commercial banks.
- For developing wastewater treatment plants, the city government will shoulder all the necessary interest on a five-year loan from commercial banks.

As for the adjustment of the size of IPs and EPZs, city authorities are considering scaling down the size of Hiep Phuoc IZ in Nha Be District and Cat Lai IZ in District 2. Currently, these IZs are facing difficulties in attracting investors. In contrast, the sizes of two IZs in Binh Chanh District (Tan Tao IZ and Vinh Loc IZ) are to be scaled up, because current industrial developments in these areas are rapidly progressing.

As for the transformation of industrial structure, city authorities now regard the IZs and EPZs close to the city center as areas for high-tech and non labor-intensive industries. On the other hand, labor-intensive and heavy industries are to be located in suburban areas, including IZs in adjacent provinces. Also, in order to promote suburban industrialization, city authorities are currently formulating plans to develop residential areas to be integrated with the IZs. An IZ development project, with residential and commercial functions and a total land area of 6,000ha straddling Cu Chi and Hoc Mon districts is an example of such a project.

2) Adjacent Provinces

In Binh Duong province, provincial authorities have been promoting industrial development in its southern area by utilizing its aforementioned advantageous land conditions. Currently, provincial authorities consider the following sectors as their main targets for industrial development:

- Processing of agriculture, forestry, and aquatic produces
- Biotechnology and new materials
- High-tech industries
- Pharmaceutical industries

To encourage investment from the above industrial sectors in official IZs, provincial authorities have prepared various incentives for them. These include favorable tax systems, simple and efficient investment procedures, and support of infrastructure development. In addition, provincial authorities are currently formulating a development scheme of new urban complexes with a total development area of 4,300ha that will include a 2,000ha industrial area that has a 200-400ha high-tech park. The new area will be located across the boundaries of Thu Dau Mot Town, Ben Cat and Tan Uyen districts. This project was approved by the Prime Minister in September 2003 and is now being promoted by the state- or provincial-owned company Becamex Corporation.

In Dong Nai province, industrial development areas now total more than 5,500ha. Since most of the IZs located in Bien Hoa City have already been occupied by several factories, provincial authorities are currently focusing on the development of industrial areas in Nhon Trach District (Nhon Trach IZ I, II and III) with the help of the central government. The main industrial targets of the Nhon Trach IZs are high-tech and light industries, including food processing, building materials, textile and dyeing, as well as software and information technology. In addition, heavy and export-oriented industries, such as machinery, chemicals, and raw materials, are also target sectors that will utilize transportation infrastructure such as ports and an airport whose development are being planned within or near the area. Provincial authorities also have plans to transform the Nhon Trach area into an urban and industrial center in Southern Vietnam with various urban functions, including residential, educational, business, and commercial functions. Besides the Nhon Trach IZs, existing small-sized IZs are envisioned for expansion into a total area with 620ha (30-50ha for each IZ) by 2010. The target sectors of this plan are light industries such as agricultural products, food processing, and construction materials. In order to promote industrial development, provincial authorities have prepared the enhancement of urban planning and management capacities by speeding up compensation procedures and developing infrastructure and investment procedures.

In Long An province, the central government has approved the industrial zones Duc Hoa 1 and Xuyen A, while the provincial PC has approved eight IZs. The main targets of these IZs are light industries, including agricultural products and equipment, building materials and consumer goods. The provincial authorities have prepared various supporting policies for the development of these IZs, which include the development of vocational schools for the training of IZ workers. Recently, the provincial PC has worked with investors in making detailed area development plans and investment schemes. In addition, incentive measures for both foreign and domestic investors have been adopted to promote investments in the officially approved IZs, in a similar manner as in other provinces.

Table 1.2.1 Amended Industrial Area Size for Recommended Growth Scenario

District Name	Major Planned IZ / EPZ	Additional Industrial Area in Each District (ha)		Reasons for Amendment
		M/P Indicated Size*	Amended Size	
HCMC				
Thu Duc	Linh Trung EPZ I & II, Binh Chieu IZ	200	490	Sizes of IZs and EPZs are expected to increase, because land conditions and accessibility to CBD in the northern part of the district are good.
District 12	Tan Toi Hiep IZ	206	250	Sizes of IZs are expected to slightly increase, because land conditions and accessibility to CBD in the northern part of the district are good.
Binh Chanh	Tan Tao IZ, Vinh Loc IZ, Le Minh Xuan IZ	748	1,460	Sizes of IZs are expected to greatly expand from the planned area sizes, because land conditions and accessibility to NHs are good. (Currently, IZs in this district are rapidly being developed)
District 2	Cat Lai IZ I & II	852	430	Due to poor land conditions, planned area sizes of IZs are expected to decrease (development of planned IZs has not progressed until today).
District 7	Tan Thuan EPZ	150	370	IZs are planned to be expanded, utilizing already developed infrastructure and harbor facilities, and good accessibility to CBD.
District 9	Phung Phu IZ	300	540	Planned areas of high-tech and software parks are expected to increase, which will be located in good land conditions along NH integrated with universities and R &D institutions to be developed in adjacent areas.
Hoc Mon		100	300	Currently, large-scale IZs are planned around the boundary between Hoc Mon and Cu Chi, which will be integrated with the newly developed urban complex. These IZs include relocated factories from the inner city area. Therefore, sizes of industrial area will increase.
Cu Chi	Cu Chi Northwest IZ	645	1,550	
Nha Be	Hiep Phuoc IZ	1,980	1,280	Due to poor land conditions, planned area sizes of IZs are expected to decrease (development of IZ has not progressed until today).
Can Gio		500	50	Since almost all areas in Can Gio are environmentally sensitive and land conditions are poor, the industrial area is to be reduced drastically.
Adjacent Provinces				
Thu Dau Mot	Trung Bong Bong, Bau Beo	800	510	Areas have advantageous conditions for industrial development due to a provincial capital; area sizes of IZs are expected to develop almost to their planned sizes.
Tan An	Thanh Trung	250	340	
Bien Hoa	Bien Hoa 1& 2, Amata, Loteco	600	480	Due to the good transportation and land conditions, IZs are expected to develop almost to their planned sizes.
Thuan An	VN-Singapore Viet Hung IZs	380	480	Due to good land conditions and accessibility to NHs and HCMC, area sizes of IZs are expected to increase more than their planned sizes.
Di An	Tan Dong Hiep, Song Than IZs	340	390	
Long Thanh	Go Dau, Tham Phuoc	1,000	1,200	Since areas are located in the industrial growth corridor where transportation and land conditions are good, area sizes of IZs are expected to develop almost to their planned sizes.
Nhon Trach	Nhon Trach 1,2 & 3 IZs	2,000	2,100	
Can Giuoc	Cang Tan Tap	1,100	280	Since most of IZs are to be located in areas of poor land conditions, and accessibilities to the regional center are not good, area sizes of IZs are expected to decrease (development of planned IZs in these districts have not progressed until today).
Can Duoc	Phuoc Dong	300	200	
Chau Thanh	Thuan My	100	90	
Thu Thua	Nhi Thanh	100	90	
Ben Luc	Ben Luc	1,800	270	
Duc Hoa	Duc Hoa I, II, III	1,400	830	
Tan Tru	An Nhat Tan	100	100	

* Sizes indicated in the M/P do not include areas already developed, and these sizes are different from the sizes indicated in the report by the HEPZA and Dept. of Industry.

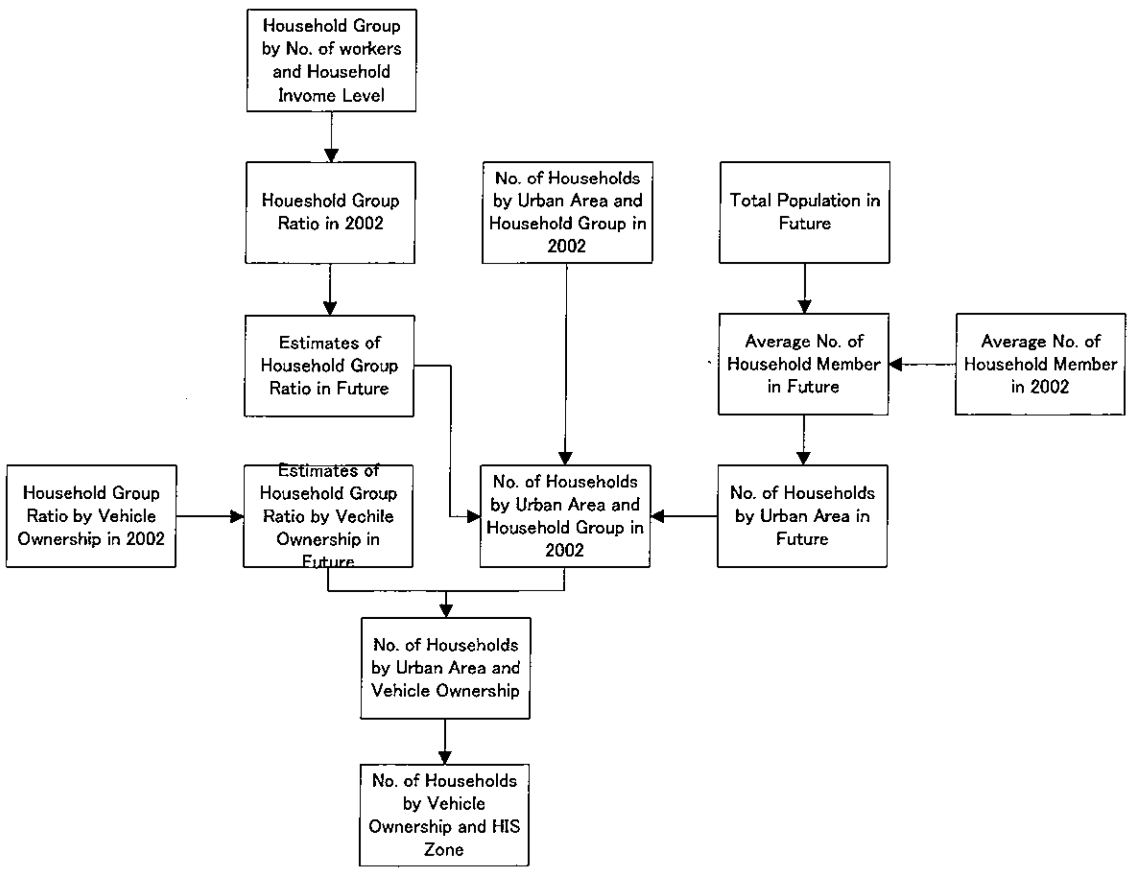
Appendix 2 Analysis of Modal Share and the TDM Policy

2.1 Estimate of Future Modal Shares

1) Future Vehicle Ownership

Estimating future vehicle ownership is one of the most important issues in forecasting future traffic demand. The HOUTRANS Study Team estimated future vehicle ownership by following the procedure shown in Figure 2.1.1. The figure shows how to estimate the number of households by vehicle ownership (car owner HH, multi motorcycle owner HH, single motorcycle owner HH, and no motorized vehicle HH) and traffic zone.

Figure 2.1.1 Procedure for Estimating Future Vehicle Ownership



Source: Study team

2) Methodology for Estimating Vehicle Ownership

(1) Total Car Ownership

The total car ownership rate in the study area is forecast to be the control total for the next step. The growth curve of car ownership was estimated taking account of the experiences of other countries, as shown in the following formula.

$$HHR = 1 - \frac{1}{\exp(-7.04 + 4.33 * 10^{-7} * HHI) + 1} \quad (1)$$

where

HHR: Rate of households owning cars
HHI: Household Income (VND/month)

Household income in 2020 was estimated to be 2.9 times higher compared with the figure for 2002, as shown in Table 2.1.1.

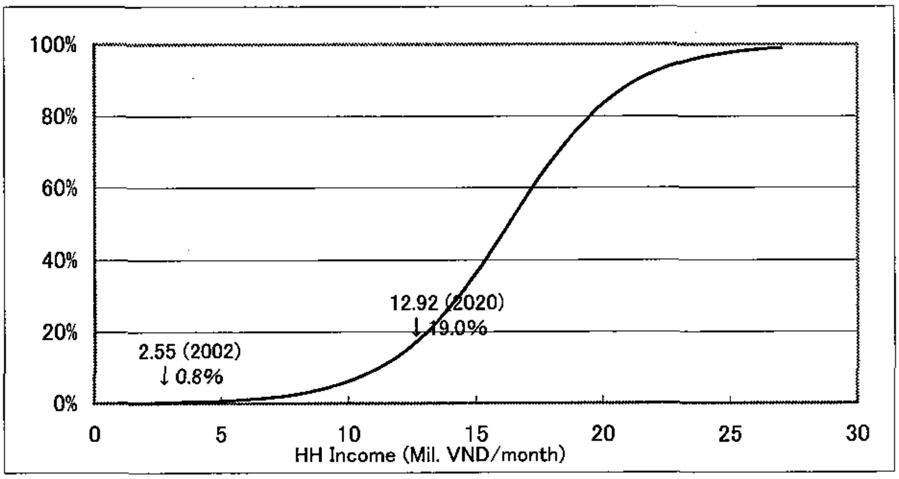
Table2.1.1 Estimated Future Household Income

	GDP/capita (US$/yr)[1)]	Number of Household Members[1)]	GDP/HH (per year)	GDP/HH (per month)	Average Income (HH/ mil.VND)[2)]
2002	1,460	4.0	5,840	487	2.55
2020	4,737	3.6	17,053	1,421	12.92

1) Estimated by the Study Team.
2) Considering increase of purchasing power from 2002 to 2020.

From these assumptions, future car ownership rate was estimated to increase from 0.8% in 2002 to about 19.0% in 2020 as shown in Figure 2.1.2.

Figure 2.1.2 Estimated Car Ownership Growth Curve and Car Ownership Rate



Source: Study Team

(2) Vehicle Ownership by Zone

The number of households by vehicle ownership type (car owning HH, multi M/C HH, single M/C HH and non-motorized HH) and traffic zone was forecast. The procedure is as follows:

a) Categorization of household type

Table 2.1.2 shows the description of household categorization by income and socio-economic status, present rate and the forecast future rate (2020) considered the increase in core families and the decrease of the number of children in the future.

Table 2.1.2 Household Type and Proportion

HH Type	Description	# of Earners	Ave. HH Income (mil. VND/mo: 2002)	% 2002	% 2020 (estimated)
1	Low-income class		0.4-	1.2	1.0
2	Single-person household	1	0.4-4.0	1.4	5.8
3	Married-couple household including a full-time housewife	1	0.4-4.0	7.4	10.0
4	Married-couple household including a full-time housewife, and school-age children	1	0.4-4.0	17.6	25.0
5	Double-income household. Low income.	2	0.4-2.5	28.1	20.0
6	Double-income household. High income.	2	2.5+	19.4	30.0
7	2 households. Low income.	3	0.4-2.5	5.5	3.5
8	2 households. High income.	3	2.5+	12.0	3.0
9	2 households. High income. Family business.	4	2.5+	5.2	1.0
10	3 households living together.	5+	2.5+	2.2	0.7

Source: Study Team

b) Household type and residential areas

The relationship between household type and residential areas (six types of areas in Ho Chi Minh City and its adjoining provinces) was examined for 2002 and assumed for 2020, as shown in Table 2.1.3, in light of changes on urban structure and characteristics of residents in the future.

Table 2.1.3 Household Type and Residential Areas

2002(%)

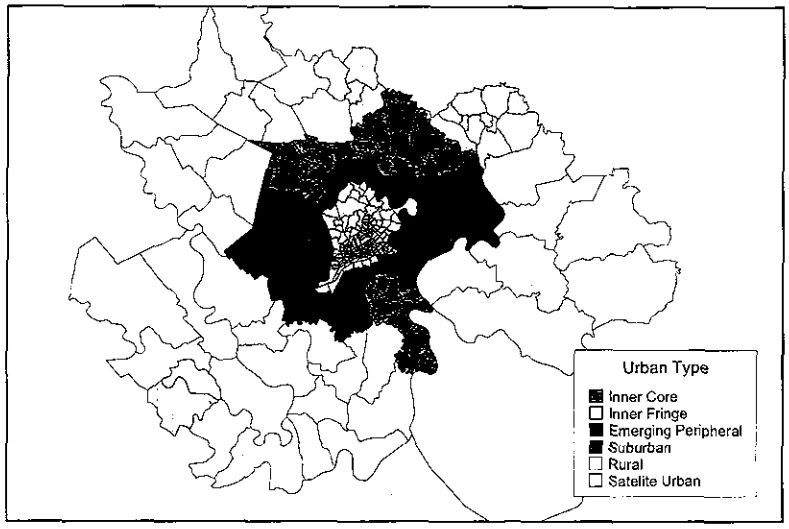
HH Type	Inner Core	Inner Fringe	Emerging Peripheral	Suburban	Rural	Provinces	Total
1	1.2	0.7	0.7	3.7	1.5	1.5	1.2
2	2.2	1.3	1.6	2.3	0.5	0.8	1.4
3	6.1	10.4	7.6	7.3	5.9	6.0	7.4
4	18.7	17.9	18.7	23.6	11.8	15.9	17.6
5	18.1	15.6	29.4	32.6	44.5	41.6	28.1
6	24.7	28.4	20.1	7.9	8.4	11.3	19.4
7	3.5	1.9	3.9	8.7	9.6	9.6	5.5
8	15.2	14.9	11.7	8.1	9.4	8.5	12.0
9	6.6	6.1	4.5	4.3	5.9	4.0	5.2
10	3.7	2.7	1.9	1.6	2.5	0.9	2.2

2020(%)

HH Type	Inner Core	Inner Fringe	Emerging Peripheral	Suburban	Rural	Provinces	Total
1	1.0	0.5	0.5	1.5	1.0	1.0	1.0
2	6.5	6.5	5.8	5.5	4.5	5.8	5.8
3	8.0	12.0	8.0	10.0	10.0	10.0	10.0
4	28.0	25.0	29.0	28.0	15.0	25.0	25.0
5	11.0	11.0	15.0	22.0	35.0	30.0	20.0
6	36.0	35.0	32.0	25.0	26.0	20.0	30.0
7	3.0	3.0	3.0	4.0	4.0	3.5	3.5
8	5.0	5.0	5.0	2.0	2.0	3.0	3.0
9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10	0.5	1.0	0.7	1.0	1.5	0.7	0.7

Source: Study team

Figure 2.1.3 Regional Classification by Urban Type



Source: Study Team

c) Household type and vehicle ownership types

The rate of vehicle ownership type by household type in the future was assumed as shown in Table 2.1.4. This shows high car-owning households for Types 6, 8, 9, and 10. These household types are economically well off and the number of household members is comparatively large. On the other hand, the rate for single M/C households and nonmotorized households were assumed to decrease drastically because of economic developments.

Table 2.1.4 Household Type and Vehicle Ownership (%: 2020)

HH Type	1	2	3	4	5	6	7	8	9	10
Car Owner	2.0	2.0	20.0	5.0	10.0	34.0	10.0	34.0	38.0	38.0
Multi-MC Owner	65.0	0.0	60.0	50.0	70.0	61.0	70.0	61.0	54.0	54.0
Single-MC Owner	15.0	85.0	15.0	30.0	10.0	3.0	15.0	3.0	5.0	5.0
Non-Motorized	18.0	13.0	5.0	15.0	10.0	2.0	5.0	2.0	3.0	3.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Study team

d) Vehicle ownership type and residential areas

Finally, by multiplying Table 2.1.3 and 2.1.4, the relationship between vehicle ownership type and residential area was calculated as shown in Table 2.1.5. This shows the inner core area as having the highest share of car-owning households.

Table 2.1.5 Household Type and Vehicle Ownership (%: 2020)

	Inner Core	Inner Fringe	Emerging Peripheral	Suburban	Rural	Provinces
Car Owner	19.1	19.6	18.2	16.1	17.2	15.2
Multi-MC Owner	55.1	55.3	55.7	56.7	59.9	57.5
Single-MC Owner	18.1	17.8	18.1	18.5	15.0	18.4
Nonmotorized	7.7	7.4	8.0	8.7	7.9	8.8
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Study team

(3) Estimated Vehicle Ownership of Household Type

Table 2.1.6 shows the number of households by vehicle ownership and the residential areas. These results show that the biggest increase of car-owning households will occur at the emerging peripheral areas, while single motorcycle-owning households were estimated to decrease by 2020.

Table 2.1.6 Number of Households by Vehicle Ownership and Residential Areas

(2002: 000)

	Inner Core	Inner Fringe	Emerging Peripheral	Suburban	Rural	Provinces	Total
Car Owner	7	8	5	1	2	9	32
Multi-MC Owner	278	282	169	29	30	252	1,039
Single-MC Owner	124	141	120	30	35	273	723
Nonmotorized	7	5	3	2	1	7	24
Total	430	448	313	68	77	594	1,929

(2020: 000)

	Inner Core	Inner Fringe	Emerging Peripheral	Suburban	Rural	Provinces	Total
Car Owner	89	158	209	29	49	169	702
Multi-MC Owner	256	453	635	100	166	575	2,187
Single-MC Owner	84	145	207	33	42	180	691
Nonmotorized	19	33	50	8	12	48	170
Total	448	789	1,100	171	269	972	3,750

(2020 – 2002: 000)

	Inner Core	Inner Fringe	Emerging Peripheral	Suburban	Rural	Provinces	Total
Car Owner	82	150	204	28	47	160	670
Multi-MC Owner	-22	171	466	71	136	323	1,148
Single-MC Owner	-40	4	87	3	7	-93	-32
Nonmotorized	12	28	47	6	11	41	146
Total	18	341	787	103	192	378	1,821

Source: Study team

3) Future Modal Share

Using the estimated number of households by vehicle owner type and the parameters in the main text of Chapter 6, the future modal share was estimated as shown in Table 2.1.7. Because of the increase in car-owning households as mentioned in the previous chapter, the share for cars drastically increases. On the other hand, the number of trips by bicycle was estimated to decrease strongly, almost to a negligible level. The one by walking would decrease slightly. Although the number of trips by motorcycle would increase, their modal share would decrease from 74% to 61%. This result shows that the M/P network without any demand management policy would not be able to bring the modal share of public transport to 50% by 2020.

Table 2.1.7 Estimated Model Share

	2002 (observed)		2020 (estimated)	
	Trips (000/day)	%	Trips (000/day)	%
Bicycle	3,613	19.0	114	0.3
M/C	14,067	74.0	21,991	61.2
Car	358	1.9	8,952	24.9
Public Transport	973	5.1	4,864	13.5
Total	19,011	100.0	35,920	100.0
Walk	3,937	17.2	3,208	8.2

Source: Study team
Note: Considering M/P network in 2020.

2.2 TDM Policy Evaluation

1) Introduction

Transport policies considered effective for Ho Chi Minh City can be largely classified into the following two: 1) Methods to promote the use of public transportation by improving public transportation services, and 2) Methods to restrict the use of other private transportation modes through some kind of action, thus promoting a shift to the use of public transportation modes. In the former, methods to improve public transportation services, speed and fares are big factors. By shortening travel time through the increase of operation speed, and eliminating the image of high fares coupled and the resistance from users, through the improvement of fares, the promotion of the use of public transportation can therefore become possible. As for the bus system (among public transportation) the feasible ideas are supplying high-quality services by expanding route networks, increasing accessibility and operation frequency, and the introduction of bus exclusive and priority lanes. All these will improve operational speed and secure punctuality. On the other hand, the use of cars and motorcycles, which are not public transportation modes but individual transportation modes, can be restricted by controlling the VOC. The VOC is generally considered as the cost required in the use of a transport mode, such as cost for a vehicle, fuel, oil, and maintenance. As a policy to restrict the use of individual transportation modes by controlling these travel expenses, the purchase price of vehicles and fuel costs can be considered. Other possible methods to restrict the use of individual transportation modes are to establish a system to charge for road usage, such as area licensing and road pricing; regulating total parking space, and increasing parking charges.

1) Improving bus services

- Increasing speed (introduction of bus exclusive lanes, etc.)
- Securing punctuality
- Shortening waiting time (increase of bus operation)
- Improving the fare system (flat fares, unlimited rides, etc.)
- Introducing advanced bus service (introduction of a bus location system, on-demand bus, etc.)

2) Restricting use of cars and motorcycles

- Parking demand management
- Area licensing
- Restriction by VOC

3) Other measures

- Self-controlled use of private cars and motorcycles
- Flex time

In this report, the study on introduction and evaluation were conducted regarding the following three major traffic demand policies, whose effectiveness can be verified by using a modal share model, among various transport policies: 1) parking demand management, 2) area licensing, and 3) transport demand management by VOC.

2) Parking Demand Management

Parking demand management, as part of the TDM aimed at restricting car and motorcycle traffic going to the inner city area by limiting parking capacity in the study area, especially in the inner city area with concentrated traffic. The expected major issue regarding parking demand management is how to answer these questions: In what area (zone) are trips that require parking concentrated? What is the quantity? How long do they stay? How does the demand change (decrease) by changing (raising) parking charges?

The change in modal share is shown when the parking charge is increased by 1.5 times and 2 times from the present level in the areas of the above-mentioned urban types 1 to 3, in Table 2.2.1. When the parking charge is 1.5 times higher than the present charge, the modal share rate of public transportation increases to 17.7%; when it is 2 times higher, the rate increases to 22.6%. However, these are the results when the modal share model is applied for every trip, and about half of the trips might not need parking space, as in the above-mentioned analysis. As such, increasing the charge would not affect the share rate, as in this table.

Present state: 1,000 for bicycle, 1,500 for motorcycle, 5,000 for car

⇩

1.5 times: 1,500 for bicycle, 2,250 for motorcycle, 7,500 for car

⇩

2.0 times: 2,000 for bicycle, 3,000 for motorcycle, 10,000 for car

Table 2.2.1 Change in Parking Demand with Increase in Parking Charge

Mode	Base Case		1.5 times Parking Charge		2.0 times Parking Charge	
	Trip (000)	%	Trip (000)	%	Trip (000)	%
Bicycle	114	0.3	19	0.1	4	0.0
M/C	21,991	61.2	20,770	57.8	19,357	53.9
Car	8,952	24.9	8,760	24.4	8,442	23.5
Public Transport	***4,864***	***13.5***	***6,370***	***17.7***	***8,117***	***22.6***
Total	35,920	100.0	35,920	100.0	35,920	100.0

Source: Study team

3) Area License

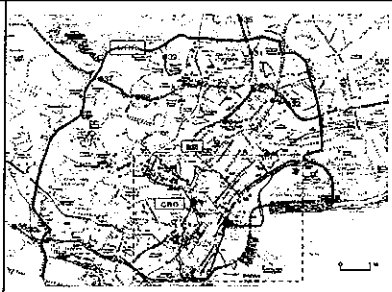
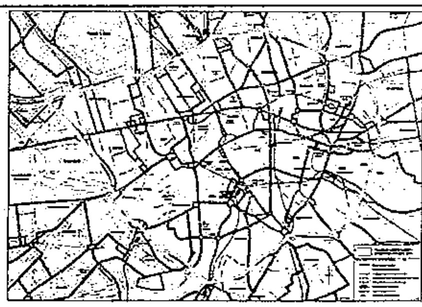
TDM techniques include road pricing and area licensing. The former is a charge for road usage, and the latter is a charge for access to certain areas (mainly in the central district) where fee are collected from the passing traffic. As a result of the charges, road users will consider choices of entering the charging area, avoiding it by detouring, or using public transportation modes when they want to enter the area without being charged. Therefore, effects to reduce traffic congestion is said to result from a shift of traffic in the area from individual transportation modes to public transportation modes, also by a reduction of traffic volume by getting passing traffic to detour around the area.

In this report, we focus on the former effect, and estimate the change of demand through modal share by charging vehicles in specific congested areas, in the same way as the parking charge is measured to efficacy. Road pricing here is not studied.

Table 2.2.2 illustrates the examples in other cities where areas licensing systems where already introduced. Singapore is one of the most famous cities in terms of a strong and successful TDM policy and their core TDM project is area license and road pricing using electrical devices on vehicles. The merits of electric devices are: a) Easy to pay and collect. b) Less expenses for human resources, and c) Easy to have varieties of fees depending on the period in order to control demand biases. London recently introduced an area licensing system in Central London. According to their report, there was a significant reduction in traffic and congestion and more than half of the residents supported the area license policy after the introduction.

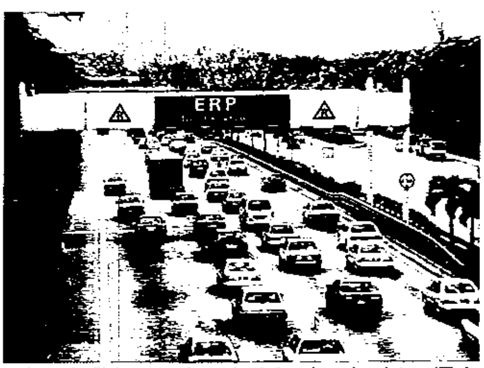
Based on these examples, an area license system in the study area was examined.

Table 2.2.2 Area Licensing in Other Cities

	Singapore	London	Oslo (Finland)
Started	1975 (ERP: 1998-)	2003	1990
Area size (ha)	725 (+ road pricing at major roads)	2,100	About 4,000
Number of Toll gates	44 (including for road pricing)	-	19
Time	7:30-19:00	7:00-18:30 (weekday)	Whole day
Charge	Car: 0.5 – 2.5 S$ Truck: 0.6 – 2.85 S$ M/C: 0.25 - 1.25 S$ (2001.4, 1S$≒0.6US$)	5 lb for all types of vehicle (≒2.8 US$) (2003)	Car: 13 SEK (≒1.1 US$) Truck: 26 SEK (2003)
Collection System	Electrical Device with special card for payment. The card can also be used at gasoline stations, department stores etc.	Registration for entry in advance	- Manual (13% of vehicles) - Coin Toss (14%) - Electrical Devise (73%)
Map			-
Evaluation	Average Speed - CBD: 20-30km/h - Expressway: 60-80km/h	Traffic Volume Going to Area - Car: 30% decrease - Truck: 10% decrease - Bus: 15% Increase Average Speed in Area - 14.3→16.7km/h Suppose to policy (post-evaluation) - 50% say "yes" - 30% say "no" (2003.10)	-

Source: http://www.lta.gov.sg/motoring_matters/index_motoring_erp.htm (LTA, Singapore)
http://www.tfl.gov.uk/tfl/cclondon/cc_intro.shtml, (Transport for London)
http://www2.kankyo.metro.tokyo.jp/jidousya/roadpricing/syoko.htm (Tokyo Metropolitan Gov.)

Photo 2.2.1 Electrical Road Pricing (ERP) System in Singapore



Source: http://www2.kankyo.metro.tokyo.jp/jidousya/roadpricing/syoko.htm (Tokyo Metropolitan Gov.)

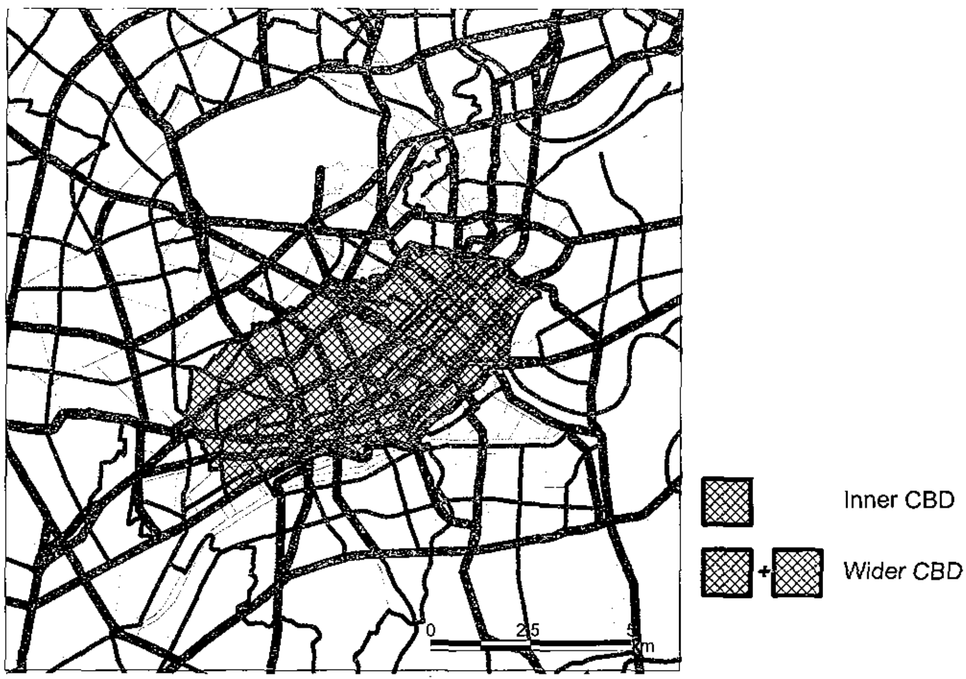
Table 2.2.3 Examined Area for ALS

	District	Area size (ha)	Estimated No. of Toll Gates
Inner CBD	Dist. 1 (part), 3 (part)	726	14
Wider CBD	Dist. 1, 3, 5, 6 (part), 10, 11	3,022	25

Source: Study team

As a case study, the change in modal share rate was calculated when 10,000VND and 15,000VND for car users and 3,500VND and 5,000VND for motorcycle users were respectively charged per trip upon entering the CBD areas as shown in Figure 2.2.1. The result is as shown in Table 2.2.4.

Figure 2.2.1 Assumed Area for Future Area Licensing System



Source: Study team

Table 2.2.4 Introduction of Area Licensing and the Change in Modal Share Rate

Mode	Base		Inner CBD				Wider CBD			
			10,000VND for Car, 5,000VND for M/C		15,000VND for Car, 7,500VND for M/C		10,000VND for Car, 5,000VND for M/C		15,000VND for Car, 7,500VND for M/C	
	Trips (000)	%	Trips (000)	%	Trips (000)	%	Trips (000)	%	Trips (000)	%
Bicycle	114	0.3	131	0.4	139	0.4	141	0.4	153	0.4
M/C	21,991	61.2	20,737	57.7	20,325	56.6	19,567	54.5	18,835	52.4
Car	8,952	24.9	8,883	24.7	8,734	24.3	8,730	24.3	8,384	23.3
Public Transport	***4,864***	***13.5***	***6,170***	***17.2***	***6,723***	***18.7***	***7,482***	***20.8***	***8,549***	***23.8***
Total	35,920	100.0	35,920	100.0	35,920	100.0	35,920	100.0	35,920	100.0

Source: Study team

As shown in the table, a bicycle is not charged, and its share rate does not decrease. As for motorcycles and cars, there is no significant change in share rates, on this level of charge. Rather, share rates greatly vary among the applied areas. In this exercise, only entering trips are charged, but actually returning trips (though not charged) must also decrease, so the modal choice for buses is expected to be higher.

4) Transport demand management by fuel cost

As to the effect from controlling modal choice of transportation modes by increasing vehicle operating cost (VOC) of individual transportation modes (car, motorcycle), two mechanisms can be considered. The first mechanism is that increasing the VOC weakens consumers' purchase enthusiasm, resulting in fewer households and individuals owning a car or a motorcycle, which leads to fewer trips by individual transportation modes, and a shift to public transportation. The second mechanism is that increasing the VOC results in people who already have a car or motorcycle choosing to use public transportation modes instead of using their own individual transportation mode. The former mechanism can be estimated in the vehicle owning household model, and as to the latter mechanism, a change in the modal choice rate can be analyzed using the modal share model. Here, we focus on the latter, and estimate transportation modal choice rates accompanying the increase of the VOC.

Before discussing the effect of VOC change on the mode choice rate, we review the composition of the VOC. The VOC consists of the part in proportion to driving distance, and the part in proportion to use time. The part in proportion to driving distance mainly includes costs for fuel and oil, these costs varies according to traveling speed. The part proportional to use time mainly consists of the depreciation cost for vehicle price and opportunity cost (for details, refer to the working paper on transportation costs). The issue is to evaluate how much the VOC and the modal share rates will change respectively, depending on different degrees of changes in vehicle prices and fuel costs, which are factors controllable by policy.

Table 2.2.5 (and Figure 2.2.2) shows VOC increases when the fuel costs 1.5 times and 2 times.

Table 2.2.5 Changes in Fuel Cost and VOC

Unit: US$/1,000km

Travel Speed (Km/h)	M/C			Car		
	Current	Fuel Cost		Current	Fuel Cost	
		x 1.5	x 2.0		x 1.5	x 2.0
5	113.6	119.0	124.3	471.0	510.3	549.6
10	65.8	69.3	72.8	279.2	304.9	330.5
20	40.6	43.1	45.6	177.8	196.3	214.8
30	31.9	34.1	36.3	142.5	158.6	174.7
40	26.8	28.8	30.9	122.0	136.8	151.7
50	24.3	26.3	28.3	112.7	127.2	141.7
60	23.9	26.0	28.1	112.3	127.3	142.3
70	24.3	26.4	28.6	114.9	130.8	146.7
80	24.9	27.2	29.6	119.2	136.4	153.5
90	26.0	28.6	31.2	126.1	145.0	163.9

Source: Study team

Figure 2.2.2 Changes in Vehicle Price, Fuel Cost, and VOC

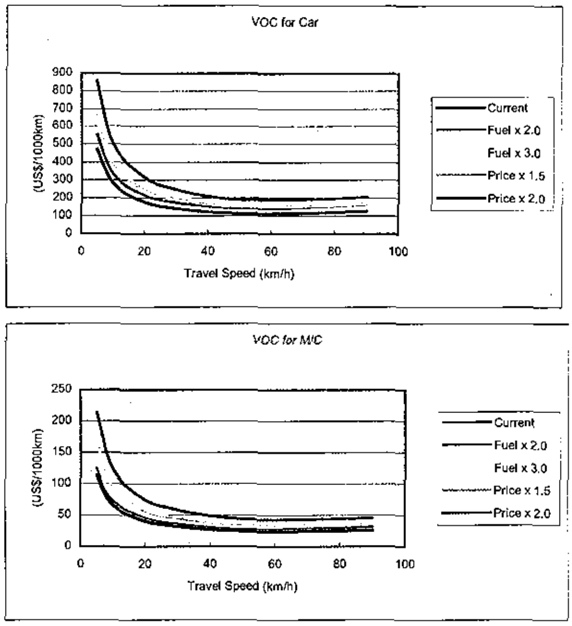


Table 2.2.6 shows the estimated future modal share when fuel cost increases, thus indicating the resulting effects. When fuel cost is doubled, the bus share increases to 27.1%.

Table 2.2.6 Change in Modal Share According to VOC Increase

	Base		Fuel Cost x 1.5		Fuel Cost x 2.0	
Mode	Trip (000)	%	Trip (000)	%	Trip (000)	%
Bicycle	114	0.3	124	0.3	134	0.4
M/C	21,991	61.2	21,681	60.4	20,505	57.1
Car	8,952	24.9	7,045	19.6	5,558	15.5
Public Transport	***4,864***	***13.5***	***7,069***	***19.7***	***9,723***	***27.1***
Total	35,920	100.0	35,920	100.0	35,920	100.0

Source: Study team

5) Combination of TDM Policies

Combination of these traffic demand management policies are examined in order to understand what kind of policies could raise the modal share of pubic transport to 50%, which is the policy target of the Vietnamese government. Two scenarios are studied: scenario 1 and scenario 2 as shown in Table 2.2.7. Scenario 1 is considerable and tolerable level to control the demand for private vehicles. Scenario 2 seems hard to accomplish but sets out to achieve the modal share for public transport to 50% of the all demands.

Table 2.2.8 shows the results of examining the TDM policy combination. This shows Scenario 1 might be able to make modal share of public transport up to 33.6% and Scenario 2 may do it up to 51.0% by 2020 under Master Plan network.

Table 2.2.7 Examined Combination of TDM Policies

		Base	Scenario 1	Scenario 2
Parking (VND/park)	Bicycle	1,000	1,000	1,000
	M/C	1,500	3,000	4,500
	Car	5,000	9,000	11,000
Area License (VND/entry)[1]	M/C	None	None	7,500
	Car	None	None	15,000
Fuel Cost (Base=1.0)		1.0	1.5	1.5

Source: Study team
1) adopted to the "Wider CBD" shown in Figure 3.3.1

Table 2.2.8 Result of Combination of TDM Policies

	Base		Scenario 1		Scenario 2	
Mode	Trip (000)	%	Trip (000)	%	Trip (000)	%
Bicycle	114	0.3	220	0.6	344	1.0
M/C	21,991	61.2	15,548	43.3	10,122	28.2
Car	8,952	24.9	7,751	21.6	7,375	20.5
Public Transport	***4,864***	***13.5***	***12,402***	***34.5***	***18,079***	***50.3***
Total	35,920	100.0	35,920	100.0	35,920	100.0

Source: Study team

6) Revenue from TDM Policies

Another aspect of the TDM policies is to ensure profits from private road users. Revenues from the combined TDM policies, as described in Table 2.2.7, were examined. Table 2.2.9 shows the revenue from the changes in parking charges and fuel cost, and introduction of area licensing system. Based on this estimation, there will be a **1.0-1.2 billion US$** income in 2020 if the TDM policies shown in Table 2.2.7 are introduced. In reality, it is a bit difficult to collect taxes from all parking spaces in the city, but it is comparatively easy to collect user charges or taxes by area licensing system and fuel cost if the government can get the commitment from private road users.

Table 2.2.9 Estimated Revenue by TDM Policies

	No of Taxable Vehicles(000/day)				PCU-km (mil/day)		Revenue (Mil US$/year)	
	Sc-1		Sc-2		Sc-1	Sc-2	Sc-1	Sc-2
	M/C	Car	M/C	Car				
Parking	7,774	3,876	5,061	3,687	-	-	640	879
Area License	-	-	88	330	-	-	-	132
Fuel Cost*	-	-	-	-	74	37	333	166
Total	-	-	-	-	-	-	972	1,176

Source: Study team

2.3 Conclusion

This technical memo is aimed at figuring out what would be the traffic demand management policy that can lead the modal share of public transport up to 50%. The findings are as follows:

- Estimate is that the rate for car-owning households will be 19% in 2020 due to economic growth.
- The number of car-owing households will increase the most at the emerging peripheral areas (District 2, 9, Thu Duc, Binh Chanh, etc.).
- Modal share of public transport will be 13.3% in 2020 under the Master Plan network if there is no traffic demand management policy.
- Increase in fuel costs have strong influence on controlling traffic demand by private vehicles.
- The combination of TDM policies that can increase the modal share of public transport will be: 1) Increase of parking charge (3 times for motorcycles and about 2 times for car). 2) Introduction of an area licensing system in the CBD area (7,500VND for motorcycles and 15,000VND for cars). 3) Increase in fuel costs (1.5 times from the present level).
- Increase of parking charges (about 2 times for motorcycles and cars) and 2) increase of fuel cost (1.5 times to present level) might be able to bring the modal share of public transport to about one third of the total demand.
- When the TDM policies are introduced, it is estimated that there will be 1.0 – 1.2 billion US$ income from these policies in 2020.

Appendix 3 Impact of Port Relocation on Road Traffic

3.1 Existing Condition of Road Traffic from Port Area

1) Introduction

At present, freight traffic from the port areas, especially from the Saigon Port area, have a strong influence on the road traffic in Ho Chi Minh City. Because of capacity problems and the negative impacts on traffic, there is a plan to relocate the ports to the suburban areas. The HOUTRANS Study Team examined the influence of port location on road traffic. This chapter studies the present situation regarding port-influenced road traffic.

2) Present Condition by Freight Survey

Table 3.1.1 shows the result of the traffic count survey at major generating/attracting places for freight transport modes. The data show a high volume of heavy vehicles (big trucks and containers) at the port area and ICDs.

Table 3.1.1 Result of Freight Counting Survey

Station Code	Location	No. of Vehicles (24 hours, in and out)				PCU
		Small Truck (3.5t<)	Big Truck (3.5t>=)	Container	Others	
1	*Saigon Port (Nha Rong)*	27	563	-	-	1,743
2	Saigon Port (Khanh Hoi)	122	234	327	-	2,091
3	Saigon Port (Tan Thuan 1)	129	841	768	29	5,498
4	Saigon Port (Tan Thuan 2)	41	33	1	2	187
5	Tan Cang Port	321	528	2,351	55	10,510
6	Ben Nghe Port	4	198	202	-	1,309
7	VICT	373	771	1,290	38	7,612
8	Lotus	71	118	107	-	871
9	Phuoc Long ICD 1	101	325	740	2	3,769
10	Phuoc Long ICD 2	249	625	714	6	4,878
11	Tan Son Nhat Airport	355	-	-	-	710
12	Sai Gon Station	125	6	-	181	449
13	Song Than Station	64	199	22	-	802
14	KCX Tan Thuan	179	151	57	186	1,197
15	KCX Linh Trung 1	414	154	78	11	1,574
16	KCX Linh Trung 2	371	229	29	3	1,534
17	Saigon Port (Ben Suc)	155	502	111	45	2,250

Source: Study Team

The results of the OD interview survey at the freight generating/attracting areas are shown in Table 3.1.2 and Table 3.1.3 Average sample rate is 20%, which is significant enough. Regarding major commodities, the rates for industrial crops are significantly high at present.

Table 3.1.2 Number of Respondents in Freight OD Interview Survey

Station	Small Truck	Big Truck	Container	Others	Total	Sample Rate (%)
1	8	237	-	-	245	42
2	24	96	85	-	205	30
3	15	112	65	-	192	11
4	16	30	1	-	47	61
5	85	130	349	1	565	17
6	4	107	71	-	182	45
7	62	107	239	9	417	17
8	5	61	11	12	89	30
9	25	85	82	-	192	16
10	54	57	83	-	194	12
11	67	-	-	-	67	19
12	32	-	-	10	42	13
13	13	33	4	-	50	18
14	100	47	34	5	186	32
15	50	46	31	5	132	20
16	58	33	23	3	117	19
17	18	228	28	4	278	34
Total	636	1,409	1,106	49	3,200	20

Source: Study Team

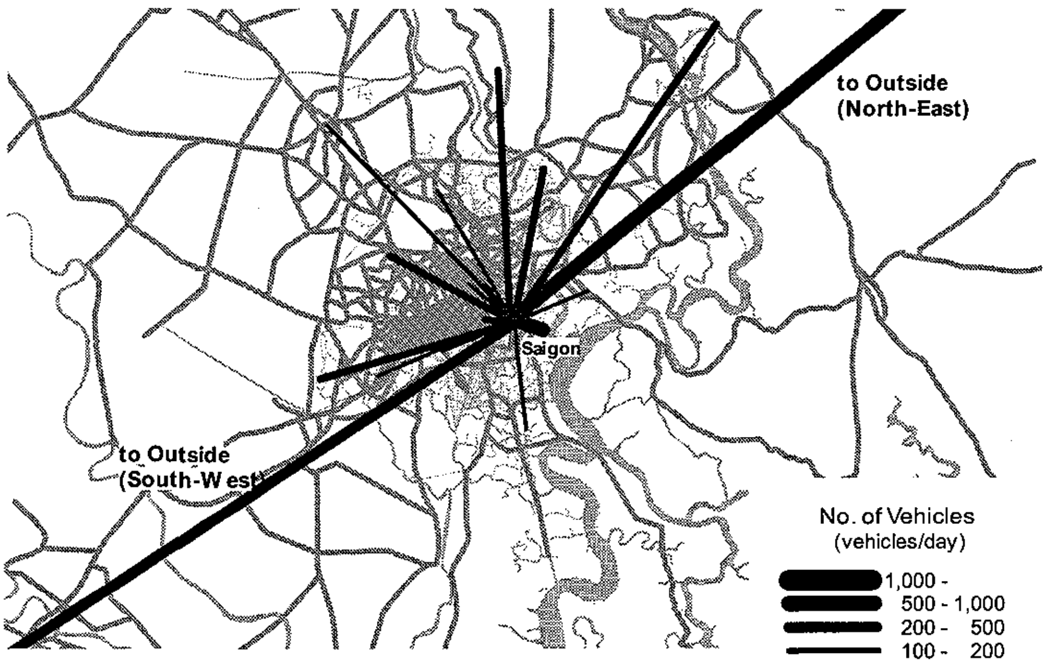
Table 3.1.3 Major Commodities Carried by Freight Transport (Freight Survey)

Items	%
Industrial Crops	35.3
Manufacturing Goods	13.4
Paddy/Other Food Crops	13.3
Fertilizer	8.9
Steel	6.1
Construction Materials	3.6
Wood/Forest Products	2.4
Cement	2.2
Fishery Products	1.7
Coal	0.9
Petroleum Products	0.5
Sugarcane, Sugar	0.5
Animal Meat	0.2
Others	11.0
Total	100.0

Source: Study Team

Figure3.1.1 illustrates freight traffic volume (after expansion) from/to the Saigon Port area (Station codes 1, 2, 3, 4, 6, 7, 8, 14, and 17 in Table 3.1.1) based on the OD interview of drivers at the survey points. The results show that there were many trucks going from/to Ho Chi Minh City and its adjoining areas. This implies that although Ho Chi Minh City plays a significant role in southern Vietnam, the ports do not need to be located at the city center because of their strong impact on local traffic.

Figure 3.1.1 Distribution of Freight Traffic from/to Saigon Port Area



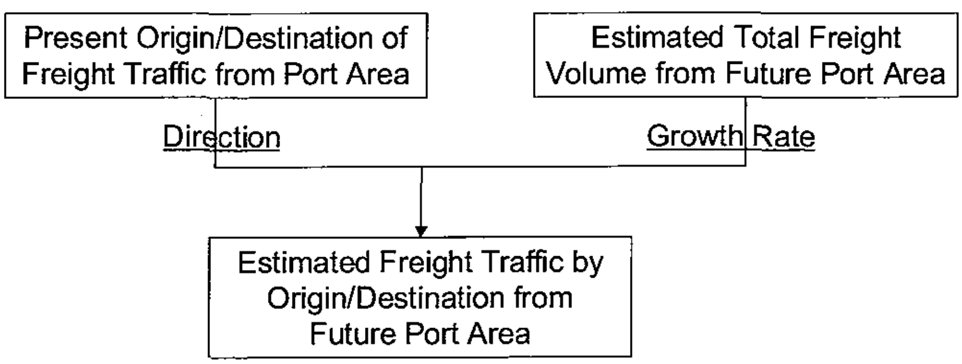
Source: Study Team

3.2 Future Freight Traffic from Port Area

1) Methodology

Future movements of freight traffic from the port areas (including newly built ports) were estimated by the following procedures as shown in Figure 3.2.1. First, the present OD table from/to port area was made, and those traffic volumes by OD pair were expanded for the future volumes based on the growth rate of estimated total freight volume by port area.

Figure 3.2.1 Distribution of Freight Traffic from/to Saigon Port Area



2) Future Freight Volume by Port

Table 3.2.1 shows the future freight volumes of ports estimated by the other study. The volume was estimated based on the port relocation and development plan. The annual growth rate of freight movements was calculated based on the estimates.

Table 3.2.1 Future Freight Volumes of Ports

	Dry Cargo (x1,000tons)			Container (x1,000TEU)		
	2000	2010	2020	2000	2010	2020
1. *Saigon/ Tan Cang/ Ben Nghe/ VICT*	*8,840*	*9,600*	*7,500*	*858*	*760*	*760*
2. Other Ports in HCMC	1,000	3,000	4,800	-	-	-
3. Cat Lai IZ Port	318	400	400	-	300	300
4. Hiep Phuoc Container Port	-	400	800	-	110	380
5. Hiep Phuoc General Port	-	-	5,800	-	-	-
Total	10,158	13,400	19,300	858	1,170	1,440
Growth Rate (-2000:%/yr)	-	2.81	3.26	-	3.15	2.62

Source: JICA Port Development Study in South Vietnam (2002)

The estimated number of trucks from/to the port area is shown in Table 3.2.2. The numbers were estimated using the results of the traffic count survey, as well as the total growth rate and ratio of all ports in each year, which are indicated in Table 3.2.1. According to this estimate, the freight traffic from port area in the study area will grow 1.69 times from 2002 to 2020. Forty-three percent (43%) of future freight traffic will be shouldered by the new ports (Cat Lai and Hiep Phouc).

Table 3.2.2 Estimated Number of Trucks from/to Port Area by Type of Truck

(/day)

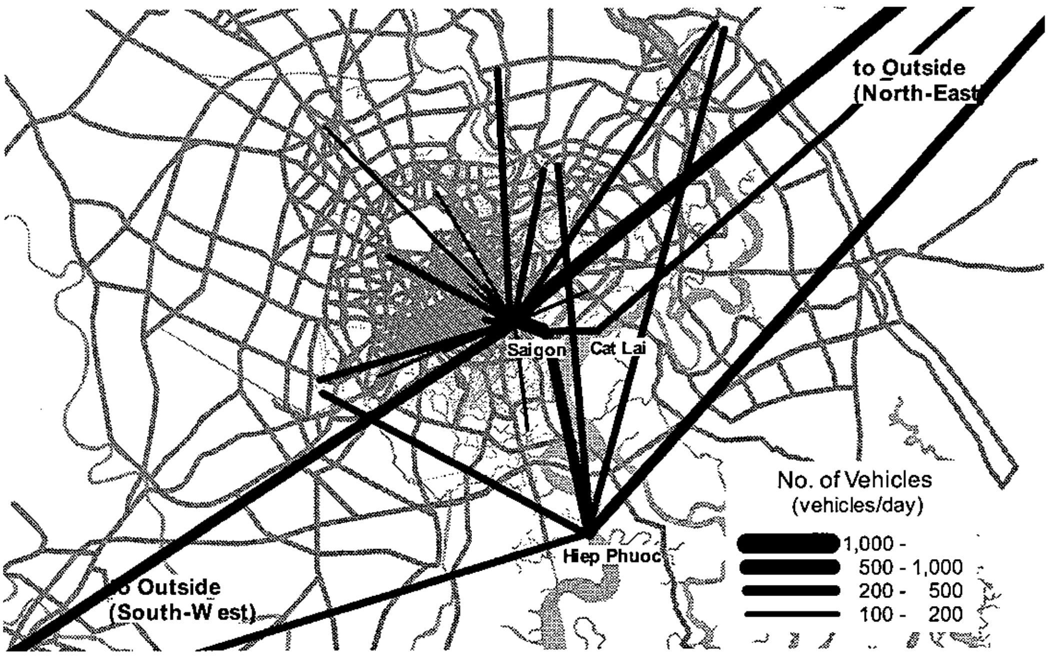
Port	2002			2020		
	Truck		Container Truck	Truck		Container Truck
	Small	Large		Small	Large	
Saigon Port (Nha Rong)	27	563	-	20	402	-
Saigon Port (Khanh Hoi)	122	234	327	90	167	281
Saigon Port (Tan Thuan 1)	129	841	768	95	601	660
Saigon Port (Tan Thuan 2)	41	33	1	30	24	1
Tan Cang Port	321	528	2,351	236	377	2,019
Ben Nghe Port	4	198	202	3	142	173
VICT	373	771	1,290	274	551	1,108
Lotus	71	118	107	551	1,679	-
Saigon Port (Ben Suc)	155	502	111	114	359	95
Sub-total	1,243	3,788	5,157	1,413	4,302	4,337
Cat Lai IZ Port	-	-	-	46	140	1,712
Hiep Phuoc Container Port	-	-	-	92	280	2,169
Hiep Phuoc General Port	-	-	-	666	2,028	-
Total	1,243	3,788	5,157	2,215	6,750	8,218

Source: Study Team

3) Future Freight Volume by Port

The future OD table of freight traffic from/to port areas was constructed by using the present OD table and the estimated future number of trucks from/to port areas shown in Table 3.2.2. The OD table was used additionally for the future traffic assignment in order to examine the influence of the future port location on road traffic. Figure 3.2.2 illustrates the movement of freight traffic from/to the port areas.

Figure 3.2.2 Estimated Distribution of Freight Traffic from/to Port Areas



Source: Study Team

3.3 Impact on Road Transport by Port Relocation

1) Introduction

Three scenarios were examined in studying the impacts of future port locations. Table 3.3.1 shows the assumption for each scenario. Scenario 1 examined the case where there would be no new port development and all estimated freight traffic from the port areas would start/end at the Saigon Port area. Scenario 2 tested the impact of a situation wherein all freight traffic would start/end at the new ports. Based on these assumptions, traffic demand was forecast for all the cases.

Table 3.3.1 Assumptions of the Examination

Scenario	Assumption
Base Case	New port development as it is planned with Saigon Port area still playing a role.
Scenario 1	No development of new ports (Cat Lai and Hiep Phuoc) in 2020.
Scenario 2	No more function for Saigon Port area in 2020 (all port functions are transferred to Cat Lai and Hiep Phouc).

Source: Study Team

2) Impact on Road Traffic

Table 3.3.2 shows the results of traffic assignment for all the scenarios. Differences can be noted among the scenarios along Corridor IIV (PR15) where the Saigon Port area and Hiep Phouc Port are located.

Table 3.3.2 Assessment of Future Network by Scenario based on VCR[1)]

Corridor/Area		By Section			By Area		
		Base	Sc-1	Sc-2	Base	Sc-1	Sc-2
CBD	Saigon	0.99	1.00	0.98	0.79	0.80	0.79
	Cho Lon	0.86	0.86	0.86	0.67	0.67	0.66
I. NH1 (East)	Area 1	1.00	1.02	0.99	0.80	0.81	0.78
	Area 2	0.91	0.94	0.90	0.84	0.86	0.83
	Area 3	0.96	1.00	0.91	0.68	0.68	0.68
	Area 4	1.73	1.62	1.64	1.05	1.06	1.05
II. NH13	Area 1	0.90	0.97	0.92	0.72	0.73	0.71
	Area 2	0.95	0.91	0.93	0.76	0.75	0.75
	Area 3	0.57	0.56	0.56	0.51	0.51	0.50
III. NH22	Area 1	0.96	0.97	0.96	0.71	0.71	0.70
	Area 2	0.96	0.96	0.95	0.76	0.77	0.75
	Area 3	0.87	0.87	0.86	0.82	0.83	0.82
	Area 4	0.52	0.52	0.52	0.58	0.58	0.58
VI. PR10	Area 1	0.61	0.63	0.61	0.50	0.51	0.50
	Area 2	0.70	0.70	0.68	0.69	0.69	0.68
	Area 3	0.35	0.35	0.35	0.56	0.56	0.56
	Area 4	0.23	0.22	0.23	0.22	0.21	0.22
V. NH1 (West)	Area 1	0.71	0.70	0.71	0.45	0.45	0.45
	Area 2	0.46	0.47	0.48	0.71	0.72	0.71
	Area 3	0.66	0.66	0.66	0.60	0.60	0.60
	Area 4	1.05	1.06	1.03	0.42	0.42	0.42
VI. NH50	Area 1	0.63	0.63	0.63	0.71	0.71	0.71
	Area 2	0.73	0.73	0.80	0.65	0.65	0.67
	Area 3	1.00	1.01	1.02	0.41	0.39	0.41
	Area 4	0.28	0.28	0.28	0.32	0.32	0.32
VII. PR15	Area 1	1.08	1.05	1.12	0.84	0.84	0.85
	Area 2	0.94	0.92	1.05	0.94	0.88	0.96
	Area 3	1.05	0.91	1.22	0.58	0.53	0.64
VIII. PR20 (NH51)	Area 1	1.08	1.06	1.08	0.90	0.89	0.92
	Area 2	0.83	0.84	0.83	0.65	0.65	0.66
	Area 3	0.50	0.48	0.51	0.34	0.32	0.35
	Area 4	0.56	0.56	0.55	0.15	0.15	0.15

Source: Study Team
1) Volume/Capacity ratio at AM peak hours.
2) Assumed modal shares (%): motorcycle - 30, car - 20, public transport - 50
3) Ave. occupancy: motorcycle - 1.3, car - 1.9, bus - 50.
4) Toll fee on urban expressway: 15,000VND/ride; on interregional expressway: 1,000VND/km; fare on UMRT: 5,000VND/ride+500VND/km.

The network performance by scenario is shown in Table 3.3.3. The results show that Scenario 2 (no function in the Saigon Port area) presents the best performance and Scenario 1 (no port development in Cat Lai and Hiep Phouc) shows the worst. According to the estimated results and compared to the present plan (base case), if there would be no port development in Cat Lai and Hiep Phouc, road traffic congestion alone would result in an economic loss amounting to **US$ 86.7 million/year** in 2020. On the other hand, if the port could be fully transferred to the newly developed area, this would produce an economic gain of **US$ 15.6 million/year** in 2020.

Table 3.3.3 Comparison of Network Performance

		Base	Sc-1	Sc-2
AM Peak	VOC (Mil US$/h)	0.6	0.6	0.6
	TTC (Mil US$/h)	2.6	2.7	2.6
	Total (Mil US$/h)	3.2	3.3	3.2
	Ave. Travel Speed (km/h)	18.5	18.4	18.6
	Average VCR	0.6	0.6	0.6
Off Peak	VOC (Mil US$/h)	0.2	0.2	0.2
	TTC (Mil US$/h)	1.1	1.1	1.1
	Total (Mil US$/h)	1.3	1.3	1.3
	Ave. Travel Speed (km/h)	29.2	29.2	29.2
	Average VCR	0.3	0.3	0.3
PM Peak	VOC (Mil US$/h)	0.4	0.4	0.4
	TTC (Mil US$/h)	1.3	1.3	1.3
	Total (Mil US$/h)	1.7	1.7	1.7
	Ave. Travel Speed (km/h)	21.5	21.1	21.5
	Average VCR	0.5	0.5	0.5
Dairy	VOC (Mil US$/h)	4.7	4.7	4.7
	TTC (Mil US$/h)	20.9	21.2	20.9
	Total (Mil US$/h)	25.7	25.9	25.6
	Ave. Travel Speed (km/h)	27.1	26.9	27.2
	Average VCR	-	-	-

Source: Study Team
1) Assumed modal share (%): motorcycle - 30, car – 20, public transport - 50.
2) Average occupancy: motorcycle - 1.3, car - 1.9, bus - 50.
3) Toll fee on urban expressway: 15,000VND/ride; on interregional expressway: 1,000VND/km; fare on UMRT: 5,000VND/ride+500VND/km.

3.4 Conclusion

This technical memo is aimed at figuring out the impacts of port relocation on road traffic in 2020. The findings are as follows:

- Based on the traffic count survey of freight traffic in the generated/attracted areas, there would be substantial freight traffic going from/to HCMC from Saigon Port area, especially to the northeast of the city.
- The process for estimating future freight traffic movements from the port areas was indicated according to the estimates. Freight traffic from the port area in the study area would increase by 1.69 times from 2002 to 2020 and 43% of this would be

shouldered by the new ports (Cat Lai and Hiep Phouc).

- Three scenarios were examined to measure the impact of port location on road traffic in 2020. Based on the estimated results, if there would be no port development in Cat Lai and Hiep Phouc, road traffic congestion alone would result in an economic loss amounting to US$ 86.7 million/year in 2020. On the other hand, if the port could be fully transferred to the newly developed area, this would produce an economic gain of US$ 15.6 million/year in 2020.

Appendix 4 Comparison of Proposed M/P Networks and Their Performance

4.1 Introduction

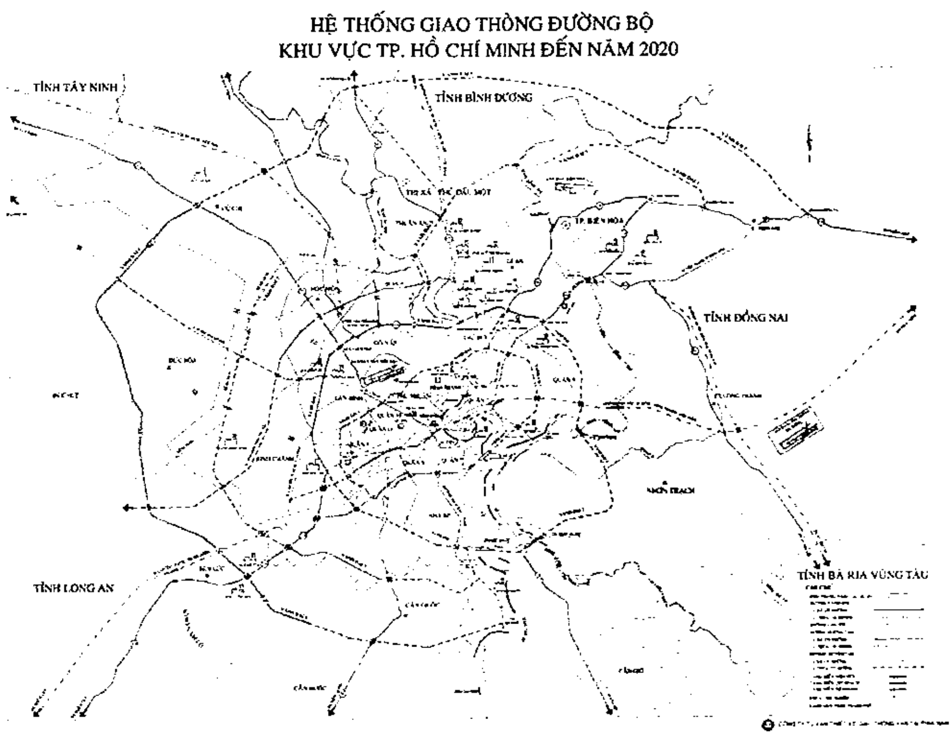
The HOUTRANS Study Team proposed the Master Plan network in the Draft Final Report, and during the Steering Committee for that report, it was suggested that the Study Team should review more the M/P network proposed by the MOT in 2003 with the technical assistance of the Transport Engineering & Design Inc. - South (TEDI-South). Even though the Study Team took this into account when they formulated the HOUTRANS M/P network, it was suggested that a more detailed and direct comparison should be done. It is toward this end that this technical memo was prepared -- to bridge the difference between the HOUTRANS M/P and the MOT 2003 M/P.

4.2 MOT M/P Network

1) At-grade Road Network

Figure 4.2.1 shows the MOT M/P at-grade road network in 2020.

Figure 4.2.1 MOT M/P At-grade Road Network

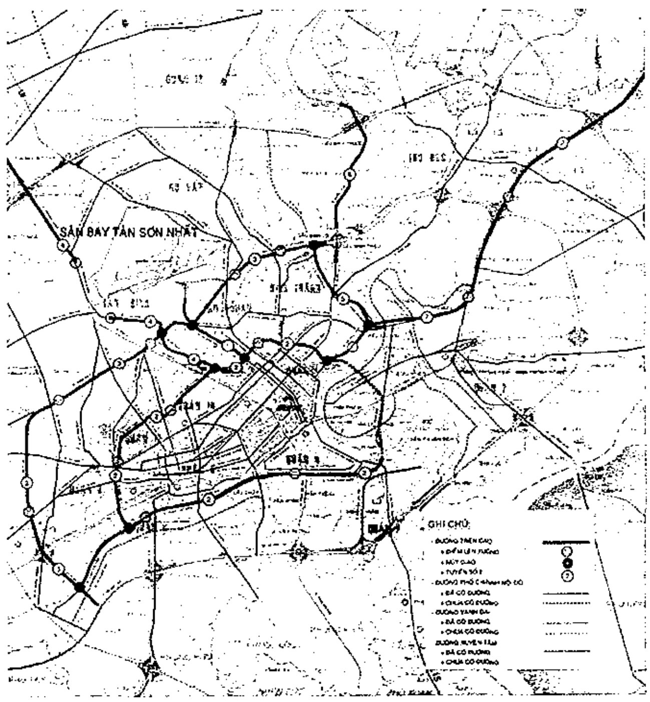


Source: HCMC Transport Development Plan 2020 (MOT: 2003)

2) Expressway and Railway Network

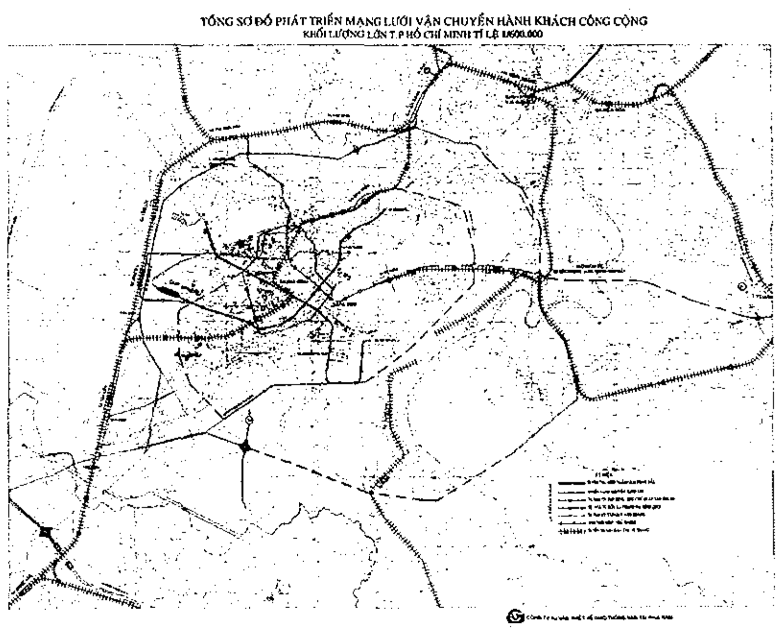
Figures 4.2.2 and 4.2.3 illustrate the MOT M/P urban expressway network and urban railway network, respectively.

Figure 4.2.2 MOT M/P Urban Expressway Network



Source: HCMC Transport Development Plan 2020 (MOT, 2003)

Figure 4.2.3 MOT M/P Urban Railway Network



Source: HCMC Transport Development Plan 2020 (MOT, 2003)

3) Project Cost

The project cost for developing the MOT M/P network is shown in Table 4.2.1. According to this, the total costs of the M/P network until 2020 is US$ 27.6 billion excluding urban railway and US$ 39.5 billion including it.

Table 4.2.1 MOT M/P Project Summary

	Length (km)	Project Cost[1)] (US$ Mil.)
Radical Road	218	5,681
Ring Road	387	8,218
Urban Primary Road	52	4,970
Urban Road	594	5,462
- At grade	464	3,841[1)]
- Elevated (expressway)	85	1,621
Other Road Facilities	25	3,268
- Bridge	25	1,030
- Intersection	(33 ISs)	2,238
Urban Railway	153	11,870
Total	**1,429**	**39,469**

Source: HCMC Transport Development Plan 2020 (MOT: 2003)
1) Cost of some road projects was estimated by the HOUTRANS Study Team due to lack of data.

4.3 Comparison of M/P Networks

1) General Features

A general comparison of the HOUTRANS and MOT M/P networks is shown in Table 4.3.1. Based on this, the road lengths of at-grade roads show similar values. The MOT suggested developing an 85km elevated urban expressway, while the HOUTRANS suggested developing a 46km elevated urban expressway. The length of the urban railway is 138km in the HOUTRANS network and 153km in the MOT network. Regarding costs, the MOT plan is three times higher than the HOUTRANS M/P network. One of the reasons is the difference in lane width. The MOT network has 2.6 times more lane width on average based on the road area indicated in Table 4.3.1. Another reason is the locations of the projects which are shown in Figure 4.3.1.

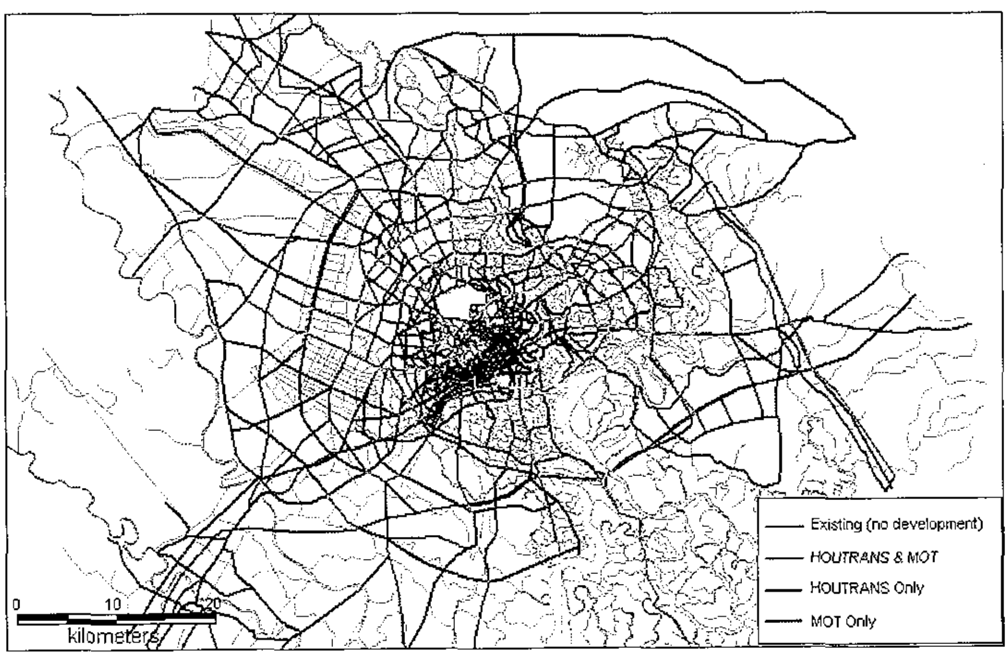
Table 4.3.1 Comparison between HOUTRANS and MOT M/P Networks

	HOUTRANS[1)2)]	MOT
Length (km)		
- At-grade Road	1,292	1,191
- Elevated Road	46	85
- Urban Railway	138	153
Total	**1,476**	**1,429**
Project Road Area (ha)[3)]	**2,425**	**6,304**
Cost (US$ Mil.)		
- Road Projects	8,649	25,361
- Intersection	1,401	2,238
- Urban Railway	3,023	11,870
Total	**13,073**	**39,469**

Source: HCMC Transport Development Plan 2020 (MOT: 2003) and HOUTRANS Study Team
1) Including ongoing/committed projects
2) Excluding other M/P components such as bus modernization program, etc.
3) Carriageway only.

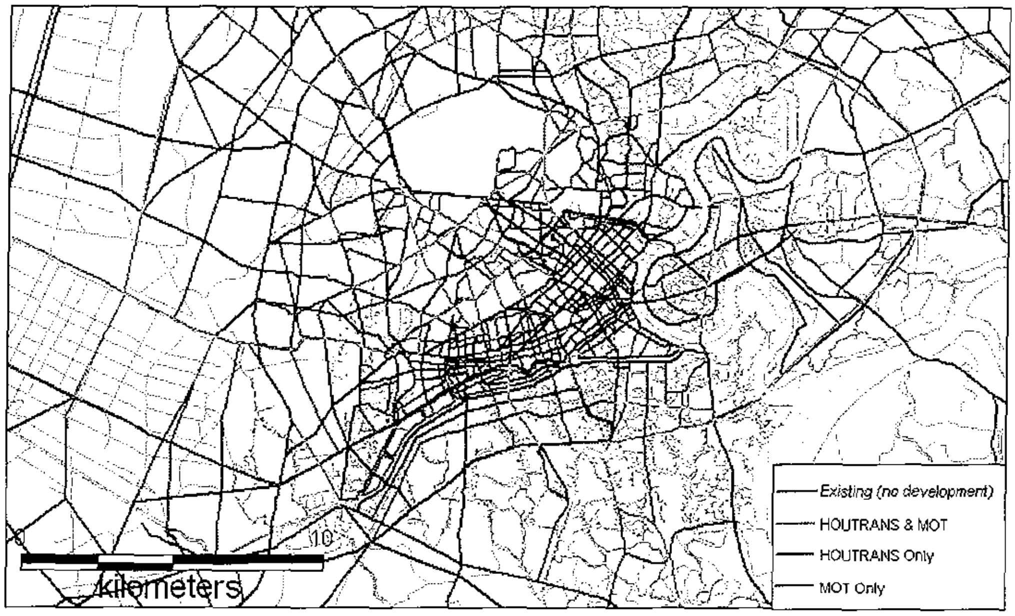
Figures 4.3.1 and 4.3.2 show the difference in the road network between the HOUTRANS and the MOT plans. Green lines show the road projects, which are common to both HOUTRANS and MOT plans. Red lines are the projects, which are included in the HOUTRANS M/P network, while blue lines are those in the MOT M/P network.

Figure 4.3.1 HOUTRANS and MOT M/P Networks for HCMC



Source: HCMC Transport Development Plan 2020 (MOT, 2003) and HOUTRANS Study Team

Figure 4.3.2 HOUTRANS and MOT M/P Networks for the City Center



Source: HCMC Transport Development Plan 2020 (MOT: 2003) and HOUTRANS Study Team

According to this figure, there are many projects in the CBD with the MOT M/P network, while the HOUTRANS M/P network has only a few. On the other hand, the latter network represents a lot of road projects in the emerging peripheral areas, such as the districts of Tan Binh, Binh Chanh, Go Vap, Thu Duc, 2, and 9, compared to the former network.

Regarding the ring roads, there are some differences in the alignments on RR1 and RR2. Basically, the differences are adjustable from the viewpoint of a whole M/P network. However, the alignment of RR3 and RR4 is quite different between two plans. Therefore, this difference might be examined carefully.

2) Summary of Differences

Based on the comparison shown in Figure 4.3.1 and a supplementary discussion with an MOT engineer, the differences in the M/P networks can be summarized as shown in Table 4.3.2.

Table 4.3.2 Summary of M/P Network Differences

	Location	Description
1	CBD and emerging peripheral areas	Since the HOUTRANS Study Team carefully chose road projects for the urbanized areas, road developments in the CBD in the HOUTRANS plan were adjusted to a lower level.
2	Ring Road No.2	The shape and definition are different between the two plans. However, both have almost the same road alignment, which is only a matter of definition of the road. However, while the HOUTRANS suggested that RR2 should be a major urban trunk road, the MOT regarded it more as a bypass for interregional traffic movement.
2	Ring Road No.3	RR3 in the MOT plan is located between RR3 and RR4 in the HOUTRANS plan, running on the edge of HCMC's boundary. In the HOUTRANS plan, it is comparatively closer to RR2 (about 5km distance), passing through industrial zones in Di An, Binh Duong.
3	Ring Road No.4	RR4 in the HOUTRANS plan is located between RR3 and RR4 in the MOT plan. In Bien Hoa City, RR4 in the HOUTRANS plan is located in an area inner than the RR3 in the MOT plan.
4	Regional Expressway	While the regional expressway in the MOT plan is connected to RR2 on An Luc that in the HOUTRANS runs on the southern part of HCMC's rural areas.
5	Other Road Projects	There are some differences in alignment on Hiep Phouc road, PR10, and PR14.

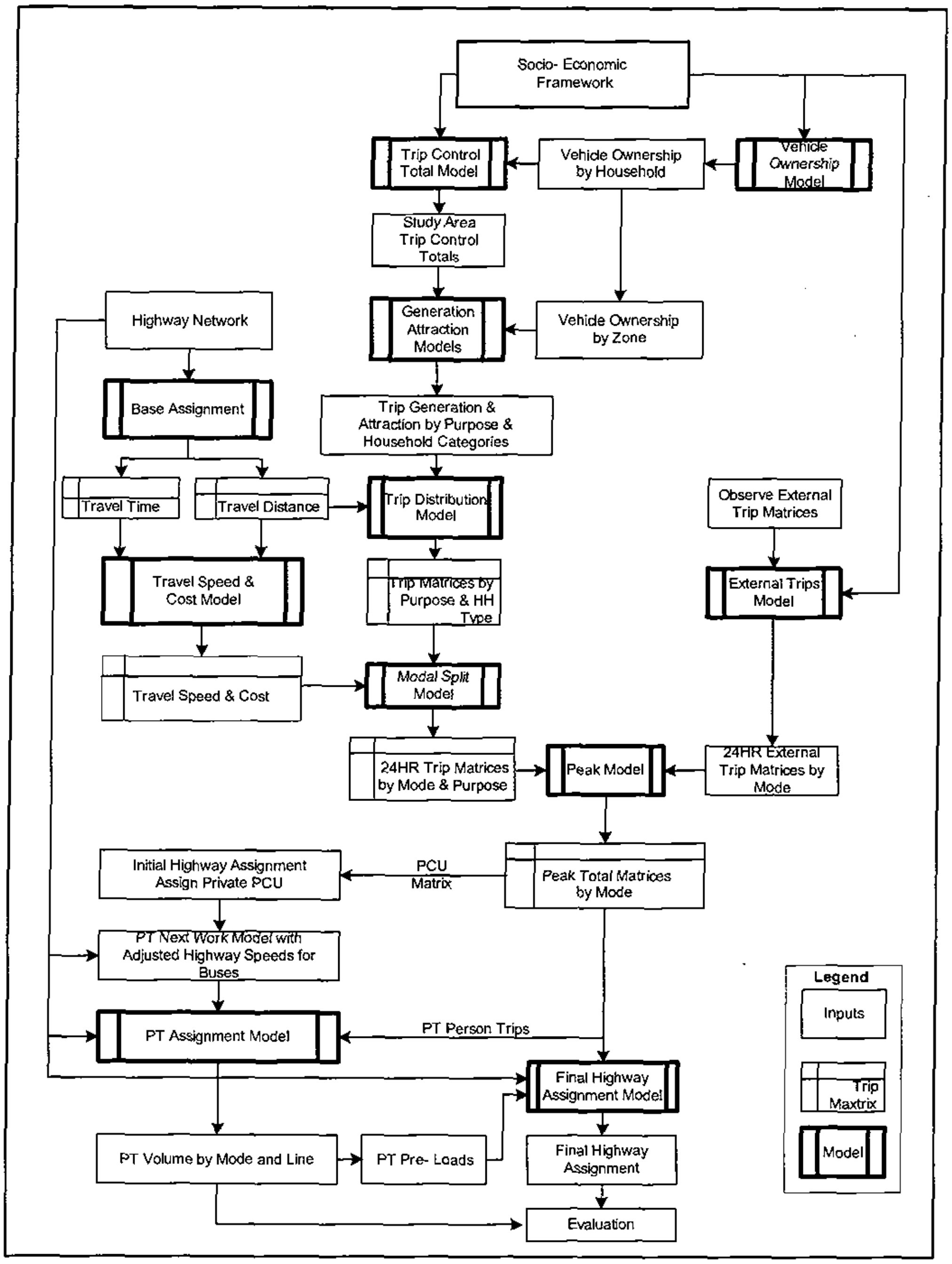
Source: HCMC Transport Development Plan 2020 (MOT, 2003) and HOUTRANS Study Team

4.4 Comparison of Network Performance

1) Whole M/P Network

Traffic assignment using the 3rd stage model (hourly assignment) on the two M/P networks were done to examine their respective performances under the future traffic demand level. *Traffic assignment was conducted following the methodology shown in* Figure 4.4.1.

Figure 4.4.1 HOUTRANS Traffic Demand Forecasting Model

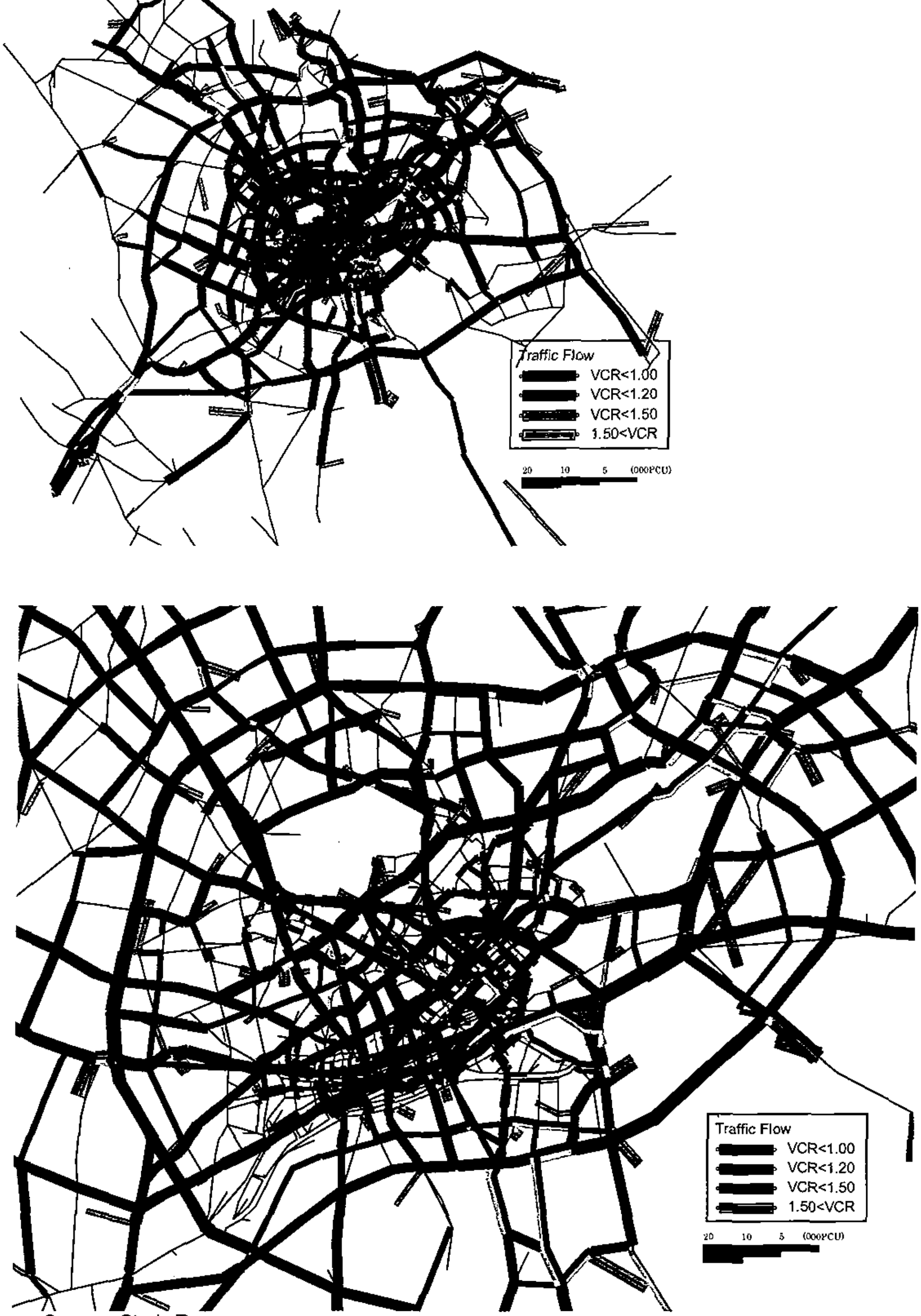


Source: Study Team

The results of traffic assignment are shown in Figures 4.4.2 and 4.4.3 for the HOUTRANS and the MOT M/P networks, respectively. Results show that both networks have few congested sections during the morning peak hours in 2020 when public transport shares 50% of the traffic demand. Table 4.4.1 shows the volume/capacity ratio by area and corridor. It shows no seriously congested area in both networks.

Table 4.4.2 shows that both networks perform similarly, although the MOT M/P network shows a bit better performance in terms of daily benefit (US$ 439 million/year). However, since the MOT M/P network costs three times more than the HOUTRANS M/P network, the latter has much higher EIRR (**34%**) than the MOT network (**12%**).

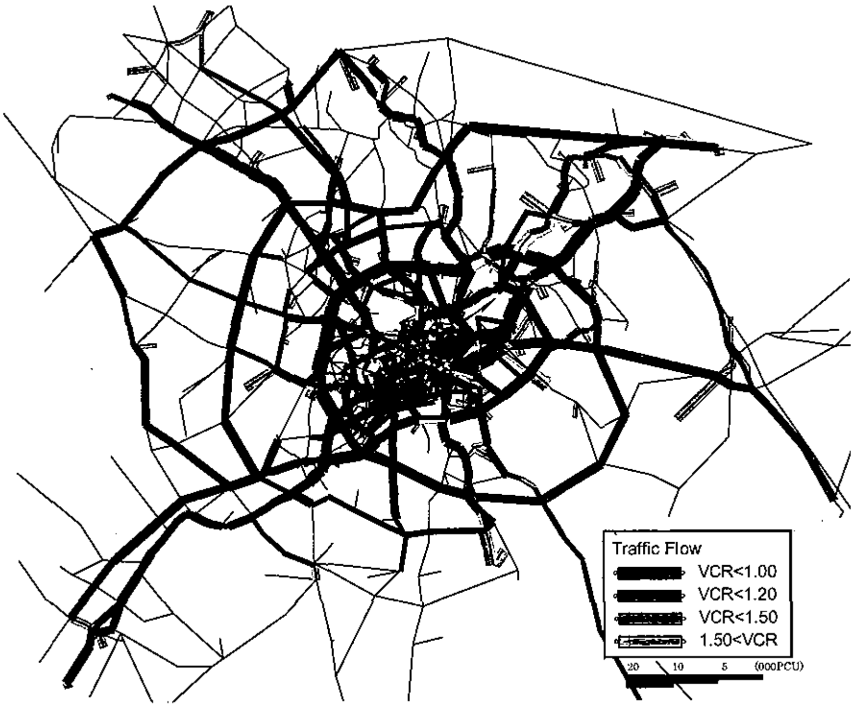
Figure 4.4.2 Traffic Assignment for HOUTRANS M/P Network



Source: Study Team

Note: During AM peak hour. Assumed modal shares (%) are: motorcycle - 50, car - 20, and bus - 30. Average *occupancy: motorcycle - 1.3, car - 2.0, bus - 50.*

Figure 4.4.3 Traffic Assignment for MOT M/P Network



Source: Study Team
Note: During AM peak hour. Assumed modal shares (%): motorcycle - 50, car - 20, and bus - 30. Average occupancy: motorcycle - 1.3, car - 2.0, bus - 50.

Table 4.4.1 Assessment of Future Network based on V/CR[1)]

Corridor/Area		By Section		By Area	
		HOUTRANS	MOT	HOUTRANS	MOT
CBD	Saigon	0.99	0.87	0.79	0.79
	Cho Lon	0.86	0.78	0.67	0.67
I. NH1 (East)	Area 1	1.00	0.68	0.80	0.73
	Area 2	0.91	1.27	0.84	0.89
	Area 3	0.96	0.79	0.68	0.70
	Area 4	1.73	1.39	1.05	0.45
II. NH13	Area 1	0.90	0.91	0.72	0.84
	Area 2	0.95	0.57	0.76	0.73
	Area 3	0.57	0.72	0.51	0.56
III. NH22	Area 1	0.96	0.81	0.71	0.79
	Area 2	0.96	0.99	0.76	0.76
	Area 3	0.87	0.78	0.82	0.52
	Area 4	0.52	0.52	0.58	0.52
VI. PR10	Area 1	0.61	0.78	0.50	0.73
	Area 2	0.70	1.01	0.69	0.71
	Area 3	0.35	0.57	0.56	0.45
	Area 4	0.23	0.35	0.22	0.35
V. NH1 (West)	Area 1	0.71	0.57	0.45	0.47
	Area 2	0.46	0.43	0.71	0.55
	Area 3	0.66	0.31	0.60	0.37
	Area 4	1.05	1.04	0.42	0.70
VI. NH50	Area 1	0.63	0.67	0.71	0.64
	Area 2	0.73	0.12	0.65	0.42
	Area 3	1.00	0.39	0.41	0.34
	Area 4	0.28	0.28	0.32	0.31
VII. PR15	Area 1	1.08	0.62	0.84	0.67
	Area 2	0.94	0.43	0.94	0.55
	Area 3	1.05	0.93	0.58	0.26
VIII. PR20 (NH51)	Area 1	1.08	1.02	0.90	1.68
	Area 2	0.83	1.10	0.65	0.71
	Area 3	0.50	0.65	0.34	0.48
	Area 4	0.56	0.54	0.15	0.42

Source: Study Team
1) V/CR at AM peak hour.

Table 4.4.2 Comparison of Network Performance

		HOUTRANS	MOT
AM Peak	VOC (Mil US$/h)	0.6	0.6
	TTC (Mil US$/h)	2.6	2.7
	Total (Mil US$/h)	3.2	3.3
	Ave. Travel Speed (km/h)	18.5	18.5
	Average VCR	0.6	0.4
Off Peak	VOC (Mil US$/h)	0.2	0.2
	TTC (Mil US$/h)	1.1	1.0
	Total (Mil US$/h)	1.3	1.2
	Ave. Travel Speed (km/h)	29.2	29.6
	Average VCR	0.3	0.2
PM Peak	VOC (Mil US$/h)	0.4	0.4
	TTC (Mil US$/h)	1.3	1.3
	Total (Mil US$/h)	1.7	1.7
	Ave. Travel Speed (km/h)	21.5	22.4
	Average VCR	0.5	0.3
Dairy	VOC (Mil US$/h)	4.7	4.7
	TTC (Mil US$/h)	20.9	19.7
	Total (Mil US$/h)	25.7	24.5
	Ave. Travel Speed (km/h)	27.1	27.5
Benefit (Mil US$/year)[4)]		**14,418**	**14,857**
EIRR (%)		**33.9**	**11.9**

Source: Study Team

1) Assumed modal share (%) of motorcycle, car and public transport is 30, 20 and 50.
2) Ave. occupancy: motorcycle - 1.3, car - 1.9, bus - 50.
3) Toll fee on urban expressway: 15,000VND/ride; on interregional expressway: 1,000VND/km; fare on UMRT: 5,000VND/ride+500VND/km.
4) Difference of transport cost from Do-nothing network (not from Do Committed Network) because MOT M/P network includes Do-committed road projects.

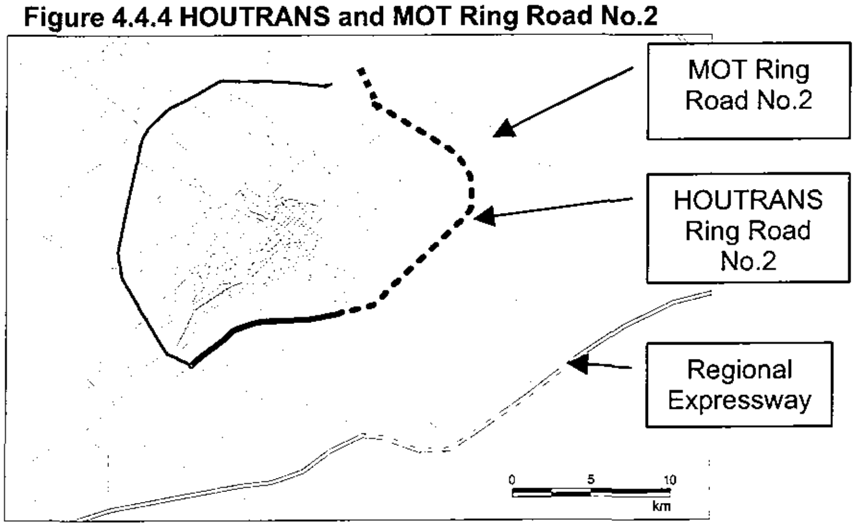
2) Comparison of Ring Road No. 2

The original plan for RR2 was to complete the missing section in the south and linking with the section of NH1 in the north (see Figure 4.4.4). This project intends to provide transport services in the south. Relocation of the ports to the south is also closely integrated with this project. The total length of the project road is 55km with four lanes. The Study Team reviewed the plan and, as a result of the network analysis explained in Chapter 6 of the main text, made the following recommendations to modify this project:

- From an overall urban transport network viewpoint, RR2 can be completed with a smaller ring at a lower cost. At the same time, demand can be met more effectively.
- The ports, which will be relocated to the south, can be better served by a regional expressway which will separate urban from interprovincial traffic and provide better linkages with other major developments planned in the region such as the new international port in Thi Vai/Cai Mep, the new international airport in Long Thanh and major industrial developments in Dong Nai province.
- Thus, the original RR2 was divided into two projects: an urban ring road and a regional expressway.

As explained, the difference is in defining which road will be RR2. Therefore, an analytical comparison was omitted in this memo and a detailed examination was instead described in the feasibility study report on RR2.

Figure 4.4.4 HOUTRANS and MOT Ring Road No.2



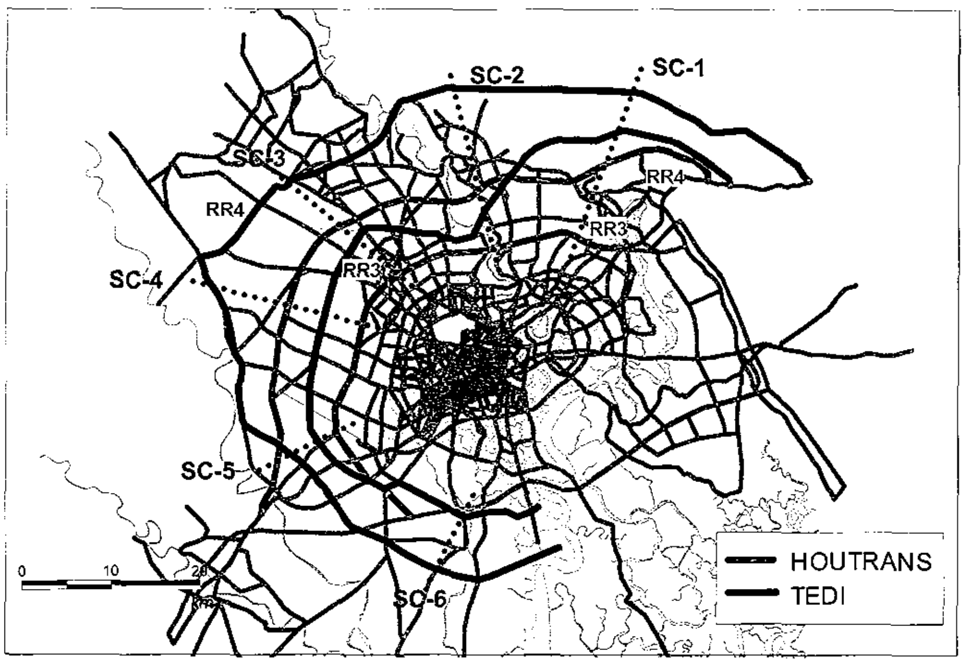
Source: Study Team

3) Comparison of Ring Road No. 3 and 4

The comparison of RR3 and RR4 in the HOUTRANS and the MOT M/P networks was conducted by traffic demand forecast in order to evaluate their alignments. The links, which represent RR3 and RR4 in the MOT plan, were added to the HOUTRANS M/P network that includes the original RR3 and RR4 for future traffic assignment.

Figure 4.4.5 shows the difference in the alignment of RR3 and RR4 between the HOUTRANS and the MOT networks. Gray lines represent the former. On this network, future traffic assignment was conducted.

Figure 4.4.5 RR3 and RR4 in HOUTRANS and MOT M/P Networks



Source: Study Team

Figure 4.4.6 illustrates the result of traffic assignment. Table 4.4.3 shows the traffic volumes on each section, which are shown in Figure 4.4.5. According to the results, the estimated traffic volume on RR3 and RR4 in the HOUTRANS network would be higher than that in the MOT network. However, the traffic volume on Section-1 of RR3 of the MOT plan would be larger than that on RR4 in the HOUTRANS plan. In 2020, there would still be little demand on RR4 in the MOT plan even if some sections would be located outside the HOUTRANS study area.

Figure 4.4.6 Traffic Assignment

Source: Study Team
Note: During AM peak hour. Assumed modal share (%): motorcycle - 50, car - 20, and bus - 30. Average occupancy: motorcycle - 1.3, car - 2.0, bus - 50.

Table 4.4.3 Traffic Volumes in HOUTRANS and MOT RR3 and RR4

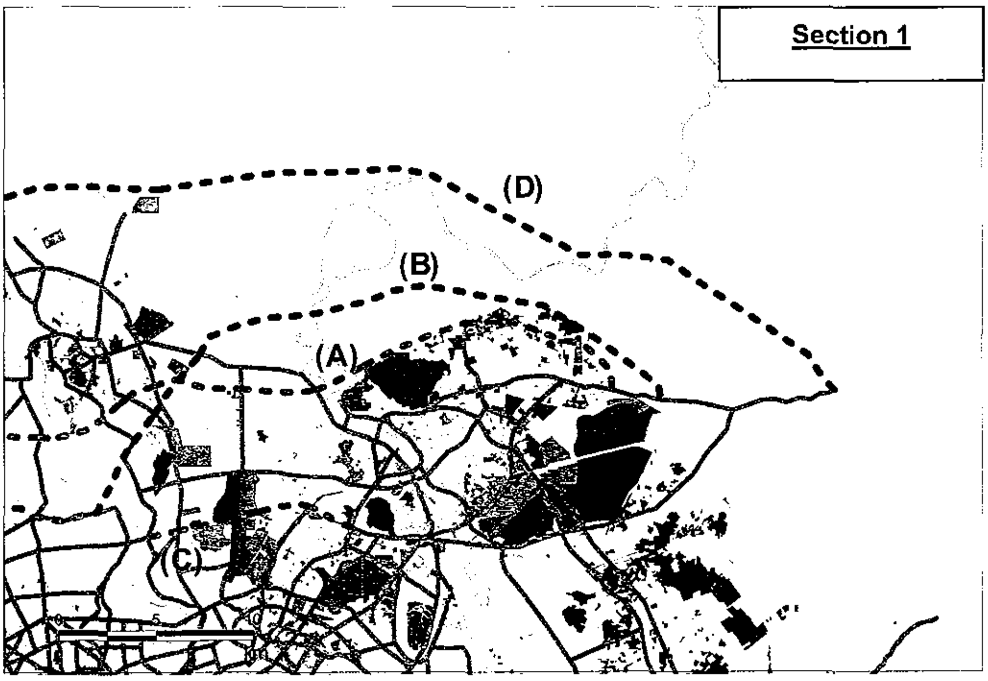
(000 PCU/day)

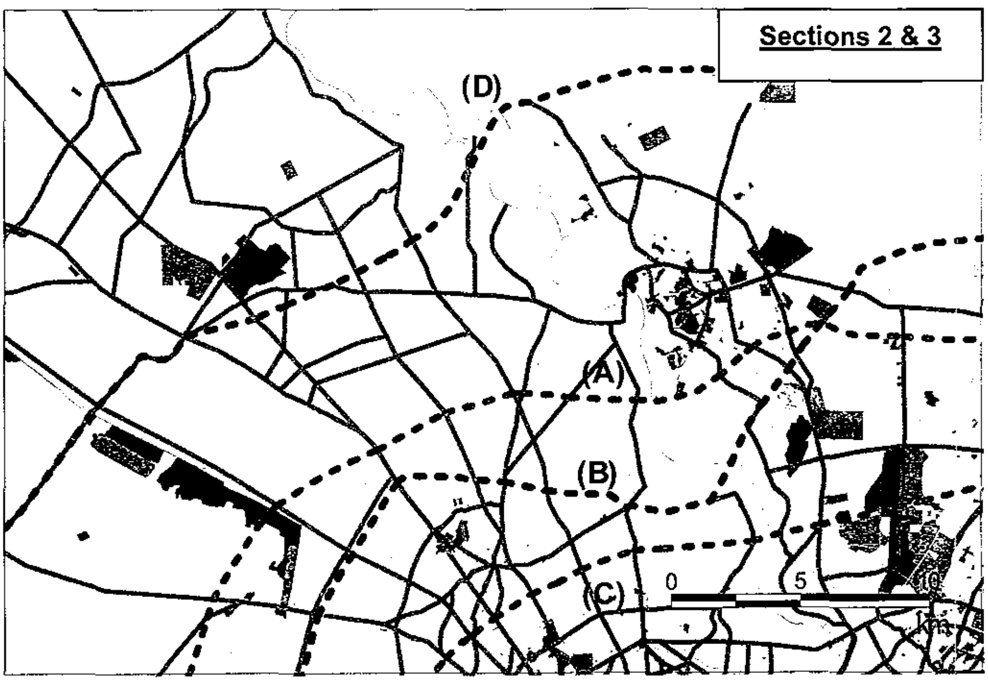
	Ring Road No.3		Ring Road No.4	
	HOUTRANS	MOT	HOUTRANS	MOT
Section 1	17.9	8.1	6.2	0.5
Section 2	38.5	9.3	19.9	0.8
Section 3	20.8	5.4	10.5	18.7
Section 4	17.1	6.4	14.0	9.0
Section 5	24.7	0.0	10.2	1.1
Section 6	-	5.2	-	4.9

Source: Study Team

Based on this exercise and related geographical and land-use information, the comparison of RR3 and RR4 by section can be illustrated as shown in Figure 4.4.7.

Figure 4.4.7 Alignment of RR3 and RR4

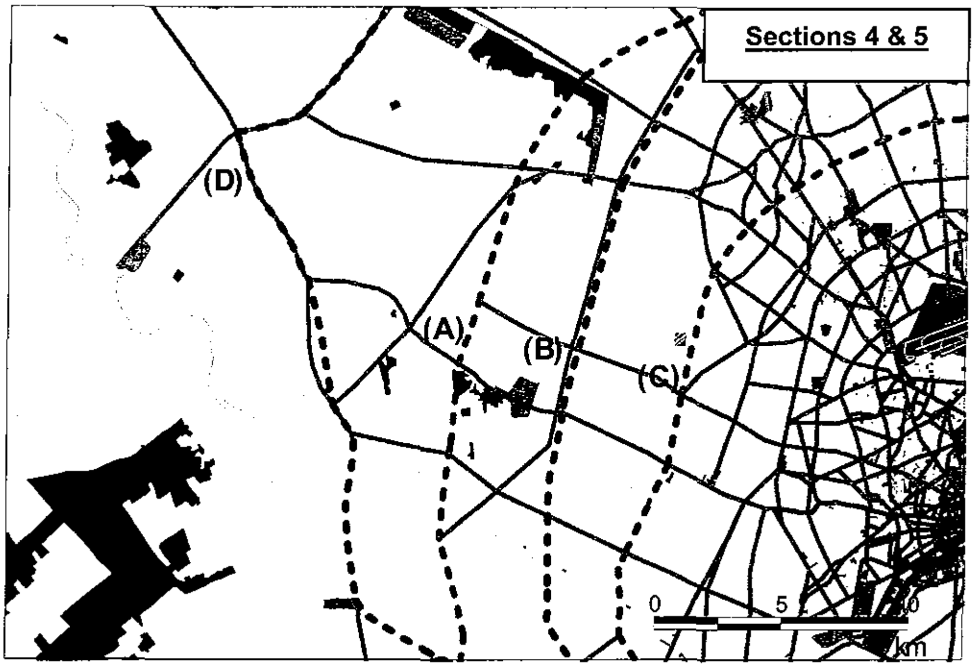


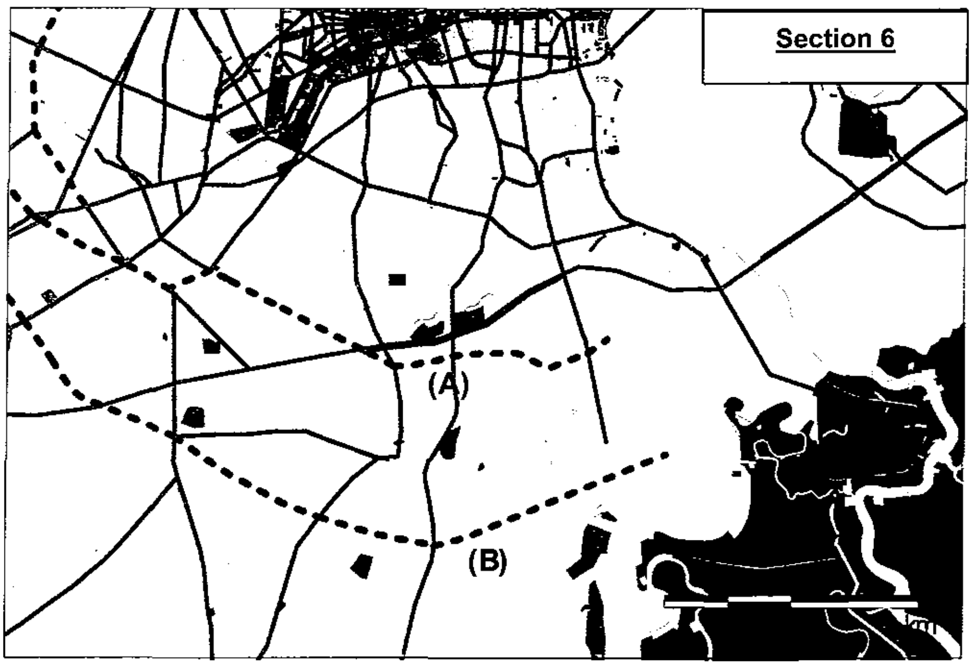


Source: Study Team

- Business&Commercial/Public Area
- Agriculture
- Green Area
- Industrial Area
- Residential Area
- Military

Figure 4.4.7 Alignment of RR3 and RR4 (continued)





Source: Study Team

- *Business&Commercial/Public Area*
- Agriculture
- Green Area
- Industrial Area
- Residential Area
- Military

Section 1

Since the alignments of RR4 (A) in the HOUTRANS network and RR3 in the MOT (B) network are close to each other, RR4 in the HOUTRANS network can be replaced by RR3 in the MOT network should there be a technical or social problem in the original alignment. This can be done because there is a military air base in Bien Hoa City nearby and Dong Nai River bifurcates at the original crossing point. In addition, according to the result of traffic assignment shown in Table 4.3.1, the traffic volume on RR3 of the MOT network showed a higher value than that on RR4 of the HOUTRANS network.

Using GIS data, RR3 in the HOUTRANS network (C) will avoid major industrial establishments. However, the alignment can be adjusted depending on the difficulties in acquiring land in that area because it is mainly an industrial zone.

Sections 2 & 3

Because of the strange shape of RR3 in the MOT plan (B), its efficiency as a ring road is decreased. On the other hand, RR3 and RR4 in the HOUTRANS plan showed superior results in terms of estimated future traffic demand. It was believed that the RR3 alignment in the MOT plan was decided due to the ease in land acquisition in the area. The development body should have to choose therefore between road efficiency and ease in land acquisition depending on the situation.

Higher traffic volume was estimated on RR4 in the MOT plan in section 3 due to the forecast dense development in Cu Chi in 2020. Traffic volume on RR4 in the MOT plan has no continuity.

Sections 4 & 5

The differences in traffic volume forecast seem to be due to the sections' proximity to the city center (radius of the ring road) and because the distance between the four roads is so small. Therefore, HOUTRANS ring roads showed higher traffic volumes than those in the MOT plan.

Section 6

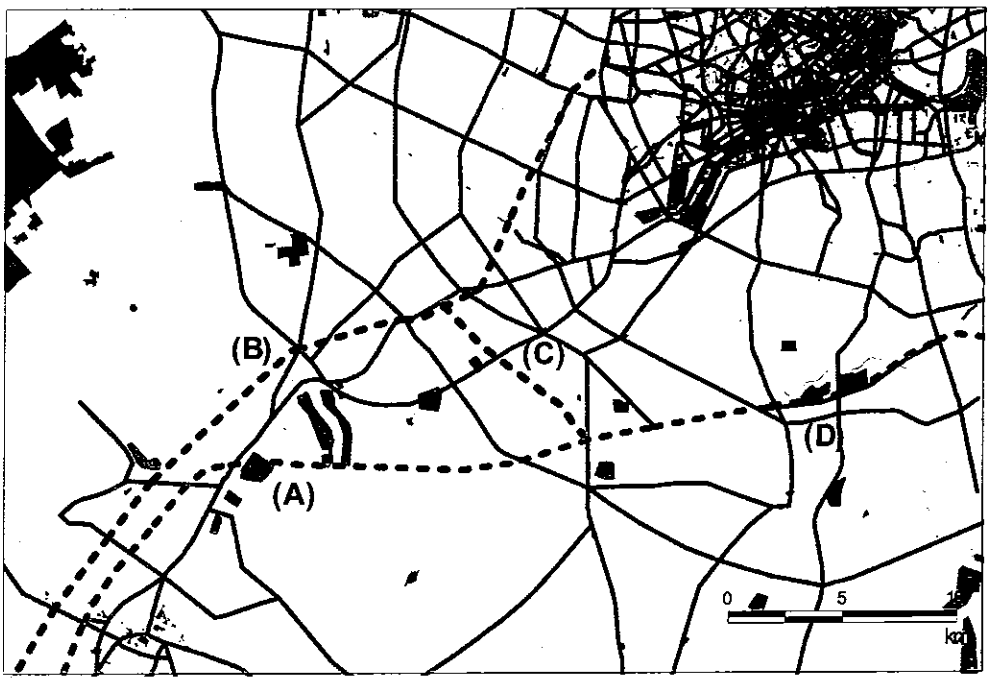
In the HOUTRANS M/P there is a regional expressway south of the study area (passing Long An, Nha Be, Can Gio, and Nhon Trach) which will function as a ring road (bypass function) for interregional traffic. On the other hand, there are two roads going to the newly developed Hiep Phuoc Port in the MOT plan. These roads will connect the port with the Mekong delta area. However, the traffic volume forecast in 2020 for these two trunk roads does not justify them.

4) Comparison of Regional Expressway

A comparison of interregional expressway plans was conducted. The Study Team suggested that the interregional expressway – (A)+(D) in Figure 4.4.8 – should not be developed in the urban area in order to clearly separate intraregional from interregional traffic and provide good connectivity between ports and industrial zones. In the MOT plan, however, (B), the interregional expressway, starts from the base of the urbanized area (connected with RR2), which might mix the intraregional with the interregional traffic on RR2. According to the plan, the construction of this interregional expressway will start by end of 2004.

Based on the foregoing, a possible alternative alignment is the integration of the expressways proposed in both the HOUTRANS and the MOT M/P networks, or (B)+(C)+(D). It is important that the interregional expressway should play a role as a bypass, barring interregional traffic from entering the urban road (RR2). Therefore, the south expressway (D) is very important even though the development of the Ho Chi Minh – My Tho expressway (B) is already committed.

Figure 4.4.8 Alignment of Inter-regional Expressways



Source: Study Team

Business&Commercial/Public Area
Agriculture
Green Area
Industrial Area
Residential Area
Military

4.5 Conclusion and Recommendations

The comparison of the M/P networks of the HOUTRANS and the MOT showed the following:

1) Overall Network: Overall road network in both MOT M/P and HOUTRANS are similar in terms of total road length. However, the cost and performance of HOUTRANS network are more advantageous than MOT network such as that:
   (a) Average ROW of the MOT plan is three times larger than that of the HOUTRANS plan, the former costs three times more than the latter.
   (b) EIRR of the HOUTRANS network is 34% compared to 12% of MOT network.
2) Ring Road No.2: MOT Ring Road No.2 was separated into smaller Ring Road No.2 and a new Regional Expressway to segregate intercity traffic and urban traffic. Technical standards of the two roads must be different. While new Ring Road No.2 is to serve as major urban road along which urban developments take place, the new regional expressway is to serve intercity and industrial transport. The regional expressway is an access-controlled toll way.
3) Ring Road No.3 and No.4: The comparison of RR3 and RR4 in the HOUTRANS plan showed better performance than those in the MOT plan because of the formal efficiency in terms of location and alignment. Alternatives for the HOUTRANS M/P were offered from the MOT plan in case social, technical, and political problems become unmanageable. Since the Ring Road No.3 and No.4 are expected to promote future urban development in the area, they must be integrated with secondary roads and landuse. The roads must not be toll roads but ordinary urban roads with high technical standards.
4) Regional Expressway: The proposed Regional Expressway is very important to separate urban traffic and intercity and industrial traffic. This expressway is to provide efficient like with future ports and three economic regions such as Mekong Delta, HCMC and Dong Nai/ Vung Tau areas. The expressway must be an access-controlled toll road.

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