Traffic Congestion around LRT 1 Station

Unexpected use – around Baclaran Station

Loading/Unloading

Intersection

3.8 Public Transport

Characteristics

With as much as 78% of total daily trips relying on it, public transport is quite important to the urban economy. Road-based public transportation in the Study Area comprises mainly of bus, jeepney, tricycle, and taxi. This mix has been nearly constant since the 1960s. There are some notable changes, however, in terms of service characteristics compared to the 1983 base data from JUMSUT (see Tables 3.12 and 3.13), as follows:

1) For buses, the number of routes and terminals has declined considerably but the number of operating units more than doubled, from 5,000 to 12,900 units, in response to a 94% jump in passenger volume. This quantitative change was accompanied by a qualitative shift – the number of air-conditioned bus routes soared from 28 in 1983 to 84 in 1996.

2) The number of jeepney routes has decreased due to the route rationalization program implemented in the mid-1980s. But the number of units has nearly doubled from 35,500 to 63,200 units, with less than proportionate 56% rise in the number of passengers. No qualitative improvement has happened on

jeepney fleet; air-conditioned jeepneys are rare (less than 20 units in October 1997), and would likely to remain so.

3) Tricycles have shown the most remarkable jump – in number of terminals, operating units and users. This phenomenon can be traced to the devolution of tricycle regulation to LGUs in 1992.

4) For taxis, there was very little data for 1983 (when vehicle importation grounded to a halt) to compare with 1996 (when laws on vehicle import and supply relaxed). However, judging from the results of the person-trip survey and observations of experts, there had been quantitative and qualitative changes. Most of the taxis now are of newer models and air-conditioned.

New types of services have emerged that have upset operators of traditional modes and blurred the distinction between public and private. The most controversial is the FX (so-called, because of the Tamaraw brand), which was initially fielded as a taxi service but subsequently became a shared taxi or an air-conditioned "jitney". Another variant used vans (e.g., L300 vans, Besta, Hi-Ace), operating on a dial-a-ride or taxi-for-hire basis, or as shuttle service. As of October 1997, the nontraditional service numbered about 13,400 units. In the beginning, they operated illegally. Taking a cue from the MMUTIS, these units were franchised eventually under two new service categories called FilCab and Mega Taxi.

Table 3.12
Supply Characteristics of Road-based Public Transportation

Mode	Item	Service Area	1983	1996	1996/1983
Bus	No. of Routes	MM Intracity	150	89	0.59
		MM Intercity[1/]	47	61	1.30
		Total	197	150	0.76
	No. of Terminals	Inside MM	121	35	0.29
		Adjoining Area	n.a.	23	-
		Total	n.a.	58	-
	Estimated No. of Operating Units	MM Intracity	4,400	9,600 [2/]	2.18
		MM Intercity[1/]	1,500	3,300 [2/]	2.20
		Total	5,900	12,900	2.19
Jeepney	No. of Routes	MM Intracity	640	399	0.62
		MM Intercity[1/]	104	91	0.88
		Total	744	490	0.66
	No. of Terminals	Inside MM	184	210	1.14
		Adjoining Area	n.a.	113	-
		Total	n.a.	323	-
	Estimated No. of Operating Units	MM Intracity	29,300	57,400 [2/]	2.18
		MM Intercity[1/]	6,300	12,300 [2/]	2.20
		Total	35,000	69,700	1.96
Tricycle	No. of Terminals	Inside MM	276	640	2.32
		Adjoining Area	n.a	551	-
		Total	n.a.	1,191	-
	Estimated No. of Operating Units	MM Intracity	17,000	60,700	3.57
		MM Intercity	n.a.	56,600	-
		Total	n.a.	117,300	-

Source: 1983 JUMSUT and 1996 MMUTIS
1/ Between Metro Manila and adjoining areas (inside the Study Area only)
2/ Preliminary estimate

Table 3.13
Number of Passengers and Average Occupancy of Road-based Public Transportation

Mode	Item	Service Area	1983	1996	1996/1983
Bus	Estimated no. of Passengers (000/day)	MM Intracity	1,424[3/]	2,584	1.81
		MM Intercity	313[3/]	434	1.39
		Total	1,737	3,018	1.74
	Ave. Occupancy[2/] (pass./veh.)	MM Intracity	38.7	50.0	1.29
		MM Intercity	37.2	58.4	1.03
Jeepney	Estimated No. of Passengers (000/day)	MM Intracity	7,420	12,078	1.63
		MM Intercity	1,013	1,096	1.08
		Total	8,433	13,174	1.56
	Ave. Occupancy[2/] (pass./veh.)	MM Intracity	10.3	15.0	1.46
		MM Intercity	9.7	15.6	1.61
Tricycle	Estimated No. of Passengers (000/day)	Inside MM	n.a.	5,340	-
		Adjoining Area	n.a.	3,056[1/]	-
		Total	n.a.	8,396	1.56
	Ave. Occupancy[2/] (pass./veh.)	Inside MM	1.3	2.6	2.00
		Adjoining Area	1.2	2.3	1.92
Taxi	Estimated No. of Passengers (000/day)	MM Intracity	n.a.	1,251	-
		MM Intercity	n.a.	114	-
		Total	n.a.	1,365	-
	Ave. Occupancy[2/] (pass./veh.)	MM Intracity	2.1	2.2	1.05
		MM Intercity	n.a.	2.2	-

Source: 1983 JUMSUT and 1996 MMUTIS
1/ Inside the adjoining area only
2/ Average occupancy inside Metro Manila (or MM intracity) was taken from those on the screenline, while for the adjoining area, from those on the cordonline.

Road-based public transportation in Metro Manila and its vicinity is characterized as follows:

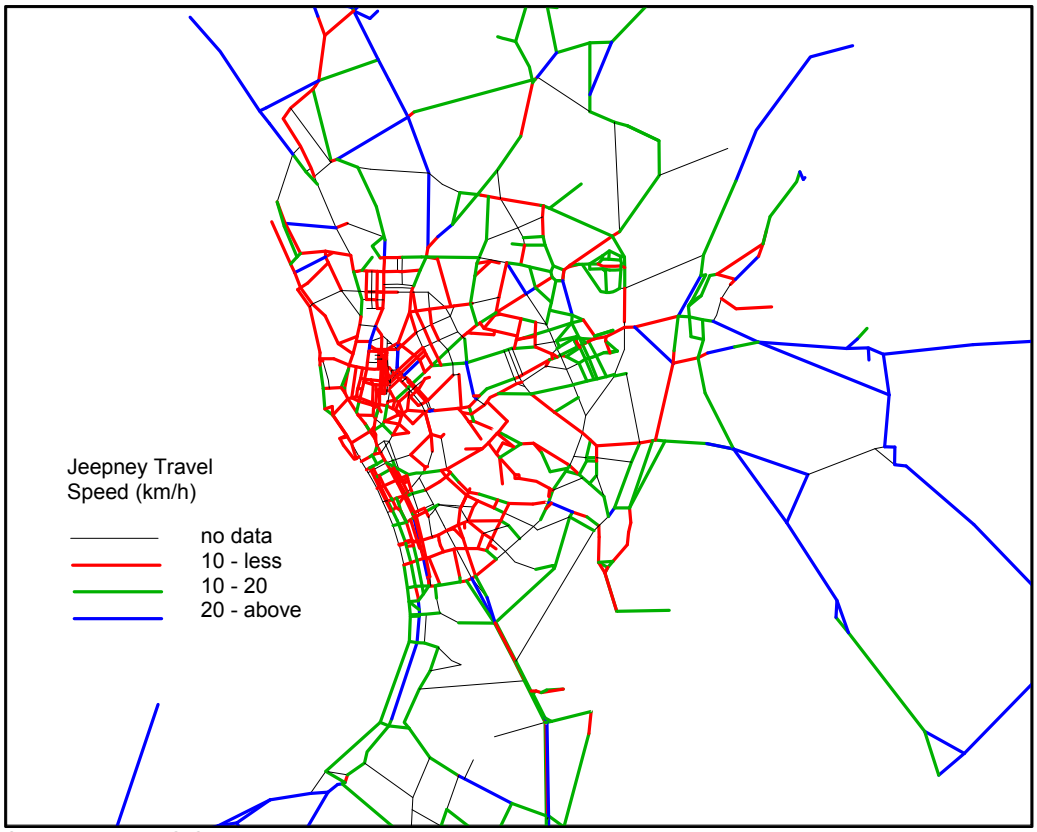
- Buses cover only a limited number of areas, while most primary and secondary roads are covered by jeepneys. The coverage is dense and the service frequency is high, in general. The areas surrounding primary and secondary roads are serviced by tricycles with terminals widely and densely distributed in areas where people's activities are centered. As a whole, the combination of bus, jeepney and tricycle services can cover most of the area and operate in a reasonable hierarchy.

- The average travel speed of bus and jeepney is 12 kph and 9 kph in Metro Manila, and 23 kph and 21 kph in outer areas, respectively. Travel speed is extremely low inside Metro Manila, and the travel time of passengers has become much longer compared to the 1983 level. Average travel time of bus, jeepney and tricycle users inside the Study Area at present is 79 minutes, 43 min and 17 min, respectively. Moreover, the average occupancy of bus, jeepney and tricycle has increased considerably. This is characteristic of in-vehicle congestion. The quality of bus and jeepney services has also worsened rapidly.

Figure 3.12
Bus and Jeepney Passenger Flow, 1996

Source: MMUTIS Study Team

Figure 3.13
Average Travel Speed of Jeepneys



Source: MMUTIS Study Team

Problems and Issues

Public road transport in Metro Manila is provided by the private sector. Although this is the main strength of the system, as compared to other cities in the world, it is beset with various problems, as follows:

Manageability: In many countries, a single transport organization manages the system and ensures route integration and coordinates service/schedule. In the GMR, about 437 active bus operators independently run 10,000 units. Sixty percent have fewer than 10 vehicles. Similarly, there are approximately 58,000 jeepney operators in Metro Manila covering 59,576 franchises with 89,304 units. While franchise holders are organized into route and operator associations for local terminal management, their dominant function is to protect their interests at the political level rather than achieve efficiency. In their pursuit of commuters, they operate with little regard to traffic flows and often block others to ensure first crack at waiting passengers. During off-peak periods, most of the units remain on the prowl or wait along streets rather than selectively withdraw to save on fuel and to undergo scheduled maintenance. Large-fleet operators routinely perform the latter task, but single-unit operators view the same as revenue loss. It is

necessary, therefore, to balance the need for an organized transit operation and the profitability of small and competing enterprises.

"Boundary" system of compensation: Jeepney drivers and some bus drivers are paid by the "boundary", a system where a driver 'leases' the unit from the vehicle owner for a fixed amount per day. The vehicle's registered operator and owner is assured of lease payment once the unit is deployed for the day. The driver shoulders the market risks, collects the fares, pays for fuel costs and other incidentals, and pays the boundary. The 'profit' or the difference between the revenue and expenses is the driver's daily compensation. Under this system, it is not clear whether the driver or the franchisee is the public transport operator. Hence, the concept of public service obligation is vague.

Franchising: Transport regulations have hardly changed in the last 30 years, governed by a philosophy that has already been dismissed in countries from where the Philippines copied. Entry into the market is still through a quasi-judicial process that resolves the three conditions of nationality, public need and financial capability. Foreign experts believe this process is a market barrier, notwithstanding the fact that any determined party eventually finds a patron who could secure approval for his application. However, despite the apparent freedom in transport operations in the GMR, operators are not allowed to change fares nor adjust routes according to market demands. A multisectoral conference in 1994, for example, recommended the following:

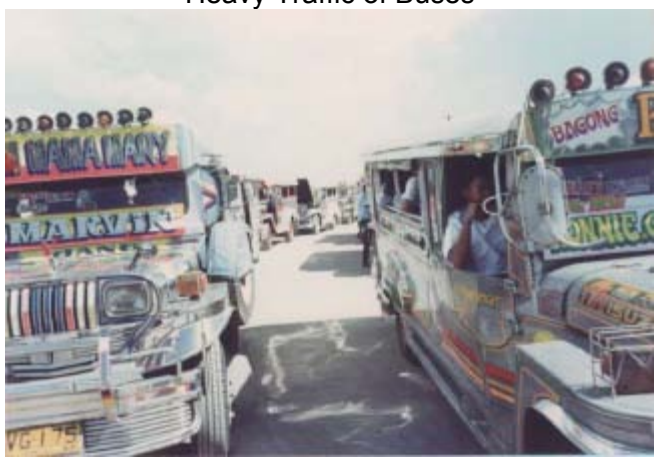
1) no new bus routes may be authorized within EDSA,

2) no new jeepney routes (i.e., not in the specified route plan which was reviewed in the 1980s) may be authorized in Metro Manila, and

3) all new provincial bus routes should terminate at the FTI (Food Terminal Incorporated) in the south and at an unspecified site in the north of the city.

The government regulatory body, the Land Transport Franchising and Regulatory Board (LTFRB), however is incapable of updating or adjusting the routes and focuses more on its role in pricing rather than on achieving specified service standards. It was even caught on the defensive when the so-called Tamaraw FX service got into the market even before it could license them.

Heavy Traffic of Buses



Heavy Traffic of Jeepneys

3.9 Transport Terminals

Current Situation

Public transportation terminals are scattered throughout the Study Area. Most are 'virtual' terminals, i.e., roads used as turning circuits or parking spaces but without the ancillary facilities for passengers and drivers (see Table 3.14).

Table 3.14
Number of Bus, Jeepney and Tricycle Terminals

Location	Bus	Jeepney	Tricycle
Metro Manila	35	210	640
Adjoining Areas	23	113	551
Study Area Total	58	323	1,191

The more formal bus terminals are few.They are found in Cubao, Buendia, Baclaran, Quiapo, Monumento, and Alabang. All terminals are privately owned mostly by

provincial bus operators. Interestingly, Cubao hosts more of the inter-city bus terminals. Jeepney terminals are concentrated in Manila, around EDSA and in some suburban areas like Novaliches and Alabang. Tricycle terminals are found everywhere, except in highly developed business and commercial areas and upper-class subdivisions where they are banned.

The main function of a transport terminal is to provide facilities for the convenient interchange of passengers from one mode or route to another. The number of transfers between jeepneys and tricycles was placed at 3.1 million a day, followed by jeepney-to-jeepney transfers at approximately 2.9 million and jeepney-to-bus transfers at 2.2 million (refer to Table 3.15).

Since EDSA is the principal bus corridor, it is not surprising that transfers from bus to other modes, particularly jeepneys, occur along this artery. This implies a feeder role for jeepneys. Bus-to-bus transfers are particularly high in Baclaran and Cubao, indicating a shift from intracity to inter-city trips. Transfers between jeepney and other transport modes occur almost everywhere – indicative of nonresponsive fixed routes and/or short trips. Tricycles serve as a feeder mode to jeepneys in suburban areas and most areas along EDSA. The main feeder mode to the LRT is the jeepney.

Table 3.15
Number of Transfers between Transport Modes in the Study Area, 1996

000/day

Mode	LRT/ PNR	Tricycle	Jeepney	Bus	Taxi	Car/ Truck	Others	Total
LRT/PNR	1	19	170	29	2	1	0	222
Tricycle	16	93	1,540	347	28	12	6	2,042
Jeepney	164	1,531	2,911	1,086	54	23	8	5,776
Bus	31	349	1,105	105	22	13	0	1,624
Taxi	4	46	65	27	10	3	4	158
Car/Truck	0	11	16	3	0	0	0	32
Others	0	6	8	1	0	4	0	20
TOTAL	215	2,055	5,815	1,597	116	56	20	9,874

Source: MMUTIS Study Team

Table 3.16 lists down salient problems associated with formal and informal transport terminals. These are the same problems since 1983, albeit at a bigger magnitude.

Table 3.16
Summary of Current Problems Encountered in Public Transport Terminals

		CBDs	Suburban Area
Terminal User	Public Transport Passengers	a) Increasing walking distance to access/transfer area b) Increasing discomfort in waiting and access c) Increasing danger in waiting, loading/unloading d) Increasing difficulties in transfer	a) Inaccessibility to trunk PT routes b) Longer waiting time c) Lesser choices of destination d) Lack of safety in travel
	Operators/ Drivers	e) Lack of turn-around spaces f) Lack of waiting spaces g) Lack of loading/unloading places/facilities	e) Lesser profitability
	Other Road Users	h) Traffic congestion in terminals i) No parking spaces	
From Government/ Overall National Economic Viewpoint		j) Increasing overall traffic cost due to increasing bottleneck in terminals k) Decreasing accessibility to economic growth centers l) Decreasing development potentials of growth centers m) Increasing difficulties in route control and management	f) Lack of public transport service to isolated areas

Source: MMUTIS Study Team

Ironically, the basic problem associated with terminals is their contribution to traffic congestion. Terminal users are both the victims and the cause of the problem. A 1996 Passenger Interview Survey identified these problems (shown in Table 3.17).

Table 3.17
Problems in Terminals as noted by Passengers

Problems	Jeepney		Bus		LRT		Total	
	No.	%	No.	%	No.	%	No.	%
Poor outside access	394	18.3	246	21.0	132	14.0	772	18.1
Congestion inside	186	8.6	94	8.0	193	20.4	473	11.1
Unpaved grounds	230	10.7	91	7.8	46	4.9	367	8.6
Unclean surrounding	398	18.5	106	9.0	68	7.2	572	13.4
Poor security	237	11.0	158	13.5	73	7.7	468	11.0
Poor waiting facilities	365	16.9	269	23.0	177	18.8	811	19.0
Undisciplined drivers	128	5.9	66	5.6	7	0.7	201	4.7
Others	63	2.9	3	0.3	62	6.6	128	3.0
No answer	153	7.1	139	11.9	186	19.7	478	11.2
TOTAL	2,154	100.0	1,172	100.0	944.0	100.0	4,270	100.0

Source: MMUTIS Study Team

As can be seen from the table above, 'poor waiting facilities' was the most frequent answer (19%) for all three transport modes, followed by 'poor outside access' (18%). Unclean surrounding was noted by 13% of the respondents. Of the three transport modes, bus terminals were considered to have more poor outside access (21%). Congestion (20%) was the most negative aspect about LRT terminals. Respondents complained about unpaved condition (11%) of jeepney terminals, which are mostly on-street and informal.

Salient Issues regarding Terminals

Should government intervene and be more pro-active in developing terminals?: Except for a number of LGUs, the government has played a benign role in developing transportation terminals. Although there is some consensus as to their function, no concrete action is done. Hence the priority terminals proposed in the mid-1980s remain unbuilt to this day. Pending proposals bar provincial buses from entering the city centers of Metro Manila, to wit:

- FTI Bus and Jeepney Terminal (private)
- Fort Bonifacio Multimodal Station (private)
- Alabang Bus and Jeepney Terminal (public)

Terminal Development in Built-up Areas: As traffic congestion worsens, the development of terminals in built-up areas becomes more critical. However, it needs a sponsor: No public or private entity has so far taken the lead in terminal development and management.

Planning for the LRT/MRT: The two rail lines under construction lack integration with each other as well as with the existing LRT Line 1. This is particularly true with regard to the stations, where little attention has been paid to smooth interchange (e.g., pedestrian path, loading/unloading space for road-based modes). For instance, passengers have to walk more than 300 meters at street level to move between LRT Lines 2 and 3 in Cubao. This omission is anticipated to create bottlenecks at ground level, cause inconvenience and discomfort to passengers and discourage ridership.

3.10 Water Transport

Current Situation

Water transport fulfills a very small portion of personal transportation needs in and around Metro Manila.

However, for those who use it, water transit is important. River, lake and bay services may be small, but they represent an efficient, convenient and comfortable service that helps divert traffic from the congested road system. The banca is an important timesaving mode for low-income residents. The river is also an important conduit for carrying goods to industry sites.

Table 3.18
Existing Water Transport in the GMR, 1998

Service	Place	Purpose	Ridership
StarCraft	Pasig River	Passengers traveling downtown and along Pasig River	About 1,000 passengers a day
Bancas	Pasig River	Shortcut crossing the river	About 26,000 passengers a day
Barges, tugs…	Pasig, Laguna de Bay	Goods to factory	Substantial
Fishing boats	Pasig, Laguna de Bay	Fishing, to market	n.a.
Laguna Star Ferry	Laguna de Bay	Passengers from Los Baños to Makati, Manila	n.a.
Manila Bay Ferry	CCP (Manila) to Cavite and Bataan	Passengers	About 4,700 passengers a day (1,500 Cavite and 3,200 Bataan)

Although water transport is slow it can be competitive with other modes operating in congested traffic, assuming the travelers' origin and destination are both near the water, or that transfer to other modes is convenient.

As far as expanding its service, it would be good to create a "water network", allowing users to transfer between boats and thus connect more origins and destinations. The Laguna service can connect to Alabang, Calamba, Los Baños, Santa Rosa, San Pedro, Binangonan, or Taytay with the existing Pasig River service. However, this is difficult in Manila's case, since its rivers do not have the physical conditions to support regular transit service. Being narrow and shallow, among other things, the DPWH recommends no navigation on the Marikina, San Juan or Parañaque rivers. Congestion and other obstructions at the mouth of the Pasig River also preclude a link to Manila Bay.

Table 3.19
Physical Conditions of Major Rivers in the GMR

	Pasig	Marikina	San Juan	Parañaque
Depth (m)	5-7	1-8	1-6	0.5-3.5
Width (m)	50-90	70-100	40-60	22-50
Lowest Bridge Clearance (m)	4.3	5.5 at Vargas (others n.a.)	2.5	n.a.
Flood Conditions	No problem	Strong current	Overflows	No trouble

Problems and Issues

Cleaning the Pasig River: There are two major environmental concerns affecting the operation of passenger boats on the Pasig River – solid waste and smell.

Solid waste affects navigation and damages boats. Plastic bags floating in Manila's waterways can get caught on propeller shafts, jam them and cause the engines to overheat. Wood and other hard objects can also damage the propellers.

More than three-quarters of the StarCraft's Manta fleet have been decommissioned for these reasons.

Smell does not affect boat operations. However, passengers who find it nauseating (especially during the dry season) are discouraged from traveling by boat. Although StarCraft ferryboats are air-conditioned, one cannot escape from the stench while waiting for a ride. The *banca*, meanwhile, is certainly not air-conditioned.

There exists no structural or economic impediment to river ferry service. However, environmental conditions prohibit the proper utilization of capital and reduce the service's financial viability.

Improving Access: One of the largest impediments to higher water transport ridership in Manila is the lack of access. Most people riding the service are traveling to and from two points near the river. Ridership is high when it links with other transit modes. High ridership in bancas is due to their easy access to jeepneys traveling to Manila and Makati.

To utilize the city's extensive water resources for public transport and increase its ridership, more must be done to ease the transfer between boats and other modes. Transfer to piers must also be convenient; only a few piers along the river are passenger-friendly. New piers along the river can be built and provided with better access to bus and LRT services. The latter should be expanded to serve potential passengers arriving from Cavite and elsewhere in Manila Bay, which will probably mean building new piers.

Increasing Ridership by Developing New Routes: Increased ridership has advantages beyond the obvious immediate financial return. It leads to greater service frequency (shorter headway) and makes the service more attractive to still more riders. For instance, the trip along the South Superhighway linking Alabang and Los Baños to Manila takes very long due to congestion. A ferry service that will offer a significantly shorter travel time can be competitive. The same applies to the Coastal Road linking Cavite with Metro Manila. Private entrepreneurs should thus open new routes, and the government must be able to support this effort.

Changing Land Use: Plans to convert the river's land use are in the formative stage: Nothing yet has been committed to paper. Still, many informed persons have described a plan currently being formulated that will likely remove squatters, phase out industry and replace them with high-end multistory housing with its own sewage treatment and solid waste system. The plan also provides for a 10-meter easement (i.e., setback) and a riverside boardwalk.

If this pushes through, the improved environmental condition would ease ferry operations, increase capacity utilization and financial viability, and attract

ridership. The presence of high-density, high-income households along the riverbank and the boardwalk for pedestrians would further increase ridership.

However, an important issue must be discussed – the movement of goods. Industries are located along the Pasig River because it serves as an inexpensive, albeit unwieldy transport channel. River transport might be slow, but the alternative in transporting such bulk over land would be expensive. Should the latter be the case, such expense would inevitably be passed on to consumers. The environmental impact on roads would also be staggering. With regard to the accusation that industries located along or near the river are its greatest polluters, this has not been proven yet.

Adjusting the Rules of Navigation: To accommodate service in other piers along Laguna de Bay, the navigational lanes in which such service could operate will be adjusted (e.g., Calamba's pier is surrounded by many fish pens and this prevents navigation to the city.) Larger adjustments could be made to shorten travel time (e.g., Taytay to Binangonan).

3.11 Airport and Port Access

Airport

Current Situation: Table 3.20 shows the number of vehicles and passengers entering the NAIA by terminal as surveyed by the MMUTIS in November 1996. As one of the largest traffic-generating sources in Metro Manila, it absorbs about 30,000 vehicles and 80,000 people a day. The international passenger terminal alone attracts about two-thirds of the total airport traffic.

Table 3.20
Number of Vehicles and Passengers Entering the NAIA, 1996[1/]

Terminal	No. of Vehicles (vehicles/day)		No. of Passengers (passengers/day)	
NAIA Passenger Terminal[2/]	17,661	(2.2)[3/]	51,053	(8.5)[3/]
Domestic Terminal	6,208	(0.3)	15,728	(0.4)
Grand Air Terminal	1,433	(0.6)	4,236	(0.5)
Cargo Terminal	1,974	(0.2)	3,620	(0.2)
Total	27,276	(1.5)	74,637	(5.9)

Note: 1/ 24-hour count.
2/ Figures in parentheses show percentage of public transport.
3/ Excluding parking located outside the terminal.

Major Issues: Major issues are summarized as follows:

1) Traffic Congestion around the NAIA: The NAIA is surrounded with several trunk roads facing serious traffic congestion such as Quirino Avenue, South Superhighway and Tramo. For instance, it often takes more than an hour to reach the NAIA from the Makati CBD, even though the distance is only about

15 kilometers, largely due to the heavy north-south traffic. Hence, appropriate measures and actions should be taken since substantial traffic could be loaded on neighboring trunk roads because of additional airport terminal projects (Terminal 2 and 3 projects).

2) Future Relocation of the NAIA: According to an estimation, the NAIA will reach its capacity in 2015. In order to maintain or improve its competitiveness in the global economy, Metro Manila should construct a new airport to take the place of the NAIA. Clark was proposed as an available, alternative site, but it would need a huge investment to provide accessibility because of the distance - it is 100 km far from Metro Manila. To cope with this issue, a strong political leadership and a social consensus will be required.

Port

Current Situation: Table 3.21 shows the truck traffic to/from the Manila Port in October 1996. North Harbor has the largest share (52%) followed by South Harbor (26%) and the Manila International Container Terminal (MICT) (22%). The MICT, however, has the largest share in container traffic. Manila Port is one of the largest traffic-generating sources in Metro Manila.

Truck Routes: A truck ban on particular roads during peak hours has been implemented since the 1980s to lessen traffic congestion. This, coupled with the lack of road infrastructure around the Manila Port, however, has hampered truck operations. While port facilities need rehabilitation and upgrading, port access roads not much affected by the truck ban should be developed immediately. The MMURTRIP has already tackled this issue.

Table 3.21
Traffic Volume of Trucks at the Manila Port, 1996[1/]

Vehicle Type	North Harbor	South Harbor	MICT	TOTAL
Jeepney	3,034	1,615	718	5,367
Light Cargo Vehicle	893	108	89	1,090
Truck (2-axle)	8895	169	78	1,142
Truck (3-axle)	756	467	416	1,639
Dump Truck	421	37	2	460
Trailer Container	1,715	1,317	2,006	5,038
Trailer Head	577	457	227	1,261
Tank Lorry	167	14	8	189
Mixer	0	0	0	0
TOTAL	8,458	4,184	3,544	16,186

Note: 1/16-hour count on both directions.

3.12 Environment

Among the regions in the Philippines, Metro Manila is the most affected by polluted air and unwanted noise due to motorization.

Air Pollution

In 1992, an air pollution analysis in Metro Manila revealed that particulate matter was at dangerous levels already. The corrective measures recommended then remain largely unimplemented, except for the introduction of cleaner fuels. Hence, the current situation could not have improved, only worsened. A limited survey was undertaken by the NCTS in 1997 to reconfirm this hypothesis. It covered six arterial roads in Metro Manila (refer to Figure 3.14). Secondary data from the seven air-quality measuring stations of EMB-NCR were also examined.

Pollutants consist of total suspended particulate (TSP), particulate matter (PM), carbon monoxides (CO), sulfur oxides (SOx), nitrogen oxides (NOx), and lead (Pb).

The survey showed that the TSP level in Metro Manila is quite high. It is especially acute near streets and industrial areas during dry season. The Philippines had accepted the upper permit value of the environmental standards from the WHO Air Quality Guideline. The WHO guideline is 60-90 $\mu g/m^3$ for long-term (annual) average and 150-230 $\mu g/m^3$ for short-term (24 hours) average (refer to Table 3.22).

Table 3.22
Philippine Guidelines on Ambient Air Quality of Pollutants (TSP and PM10)

Pollutants	$\mu g/m^3$	Short-term Averaging Time	$\mu g/m^3$	Long-term Averaging Time
TSP	230	24	90	1 yr.
PM-10	150	24	60	1 yr.

Figure 3.16 shows the TSP data measured by the DENR-NCR from 1992 to 1996. The values exceeded the acceptable ambient standards on maximum and average values. The Valenzuela monitoring station in particular showed the highest annual average TSP concentration, while high concentrations have also been measured in Manila (Ermita monitoring station). Annual TSP average in these stations are 2.5-3.0 times higher than the level prescribed in the WHO Guideline. An annual variation shows relatively higher values during dry than wet season (starting July/August) by as much as a factor of two. This is probably due to higher wind speed and turbulence causing dispersion, decreased resuspension from the ground and/or increased washout of particles in the rain.

Figure 3.14
Air Quality Measurement Stations
by MMUTIS/NCTS

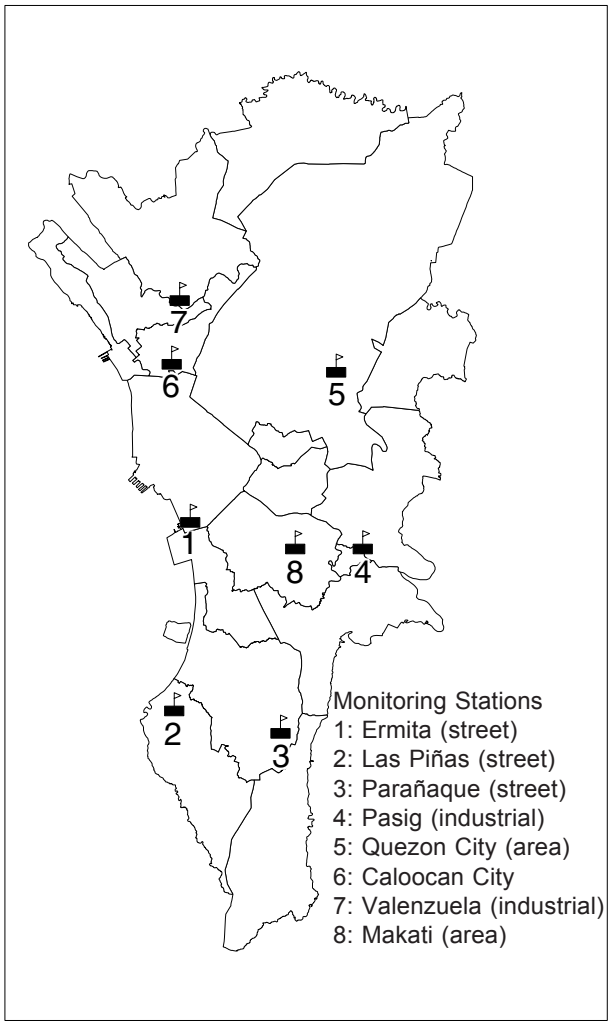


Figure 3.15
TSP, SO Monitoring Stations
by the DENR-NCR

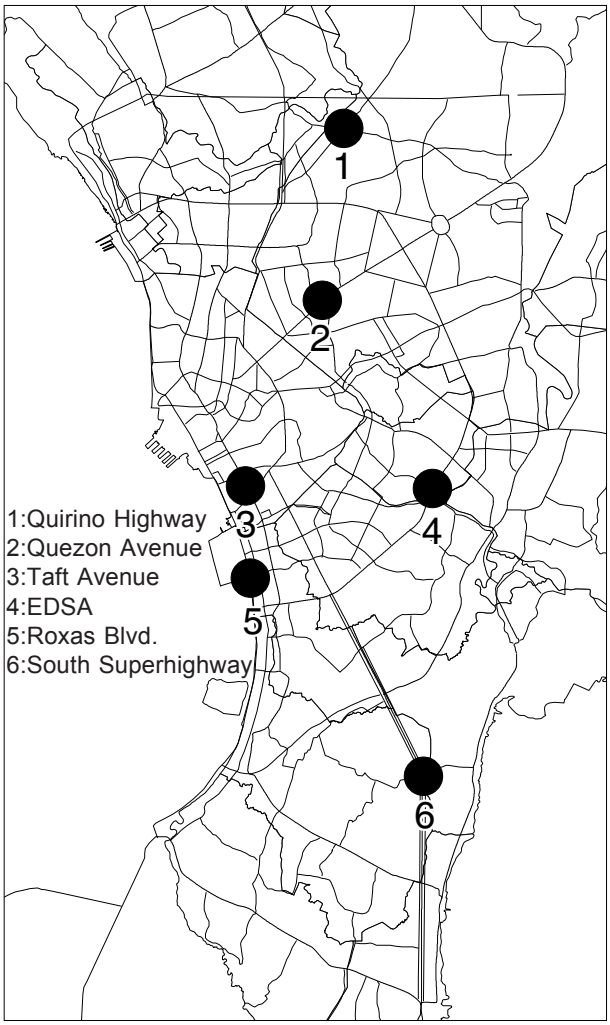
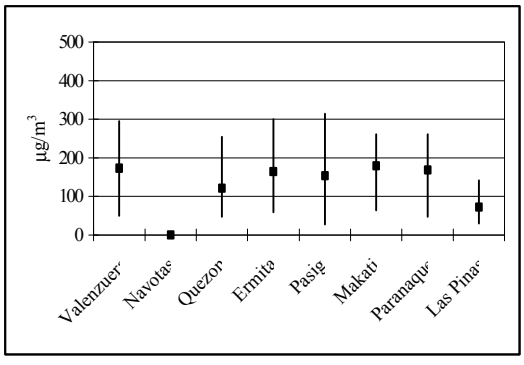


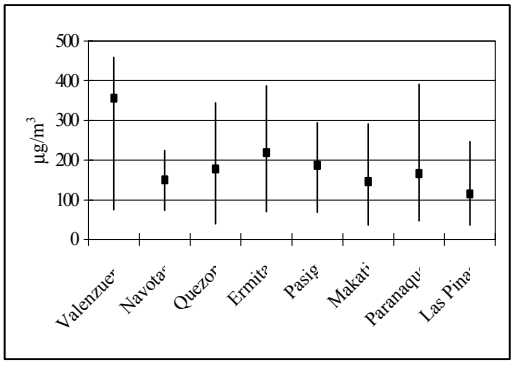
Figure 3.16
Minimum, Maximum, Average TSP Concentration, 1992-1996

Year	Monitoring Station	Minimum	Maximum	Average
1992	Valenzuela	75	459	356
	Navotas	74	224	150
	Quezon	40	345	178
	Ermita	70	387	219
	Pasig	69	294	187
	Makati	36	291	146
	Parañaque	47	391	166
	Las Piñas	36	247	115
1993	Valenzuela	50	295	173
	Navotas	-	-	-
	Quezon	47	254	121
	Ermita	59	300	164
	Pasig	27	314	154
	Makati	63	261	179
	Parañaque	47	261	169
	Las Piñas	30	141	72
1994	Valenzuela	77	559	322
	Navotas	-	-	-
	Quezon	27	218	113
	Ermita	45	312	164
	Pasig	-	-	-
	Makati	47	324	188
	Parañaque	35	192	112
	Las Piñas	-	-	-
1995	Valenzuela	131	454	296
	EDSA– QC	64	401	193
	Pagasa–QC	43	310	133
	Ermita	77	302	174
	Makati	77	485	210
	Las Piñas	74	198	118
1996	Valenzuela	157	463	276
	East Ave.–QC	111	369	201
	Pagasa-QC	57	355	123
	Quezon Ave.-QC	205	384	269
	Ermita	45	217	146
	Makati	132	351	246
	Las Piñas	73	295	136
	Pasig	139	219	188

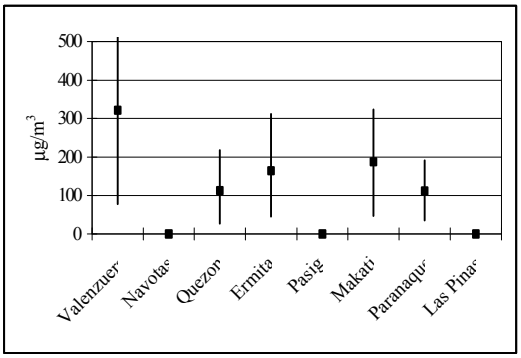
1992



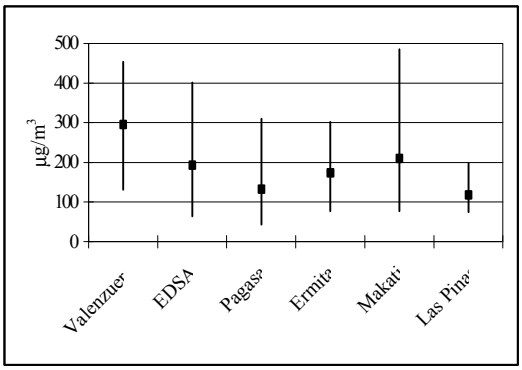
1993



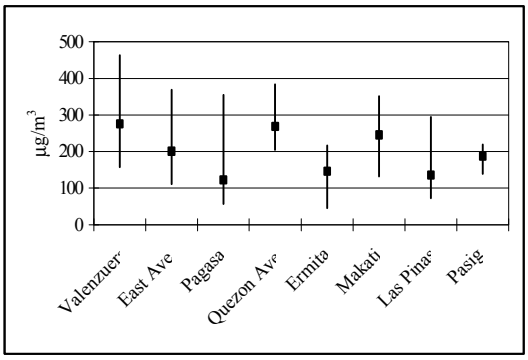
1994



1995



1996



Source: DENR/NCR

More dangerous than TSP is PM_{10} because its size is so small, it can penetrate the lungs and cause respiratory illnesses. The national acceptable levels are 60 $\mu g/m^3$ for the long-term (annual) average and 150 $\mu g/m^3$ for the short-term (24 hours) average. The limited measurements on six corridors showed excessive daily average levels, particularly on Taft Avenue and Quirino Avenue.

Table 3.23
PM_{10} Concentration ($\mu g/m^3$) at Selected Sites

Station	Street	PM_{10} Concentration		Observation Period (1991-1992)	No. of Observation
		Average	Max. 24 hr.		
Ermita, Manila	Taft Avenue	144	258	Aug-Feb	62
ADB, EDSA	EDSA	219	321	Aug-Feb	47
DENR-NCR	Quezon Ave.	227	321	Oct-Feb	26
San Lorenzo		174	206	Jan.-Fe	10
Monumento	EDSA	198	241	Feb.92	5

Source: ADB/EMB project

Measurement data for lead are not as extensive as those for TSP and PM_{10}, since it was found out to be well within tolerable limits in 1992. There were a few areas where the levels exceeded the national AQG (1.0 $\mu g/m^3$). Some readings of up to 5.5 $\mu g/m^3$ on a 24-hour average were recorded at the ADB station in 1991-1992. Since mid-1993, however, when unleaded gasoline (0.15g/l) was introduced, it was expected that lead concentration would have improved. Table 3.24, which summarizes lead measurements made in 1997, supports this conclusion.

Table 3.24
Lead Contents ($\mu g/m^3$), 1992

Monitoring Station	Mean	No. of Measurement	Mean/Max.
Ermita	07	36	144 / 258
ADB	30	34	219 / 321
Monumento	00	4	198 / 241

Source: MMUTIS Study Team

Table 3.25
Results of 1997 Lead Level Survey

Sampling station	Date	Pb ($\mu g/m^3$)	AQG ($\mu g/m^3$)
Quirino Highway	Feb. 5 - 6 '97	0.073	90
Quezon Ave.	Feb. 19 - 20 '97	0.223	90
Taft Ave.	Feb. 12 - 13 '97	0.110	90
EDSA	April 16 - 17 '97	0.063	90
Roxas Blvd.	May 14 - 15 '97	0.063	90
South Expressway	April. 2 - 3 '97	0.140	90

Source: MMUTIS Study Team

Noise Pollution

Noise caused by motor vehicles is related to the number of vehicles passing a road and, in particular, the number of heavy vehicles. The reaction of people to vehicle noise varies considerably depending on their level of tolerance, the background level of the noise and its characteristics, e.g., frequency, tone, intensity hertz, as well as absolute level. Cars generate unwanted noise, though larger trucks, buses and jeepneys are generally noisier. Faculty exhaust production by cars is also considerable.

Sound, measured in terms of intensity as this is associated with the human perception of loudness, is expressed in units of power per unit area. It is rarely constant over time, and time is found to affect noise impact in the following ways:

- The duration of the sound;
- The number of times the sound is repeated; and
- The time of day when noise occurs.

A number of noise descriptions have been developed to characterize the nature of highway traffic noise. Ideally, any descriptor should be capable of reflecting frequency, sound pressure level and the fluctuation of these two variables over time. Those that are currently used include:

- Percentile exceeded noise levels (Lx) refers to the sound level that has exceeded x percent of the time,
- Equivalent continuous (A-weighted) sound levels (Leq) refers to the average sound level over a prescribed period of time. Common periods are one hour, 24 hours, day time, or night time, and
- Maximum sound pressure level (Lmax).

4 TRANSPORT POLICY

4.1 New Transport Policy Directions

A new paradigm in urban transport planning and management has emerged, emphasizing sustainability and private-public partnership. The environment is being given greater attention, not as an afterthought, but as an intrinsic element of economic growth and poverty reduction. While the planning horizon is necessarily long, the requirements of the short- to medium-term period cannot be sacrificed. In the case of the greater Metro Manila area, failure to adopt and follow a long-term plan has severely restricted its present options. True, there is already a perceptible shift from dependence on public sector management and funding to greater reliance on private sector skills and resources. However, the requisite adjustments in government institutions, regulations and processes have been slow as to limit the volume of privately financed transport infrastructure. With less government investment in transport projects, there is a greater need to focus on capacity building, institutional restructuring, user charges, and policy reform to create competitive markets.

This basic policy direction will have to be further discussed and defined specifically by the government to provide operational framework and guideline for relevant subsector agencies and the private sector to take concrete and coordinated actions. A number of key issues and concerns relative to transport policy are explained in subsequent sections.

4.2 Infrastructure Development and Management

The metropolitan area lacks, to a considerable extent, an efficient transport infrastructure of almost all types, including roads, mass transit, public transport facilities, traffic management measures, pedestrian facilities, etc, despite efforts done to develop it during the past decades. While the funding capacity is severely constrained, it is very critical to allocate available resources more effectively between new construction and maintenance/operation among subsectors, including roads, mass transit, intermodal facilities, etc., between primary roads and secondary roads, between congested CBDs and emerging suburban areas, and so on. Effectiveness of the process strongly depends on good planning and sound decision-making.

Poor maintenance of roads and transport facilities has been a long-pending issue in the Study Area. Inadequate maintenance practice contributes to enormous economic losses, decreased safety and environmental degradation. Expected benefits from new investments have often been diminished due to subsequent deficient maintenance. An adequate maintenance system to manage existing infrastructure facilities is badly needed in the Study Area through strengthening and reforming the current system, wherein sustainable financing mechanism and quality control are much of the concern.

ROW acquisition has become more and more difficult and expensive for most of the infrastructure projects and often causes delay in project implementation. Alternative methods to the current practice need to be seriously looked into, such

as the introduction of "Land Readjustment Scheme", closer integration of resettlement with the projects, strengthening of city planning/land-use controls, and so on.

4.3 Integrated Transport Planning and Development

Subsector and project-based approach is no longer the effective method of project implementation. There is a growing concern on the disadvantages due to uncoordinated/unintegrated developments, which result in high investment costs to suppliers and low efficiency and convenience to users. As urban areas expand, activities become concentrated, space becomes limited, higher services are required, and social and environmental concerns become critical. The transport sector is thus required to take a much more integrated and coordinated approach in planning and development. "Integration" should not only be focused on intermodal issues but should also cover urban and transport sectors, central and local governments, public involvement, long- and short-term strategies, etc.

Good planning should also be a central requisite for transport sector administration. For this, planning capabilities need to be strengthened and supported with good and reliable database and decision support system. Expansion of research and development capabilities of the transport sector is also much needed in connection to improving and sustaining good planning.

4.4 Public Transport Operations

Road-based Public Transport Operations

Private Sector Operations: Road-based public transport services in Metro Manila are provided by the private sector. Authority to operate within the city, just as in the rest of the Philippine archipelago, is controlled through a franchising system. There are, however, some special conditions for operators in Metro Manila. Generally, franchisees only own a single vehicle (unit). There are 437 active bus operators in Metro Manila with approximately 10,000 units and 1,016 franchises. Sixty percent (60%) of the operators have fewer than 10 vehicles. Similarly, there are approximately 58,000 jeepney operators in Metro Manila covering 59,576 franchises with 89,304 units. Franchise holders are organized into route and operator associations to manage local terminals and to protect their sector's interests at the political level. Almost all routes are operated by a large number of companies. Entry into public transport operations is restricted to those who have sufficient financial capacity, can demonstrate ownership and registration of their authorized vehicles and have appropriate off-street terminal facilities. This last requirement restricts the extent to which new entrants are able to compete within Metro Manila.

Government Planning Intervention: Although road-based public transport operations are privately owned and operated, there are a number of regulations governing them, the routes and the fares. Various government agencies are involved in planning and franchising routes in Metro Manila. Foremost among these are the following:

1) The Department of Transportation and Communications, Road Transport Planning Unit (DOTC): This unit is responsible for planning the routes of road-based public transport in the country and has a staff of around 12. The unit reviews applications for new routes from potential operators. These applications are compared with the preferred network as established by the JUMSUT in 1985 and detailed in the "Bus and PUJ Route Study - LRT Line 1 and Tributary Area". This new network was based on the existing one and an appraisal of the impact of LRT Line 1.

   The latter report also established a maximum route length of 15 km within Metro Manila for jeepneys and a route-measured capacity (RMC), a restriction on quantity of service, for each route. This capacity constraint, based on the level of service provision on each route before the 1985 study and on estimates of possible demand changes, was used by the DOTC and Land Transport Franchising and Regulatory Board (LTFRB) until recently. The DOTC has now abandoned it to allow market forces to determine outcomes.

   Once the DOTC is satisfied that a proposed new route is appropriate within the network structure, it instructs the LTFRB to open the route for applications; the initial applicant has no 'intellectual property' rights over the new route.

2) The Land Transportation Franchising and Regulatory Board: The LTFRB issues franchises for operation of public transport services and controls fare levels nationwide. It has a staff of 500, 150 of which are based in the central office in Metro Manila.

   The LTFRB requires proof of Filipino citizenship, taxpayer identification number, proof of financial capability, map, and sketch of the proposed garage, and proof that the vehicles to be included in the franchise are licensed. If a proposed route covers 51% or more of the route of an existing operator, the affected operator has the right to object to the application and to be present during the franchise hearing. Their objections will make the Board survey the route and establish their own view of the demand requirements. (An LTFRB survey includes discussions with operators and travelers as well as consideration of the land-use changes in the area.)

   Local government units (LGUs) may also present their objections, which can be sufficient enough for an application to be rejected. If, in the view of the Board, there is a need for the proposed route, the franchise is awarded for five years. New routes are designated 'developmental' and the Board grants no new franchises within the first three years of operation as protection for the incumbent operator. If the Board turns down any application, an applicant may appeal to the DOTC legal department, which may either issue a franchise itself or require the LTFRB to do so.

   If an operator has more than one franchise, it may use 25% of its authorized units from one route on another, without being deemed to have abandoned the first route. There are two restrictions on this: Vehicles authorized on Metro Manila routes cannot be transferred to provincial routes, and buses allowed to

operate on radial routes may not operate on EDSA. This is known as the Bus Flexibility Rule, which was revoked in 1997, following applications from operators and a DOTC study, and then reintroduced within four months following representations from other operators (through the LTFRB). The LTFRB is required to produce an IRR (Implementing Routes and Regulations) that will give details of the monitoring procedure to be followed.

Franchises are awarded for five years and can be renewed up to three times only for buses (since no buses over 15 years old may operate in Metro Manila) and as long as a jeepney passes its licensing inspection. An application for franchises or alterations on existing franchises costs ₱ 430. Franchises may not be sold or passed on to other operators within the first year.

The LTFRB also sets fare levels and structures. It changes the status quo only on requests from operators, which appear to be infrequent since there were no fare changes from December 1990 to November 1996. The current fare for ordinary buses and jeepneys is ₱ 2.50 for the first 4 km. For each additional kilometer, ordinary buses charge ₱ 0.50 and jeepneys, ₱ 0.57. Air-conditioned buses charge a minimum fare of ₱ 7.

3) The DOTC Land Transportation Office (LTO): The LTO is responsible for driver and vehicle licensing and registration and for ensuring that operators abide by the details of their franchises. Despite this, there is much concern about 'colorum' or illegal operation. It is thought that the existence of multiple operators on each route prevents short turning or route deviation, since this would lead to complaints from those adhering to their franchises. JUMSUT surveys did indicate that these practices were rife in the early 1980s. MMUTIS observations, however, found 501 routes operating in Metro Manila, 35 fewer than registered by the LTFRB in July 1995. Whether this suggests that colorum operation is indeed dying out or that there has been a reduction in the number of franchises since 1995 is, however, not clear.

   Given the Bus Flexibility Rule and the large number of buses and jeepneys authorized to operate in Metro Manila, the LTO faces a difficult task.

4) The Metro Manila Development Authority (MMDA): The MMDA has broad authority for transport planning within the city and can introduce such measures with relative independence. The scope of its role includes managing transport and traffic, rationalizing existing transport operations and instituting a system to regulate road users. Recent changes have included the change from an 'odd-even' system, which allows cars to be used on alternate days only on some streets, to a blanket ban on the use of every vehicle one day a week based on the last number of the license plate. The MMDA appears to be monitoring the impact of these changes. There are now proposals to change the scheme again.

Conclusions: It is clear that despite the apparent freedom in transport operations in Metro Manila and private sector operations, there are substantial barriers to entry in the market. (This is stated notwithstanding the fact that there are over 300 individual operators.) These barriers and the multisectoral agreement, resulting

from the 1994 transport traffic conference, established a number of other regulations for planning and franchising public transport routes in the city, such as no new bus routes within EDSA, no new jeepney routes may be authorized in Metro Manila and all provincial bus routes should terminate at the FTI in the south and at an unspecified site in the north of the city, as previously explained in page II 3 - 32.

This means that there are restrictions on market development strategies of existing public transport operators. New service types have therefore begun to develop to fill the gaps in the market such as higher-quality jeepneys with air-conditioning or large taxis, such as the Tamaraw FX, which the government has officially recognized.

Rail-based Systems

Each of the major corridors in the city has been selected for LRT[1] service. The strategy was to identify a first alignment from which extensions were then assessed. Line 1 opened in 1984 and 1985 and is currently undergoing a capacity enhancement as a result of continued high levels of demand in the corridor. A second line, MRT Line 3, is under construction along EDSA, as is MRT Line 2 along Aurora Boulevard. Further lines are in the planning stages.

Financially, the first LRT line has been successful, with one of the best farebox ratios[2] of any urban rail operation worldwide. This is helped by the relative stability of demand during the day, with off-peak demand on the system almost reaching the current system capacity even with short headways (2-4 minutes). Operational strategies and management are sometimes problematic, however, and headway control is clearly suffering.

Moreover, little attention has been given to either LRT-LRT integration or LRT-bus/jeepney integration. The former involves:

1) Design of common stations where lines cross
2) Design at stations for passengers to conveniently access stations from buses, jeepneys, on foot, etc.
3) Restructuring of bus and jeepney
4) Fare integration which in turn requires ticketing integration (a common ticketing technology), and
5) Information integration for passengers to find their way around the system efficiently.

The latter integration, on the other hand, should be designed to ensure that passengers are encouraged to use the LRT systems and that 'wasteful competition' by buses and jeepneys is avoided, which requires route restructuring and tariff-setting.

[1] LRT refers to a fully segregated (therefore rapid) and mass (therefore high-capacity) transit system.
[2] The Farebox Ratio is defined as the fare income paid by passengers divided by direct operating costs (including operations, maintenance and administration, but excluding depreciation/ asset replacement).

In neither of these aspects of integration is the necessary action taking place. For LRT-LRT integration, attention is too late and does not cover many important aspects. For LRT-bus/jeepney integration, the DOTC is not currently planning to restructure services or change tariffs.

There has also been little thought of providing underground alignments in Metro Manila. There is one underground proposal for the North Rail, a joint venture project between the Philippine National Railways (PNR) and the private sector. This scheme was originally intended to link Metro Manila with the proposed international airport in Clark. Following various alignment proposals, it took the form of a high-capacity system from Fort Bonifacio to Clark. The alignment would be underground in the city and along existing PNR rights-of-way (ROW) elsewhere. The form of this project is still being reviewed.

Passenger rail services once ran both to the north and south of the city, but only a single commuter rail line currently operates in the south. This line runs through very densely populated areas, crosses many major and minor roads at grade and is encroached upon, to a substantial degree, by squatters on either side of the track, all of which result in very low operating speeds within Metro Manila. Load factors are quite high but the level of service is extremely poor, with few seats or windows.

The DOTC received an unsolicited proposal (the MCX project) to upgrade the commuter rail line and extend its operations. This proposal is based on the premise that operations will be separated from the PNR, the existing public sector operator. The private bidder proposes to add new tracks, requires the government to remove squatters and offers a frequent service, for which higher fares would be charged. There are no plans of altering or upgrading road crossings.

The Transport Infrastructure and Capacity Development project (TICD)[3] is currently developing an Implementation Action Plan for the PNR's commercialization to separate infrastructure ownership and operations. A component for an ADB loan is being prepared to implement the recommendations, providing government commitment exists.

Recommended Approach to Public Transport

The current approach needs to adapt to a rapidly changing situation, one that offers opportunities for public transport and must consider the following:

1) Metro Manila is rapidly expanding outward. The failure to expand services to keep pace with development will lead to increased private vehicle use.
2) The existing route structure of the new MRT systems must be changed to maximize ridership and benefits of these mega investments.
3) New highways (e.g., C-5) and expressways provide opportunities for improved services.
4) Increasing incomes require an increasing diversity of services for the urban poor and the expanding middle class.

[3] Transport Infrastructure and Capacity Development project, by HALCROW FOX for ADB/ GOP, current

A review of the existing approach to public transport planning in Metro Manila has highlighted the following specific matters that should be addressed:

1) Although road-based public transport system in Metro Manila is ostensibly private sector-led, there is a high level of public sector intervention, none of which is based on recent evaluations of the network or operations. The focus remains on areas within EDSA for example, although population growth outside it is more significant. The system, however, has no capacity to integrate new service types or to adapt to changes in road structure and pedestrian networks, except through changes made by operators, which however are not permitted in their franchises. Operators have no incentive to apply for changes in their franchises because of the flat-fee system for LTFRB hearings.

2) In some respects, the existing franchising system must adapt to changing conditions and development patterns. At present, it curtails legitimate commercial objectives of operators and discourages them from planning. Specifically, as the LRT system develops so should the franchising system to maximize the former's benefits.

3) LRT lines should become an integrated system for the traveling passenger. But this will only happen when the government takes the lead. To date, integration has not materialized, and in its absence benefits from massive investments would be much lower than they should be.

A Changed Focus for Public Intervention

This needs to build on the strengths of the existing system. The main requirement is for the government to manage 'pressure points' in the public transport system, allowing the private sector to provide services which the diverse public transport market demands. The main pressure points are:

1) Improving/providing off-street terminals/interchanges. This requires government planning and investment in partnership with the private sector. Unless convenient interchange between services (bus-bus, bus-jeepney, bus/jeepney-MRT, etc.) takes place, the public transport system cannot operate as a network. Terminals and interchanges will allow new entrants to the market to compete on a level playing field. It is thus necessary to determine the locations of these facilities and to develop a program with the operators for implementation/ improvement.

2) Freeing up the existing franchising system. This has resulted in an ossified route network and widespread unauthorized operations. Although it is not realistic in the short term to carry out sophisticated network planning, the system should adapt to encourage operators to innovate and develop new services, where needed.

3) Enforcing on-street regulations. Currently being tackled by existing agencies, the objectives are to control traffic congestion impact which operational excesses create and to control illegal operations.

4) Planning bus/jeepney priorities as a routine element of traffic management activities. This is currently being practiced on the MMURTRIP Study.

Government Responsibilities

The MMDA should increasingly implement its powers and may even take over the functions within Metro Manila of other government agencies. These include the DOTC (MRT planning, public transport route planning), TEC (traffic management), LTFRB (franchising and control of fares), and LRTA (LRT development).

The transfer of existing functions to the MMDA will, however, achieve little. Justification should depend on demonstrating the 'value-added service' of change – through greater efficiency (e.g., downsizing some functions) and new transport policies relevant to Manila's current position.

It is likely that this radical course would require new skills not currently available within the government service. This suggests that the transfer of functions to the MMDA should be accompanied by substantive technical assistance, incorporating long-term local consultants, together with short-term foreign specialists.

Restoring Viability to Bus and Jeepney Operations

Analysis: A detailed analysis has been undertaken on the cost and revenue streams for typical bus and jeepney operations in Manila. This combined the following:

1) Load factor data from MMUTIS bus and jeepney surveys;
2) Average vehicle speed data from MMUTIS bus and jeepney surveys;
3) Average (passenger) trip length data from MMUTIS bus and jeepney surveys;
4) LTFRB tariff schedules; and
5) Output from the MMUTIS vehicle operating cost model.

Estimates of average revenue and cost per km run were made. These were compared to estimate the financial viability of the services, both collectively and on individual routes.

The analysis indicated that, with the current tariff schedules and typical Manila traffic conditions, there are limited circumstances where revenue on ordinary (non-air-conditioned) bus services can both cover day-to-day operating expenses and justify vehicle replacement when its life has expired. Long-term financial viability may also be a problem for a number of jeepney routes, typically those covering long distances and with long average passenger trips.

These problems are partly attributable to the traditional tariff structure applied on heavily regulated ordinary services in the Philippines and partly to operating conditions in most of the NCR. As noted elsewhere in MMUTIS reports, traffic conditions are unlikely to improve substantially in the next 20 years and may

worsen if transport demand management is not successful, and there is insufficient funding to implement the recommended investment program.

Achieving Financial Viability: For both the ordinary bus and jeepney, the industry as a whole is profitable, but there is no mechanism for subsidy[4] and no incentive to operate intrinsically unprofitable routes or submodes for which a franchise can be offered or issued, but does not have to be used. If mass transit is to continue to be available to the poorer members of Manila's population, urgent reform in the tariff structure and franchise regulations is needed. Moreover, travelers may be required to pay more on some journeys.

Ordinary bus operations, catering to longer trips even on city routes, need either a radical improvement on operating conditions[5] or an increase in revenue. Likewise, the extreme taper in the jeepney tariff schedule, which makes short routes extremely profitable and long routes unprofitable, seems to be operating against the public interest.

It is notable that bus and jeepney tariffs set by the LTFRB are almost identical in structure and in the tariff for trips of different lengths for both bus and jeepney all over the Philippines. There is no explanation for this, since operating conditions in the Study Area are very different from those in almost everywhere else in the country, and within Manila there is little remaining on-street competition between bus and jeepney.

A national tariff level, which permits financial viability for a wide range of services while preventing excess profits in the provinces (where demand levels may be lower but operating speeds are much higher), would not seem to be appropriate for the metropolis. Under the present tariff structure, short feeder routes in the GCR experience huge demand and can generate revenue well in excess of cost, even in congested urban conditions, while longer urban routes, whether run by ordinary bus or jeepney, are not viable in the long run.

Revision of the tariff structure for ordinary services is thus needed. The rate for short trips (where travelers pay higher fares than necessary) on urban routes with high levels of demand over long periods of the day should fall. Conversely, fares for longer trips need to increase so that operators serving these markets can stay in business.

This suggests a need to reduce the taper on the current tariff structure. A boarding charge of ₱ 2.0, covering only the first three kilometers, with a marginal rate of ₱ 0.6 thereafter, has been compared with the current schedule. This results in cheaper short trips (below four km), with travel increasingly becoming more expensive the longer it takes. Higher fares may not seem to be in the interests of

[4] There is limited opportunity for cross-subsidy within a route or group of routes. One bus company may own most or all of the operating vehicles, and it is not necessary for all vehicles to operate profitably. For jeepneys, this is more difficult since most are operated by individuals. All operators need to at least break even all the time. A form of revenue sharing is in use, with route cooperatives controlling the number of vehicles in service at any time. On some routes, excess revenue is divided among more vehicles than are strictly needed to run the service.

[5] MRT 3 may force buses operating along EDSA to improve their operations. The main cause of delay to buses on EDSA is other buses blocking intersections and boarding/alighting areas. Since the MRT 3 will attract up to 50% of public transport demand in this corridor, the number of buses will be reduced and create an improved traffic condition for those still running. As MRT 3 will be air-conditioned and charge at least ₱1.5 per km, it is likely that most of the mode transfer will be from a/c buses, leaving poorer travelers on ordinary buses.

poorer travelers, but without these fares ordinary long-distance services will stop and trips will involve taking a number of more expensive short trips by jeepney or upgrading to air-conditioned bus.

It would also reduce the income of jeepney operators (both drivers and owners) on short routes. Income levels could be maintained, however, if these routes were run with fewer vehicles. Redundant vehicles could be refranchised on longer routes, which would now be more financially attractive.

Improving the financial viability of ordinary bus and jeepney services will require action from regulatory authorities, both in revising the tariff schedules and in helping the industry to reorganize and improve their services to the traveling public while preserving the income of operators.

Manila, however, is one of the very few large cities in the world, if not the only one, where public transport is not regulated by a body, usually a branch of the city government with particular responsibility over the metropolis. It may thus be appropriate for one such regulatory body to be responsible for NCR or GCR. The MMDA, still relatively new and limited in its powers and capabilities, would seem to be the appropriate body to administer Metro Manila's public transport, provided it can be more locally accountable and concentrate on optimizing the interests of local travelers and operators.

The financial viability of services in the MMUTIS database was tested using the revised tariff schedule. Short jeepney routes remained viable, long routes and ordinary bus services became viable, but most long jeepney routes serving a number of different local markets and experiencing average trip lengths below four km became less viable. Further detailed research into the cost and revenue structure of the Manila jeepney industry may be needed before change is introduced.

There is no reason why all routes should have the same fare schedule. In Hong Kong, regulatory authorities set a different schedule for each route, with usually a flat fare with a lower charge for short trips that is only applied toward the end of the vehicle's journey. A new regulatory body more closely attuned to the metropolitan transport market could define some routes as short, local or feeder services (e.g., to the increasing number of LRT stations) and specify a flat fare for all trips. Other longer routes that also serve cross-city trips would operate under different regulations and have a graduated fare structure with a gradual taper.

Given a tariff system and route structure to give industry-wide long-term financial viability, the regulating authority would also need to impose quality standards more rigorously. There is currently no clear mechanism to prevent unscrupulous operators taking the new, higher fares but continuing to operate old vehicles, making excess profits until the vehicles become a commercial liability, then leaving the industry.

Safety and exhaust emission standards are among those that can be used to ensure that vehicles are well maintained and renewed at the appropriate time. If

necessary, schemes to make imported reconditioned vehicles available on lease to ordinary bus operators could be revived.

Further Quality Improvements: A revised tariff and route structure could enable basic services to be provided by jeepneys and cars/taxis, with the former remaining financially viable and continuing to serve poorer travelers in all parts of the Study Area. Economic growth, however, brings increasing personal income levels and aspirations for a higher quality of service. At present, air-conditioned mass transit services are only found in few areas and main corridors. For much of the city there is no intermediate level of transport and poorer use of scarce road space.

As a result of regulatory inaction – failure to franchise new jeepney routes in areas of urban expansion – paratransit services operated by air-conditioned Tamaraw FXs and mini-vans have become increasingly common but are considerably more expensive than jeepneys (around ₱ 3/km) and do not serve all areas. While such services may give people an alternative to using a car, the FX particularly makes relatively poor use of the roads. In addition to carrying fewer people than a jeepney, it blocks other traffic at boarding points since opening and closing doors take time. Further, its doors are hinged, opening outward onto the path of other road users. Hence, passengers can board and alight on the off-side of the vehicle even in the middle of the road in heavy traffic, causing further traffic disruption. The FX, as currently used, is thus not an ideal solution to the problem of providing intermediate transport services throughout the metropolitan area. There is a need for air-conditioned transport services with vehicles that:

1) have greater capacity (lower operating cost per passenger, more efficient use of road space);
2) allow passengers to board or alight only on the near-side of the vehicle (safe, more efficient use of road space); and
3) have sliding or folding doors (more efficient use of road space, shorter dwell-time at stops).

Such vehicles, based on the Ford transit van, are in common use in south Asian and South American cities. The base vehicle is cheap and the capacity is similar to a jeepney (15-18 riders), with a large sliding door on the vehicle's near-side. They are, however, usually operated by two persons, with the second man controlling the door and collecting fares, which might make them uneconomical in Manila.

If air-conditioned paratransit services that make more efficient use of road space were to appear in Manila, positive regulatory involvement will be needed to encourage operators' organizations to agree on the need for and specification of a new type of service and on moves to curb the inappropriate use of the FX.[6] Since the need for this service as an alternative to private cars is much greater in the Study Area than elsewhere in the country, the organization and regulation of efficient quality paratransit services need to be controlled by a body with specific responsibility for Metro Manila. Again, this is unlikely to happen while the regulatory authority has national responsibilities and priorities.

[6] Restricting the use of the off-side door by passengers to emergency situations only, limits on fares to be charged, etc.

Mass Transit Strategy

As incomes rise, Manilans want and will increasingly be willing to pay for improved services. They want mass rapid transit (MRT) systems which in Manila, and indeed much of Asia, has meant rail-based systems that are hugely costly and unnecessary except in areas of very high demand, severe traffic congestion and probable substantial growth.

Recently, a proposal for a partially segregated busway was made for the C-5 corridor, adopting a technology that is relatively low-cost and demonstrably effective. Little progress has been made toward its implementation. Nevertheless, it is likely that more MRT projects would be developed in Manila, particularly in the newly developing corridors.

Turning to rail-based systems, LRT Line 1 has always been successful and was appropriate in terms of service quality and aesthetics in the early 1980s. But today more is required – air-conditioning, reliability and speed. The government has supported the development of a rail-based MRT network. In addition to LRT Line 1, currently under capacity expansion and quality enhancement, MRT Lines 2 and 3 are under construction, and many other projects are being planned.

Many cities have invested huge efforts to make rail-based MRT networks effective and successful. It is no accident that the Hong Kong MRT and the Singapore MRT are recognized for their excellence: Their governments poured enormous efforts and invested huge resources in purposeful planning, making sure that the systems would be fully integrated with existing transport networks before building.

This is where problems of considerable importance loom in Manila, problems which demand urgent attention. The worldwide experience of rail-based MRT systems shows that errors are frequent, costly and not readily rectified. Moreover, new-generation private entrepreneurs do not necessarily understand the issues which should be the central concern of government. These issues are as follows:

1) Little effort has been devoted to planning Manila's MRT system. It is rather the summation of past commitments and competing private sector entrepreneurs, who do not face up to the financial questions and therefore are not forced to examine the potential of low-cost busway options.

2) Very little attention has been devoted to integration (MRT with MRT or MRT with buses/jeepneys). Neither is the subject adequately understood.[7] Thus construction becomes underway even though fundamental integration questions are often still unanswered. With such a situation it will be essential to restructure bus and jeepney routes and tariffs on MRT corridors to encourage MRT ridership.

[7] Integration requires all the following: (a) Location of stations where lines cross, allowing a short, rapid walk between platforms, (b) Physical design at stations for buses, jeepneys, taxis, and kiss-and-ride cars to deliver/collect passengers conveniently, (c) Ticketing integration to allow the same ticket (e.g. stored value card) to be used on all lines, (d) Fare integration to allow fares to be centrally collected and allocated fairly among different operators, and (e) Information integration to ensure that passengers have a good information of the entire system.

3) The MRT network will increasingly comprise different operators with different and often competing commercial interests. This makes integration much more important and very much more difficult to achieve than in a situation where a government body is the operator. A strong government will be thus essential to realize network integration.

4) Failing to rectify this will result in an MRT network that will fall far short of Manila's needs:

   (1) It will not operate as other MRT networks do. There will be much less interchange than there should be (put in another way, millions of people will be inconvenienced everyday and for all time on their routine commute and school journeys.
   (2) Much fewer people will use the system as a whole, and the benefits and revenues will be much lower.
   (3) The economic and financial viability of the lines will be much lower and the need for public investment much greater.

5) The government is not controlling the development of the network, but is reactive, with the proponents of individual lines attempting to determine what happens, where, how, and when.

6) The government has not yet faced up to the public sector cost of MRT systems, none of which in the world is yet known to be profitable. Already, the government is borrowing for Lines 1 and 2 and carries most of the risk for Line 3.

Use of the PNR Right-of-Way

There is a further issue of strategic importance: The future use of the PNR right-of-way (ROW) through Manila, which however has been allocated to the PNR Pabahay Sa Riles Elevated Tollway, with the PNR continuing to operate at ground level with squatter housing alongside the track.

Yet, this corridor could be a major asset and should certainly be used for MRT operation for the following reasons:

1) The need for cross-city rail capacity is well established: The parallel LRT Line 1 has been operating at capacity for several years. If within five years its capacity is increased by 50%, it will again be soon reached. Since no capacity increase will be feasible, what happens then?

2) The two major corridors from Manila are dictated by geography – to the north and south. There is little doubt that a core component of a sustainable transport strategy for Metro Manila should be composed of MRT lines in these corridors. Indeed, there are proposals for both.[8] What happens when these MRT lines reach Manila? Is it not likely that cross-city MRT services linking them should operate?

[8] The North Rail and MCX Projects would result in such services.

3) Yet, the current agreement over the use of the PNR ROW confines rail to ground-level operation only, which is inevitably very slow with low capacity due to the frequency of level crossings and the presence of squatters, while elevated air rights are allocated to yet another expressway.

It is considerably important to review the use to which the PNR ROW through Manila is put before the option of a cross-city MRT is finalized.

4.5 Traffic Management and Demand Management

Traffic management has always been given a high priority in urban transport planning and studies in Metro Manila, and a series of technical assistance/engineering projects have been undertaken since the 1970s. In spite of vigorous efforts and achievements, traffic management remains a critical area to be strengthened and has even become a more critical concern than in the past. While the TEAM project continues, a couple of new projects have been committed including the World Bank-assisted MMURTRIP and ADB-assisted Air Quality Improvement Projects. The World Bank ILI loan intends to strengthen the MMDA's institutional capacity in traffic management.

While the conventional traffic management is to be improved further, there is a need for more drastic measures and policies on traffic management in the Study Area.

Demand Management

Purpose of Transport Demand Management (TDM) Measures: It is the common experience of major metropolitan areas to have extensive traffic congestion, and this has a number of adverse impacts, in particular:

1) It restricts personal accessibility, creating 'villages' within the city and destroying the economies of scale that should be a major rationale for big-city living.
2) It causes air pollution, which is now recognized as serious in Metro Manila.
3) It is particularly disadvantageous to the urban poor, who often spend very long hours travelling to work.

Large areas of Manila are very congested for long periods of the day: In technical terms, they are near the bottom of the speed-flow curve. The corollary is that small reductions in traffic result in relatively large reductions in travel time for everyone. TDM measures in Manila need to be regarded in this light – as having the potential to reduce traffic levels where there is severe congestion, and in so doing, while not removing congestion, these at least reduce traffic's worst excesses.

Tackling the Causes of Congestion: Congestion arises when people or businesses demand a greater quantity of transportation than what can be supplied. Addressing this problem requires a combination of increasing supply and/or limiting demand.

Historically, governments have usually concentrated on increasing supply to meet the ever-increasing demand. In metropolitan areas, it is now widely accepted that this road-building approach is neither practical for land acquisition and the environment, nor affordable, nor a solution to serious traffic congestion. Tokyo, Seoul and Sao Paulo are all cities with substantial expressway networks, yet traffic congestion is still chronic. As concluded everywhere, it is the demand that should be reduced to a level that matches the level of supply that can reasonably be made available.

The demand level depends not only on the number of trips made, but also on the length of trips – the trip kilometers. A high-level approach to TDM starts from land-use planning. It is theoretically possible to organize the locations in which people live and work, or in which goods and services are produced and consumed, in such a way that trip length, and thus demand for transport service, is minimized. This is most easily achieved when planning new communities or commercial facilities and may require specific legislation to give authorities appropriate powers to control land use.

But even where such powers exist, as in Singapore, congestion can become serious, while in a massive, established city like Metro Manila the potential for such approach is limited to newly developing areas (the ongoing Cavite-Laguna Urban Development and Environment Projects is one such initiative).

Congestion arises because too many trip-makers wish to use the same transport services at the same time. Trip suppression is not necessary if enough people can be persuaded to:

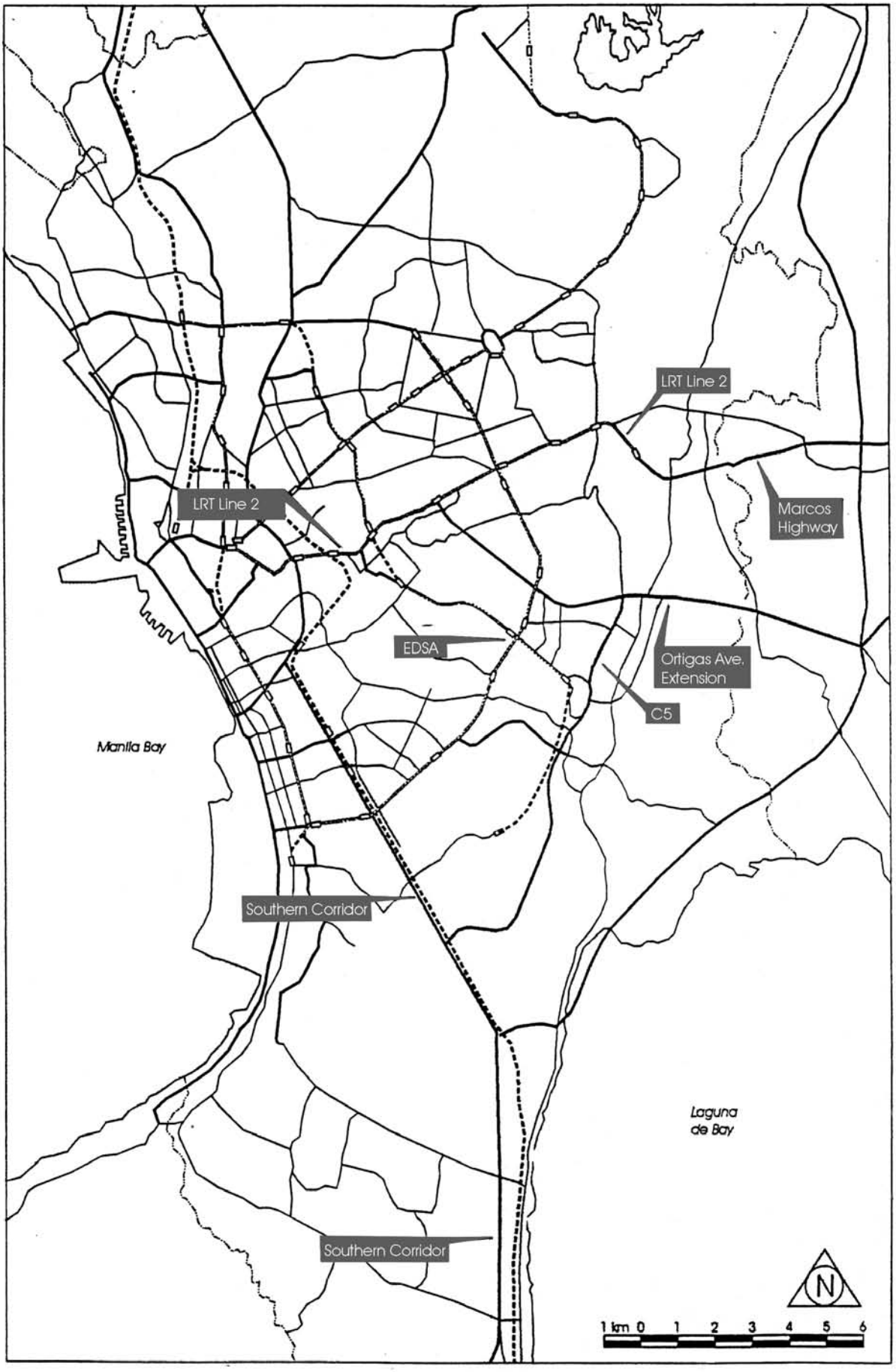
1) Make the same trip but at a different time;
2) Make the same trip but by a different, possibly longer or less convenient, route;
3) Share a car instead of making individual car trips;
4) Make the same trip but by a different, more efficient, mode; or
5) Make a trip with the same trip purpose but to a different location where the transport services are not overloaded.

Changing the time, route, mode, or destination of a journey to reduce congestion can be effected by altering the relative cost[9] of the socially "desirable" and "undesirable" alternatives. This may involve making the current trip more expensive ("applying the stick") or making the alternative cheaper ("using the carrot").

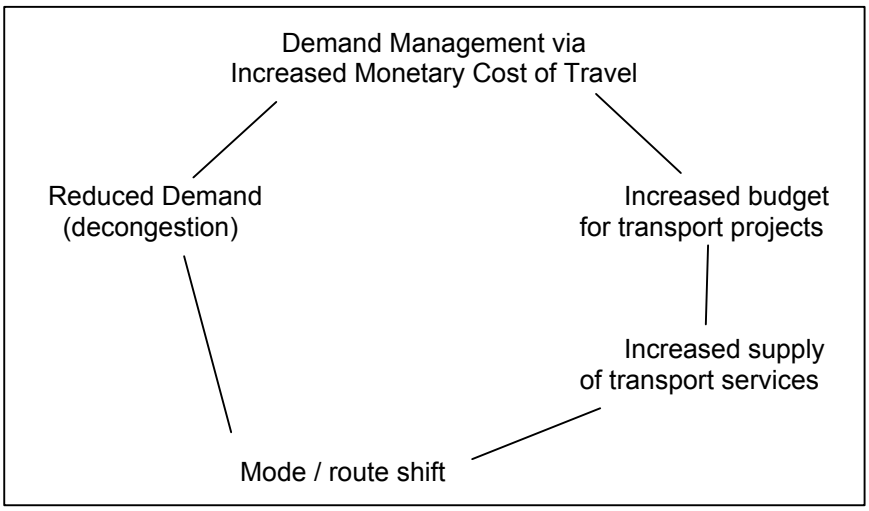
The term TDM is usually applied to measures that are intended to increase the cost of making the undesirable trip. As its objective is to reduce the time (congestion) cost of travel, it follows that they must increase the monetary cost (either formal or informal) or decrease the convenience. Where a formal monetary cost increase is involved, it makes possible a virtual circle of

[9] Cost is considered in generalized, rather than monetary, terms and can include formal money costs (fuel, fare, toll, parking fees, fines), informal money costs (bribes, etc.), time, comfort, and convenience.

Figure 4.1
Location of Major Study Corridors of MMURTRIP



decongestion via both demand management and increased supply over the longer run, as follows:



Alternative TDM Measures: A number of TDM measures have been considered or implemented in various cities, some of which may have application in Metro Manila during the study period. These are reviewed below.

1) Using Physical Restraint: This may involve road closure either permanently or at particular hours to force road traffic to use alternative (longer) routes. While this method raises costs and reduces the number of trips, it increases trip length and may actually increase demand and congestion in other locations. Public transport can be given priority by lowering the cost of public transport in both absolute and relative terms, thus helping to effect mode shift. This measure is most commonly used for environmental reasons and pedestrian safety in crowded shopping areas, rather than as an explicit TDM. There is no revenue and may usually entail an enforcement cost.

   As a deliberate restraint policy, however, this cannot be implemented in Manila because the common experience is that even a simple breakdown on a major road can cause widespread, serious congestion. Where a major new road or rail line is being opened, however, the potential to downgrade the function of the existing road, but prioritizing buses and jeepneys, and reducing the road space available for other traffic is possible.

2) Imposing Policy Restraint: This involves banning particular vehicles or types of vehicle from some or all roads at particular hours. It is already being applied in Metro Manila with the truck ban on some roads and the color-coding scheme to limit days of using private cars.

   Truck ban - truck trips are essential to distribute goods and in primary and secondary economic activities. If trips transfer from very congested to less congested hours, the adverse impact on the distribution system (the extra costs imposed) needs to be balanced by the overall reduction in traffic congestion. The experience in Metro Manila is that truck ban is useful, provided it is well

devised. The MMURTRIP project has recommended a substantial revision of the existing truck routes and regulations to meet this requirement.

Color-coding scheme - restricting the days when private vehicles can be used raises the overall cost of travel (more cars and drivers are used as a result), and may have a limited impact on traffic level. While there has been some research into the traffic impact, there has been no comprehensive review of the impact of this particular scheme. Based on international experience, it is difficult to conclude that such is beneficial.

Development control – development control in Manila typically requires developers to provide a minimum number of parking spaces in new buildings, and many buildings make a large provision (it may be seen as a 'competitive edge' for major office or retail developments) for them.

In many other foreign cities, development control is quite different. The number of parking space (per building type and location) is limited, so that access by private car is restricted. This is a major form of traffic restraint that is gaining international acceptance.

3) Establishing High-occupancy Vehicle (HOV) Lanes: The use of particular roads, or one or two lanes on a road, is restricted to vehicles carrying more than the minimum number of passengers. These are mainly buses and jeepneys, as well as cars/vans with more than three passengers. This can lead to more efficient use of road space as more person trips are carried in fewer vehicle trips. It is used successfully in Singapore and in many US cities, where strict control of city center parking exists.

   This system is time- and location-specific. It should make public transport faster and cheaper (mode shift) but may force non-HOVs to switch to another route where space is not reserved for HOVs. There is no revenue and may entail a significant enforcement cost.

   Other cities have bus-only lanes, which have been tried in Manila. However, due to the lack of lane discipline of drivers of all vehicle types, the scheme was never successful. Loss of road space to the MRT 3 construction has led to the system's complete breakdown along EDSA.

   In Metro Manila it is clear that while bus priorities should, when well devised, be implementable (for example, along EDSA after MRT 3 opens), other HOV lanes are impractical, quite simply because there is no lane discipline.

4) Restricting Private Vehicle Ownership: This can be through legislative (a permit is needed to register a new or imported second-hand vehicle) or financial means (high taxes on vehicle ownership or purchase), and these are often combined. Many countries impose a high import duty or luxury tax on private vehicle purchase, as well as general sales tax. This is not usually an explicit TDM measure but part of a wealth redistribution policy when income taxes are difficult to impose or collect, since cars are predominantly owned by the richer members of society.

Both Singapore and Hong Kong apply such policies to restrict vehicle ownership and suppress traffic demand. Both are city-states, with sophisticated and efficient public transport systems.

As noted in the MMUTIS, there is significant revenue potential in this measure. However, while this measure may restrict vehicle ownership, it may not be particularly effective as a TDM tool. If a limited number of vehicles are used more – as has been the experience in Singapore - it will not reduce the level of traffic as much as expected. It also has no influence on the time or place the vehicle is used.

A critical disadvantage of restricting ownership is that, for administrative convenience, it needs to be applied to the whole country. It will therefore also restrict vehicle ownership and use in areas where vehicle ownership would otherwise be encouraged to help regional development. Such measures are clearly impractical in the Philippines if, for example, car ownership is controlled in Mindanao or northern Luzon because of traffic congestion in Manila.

5) Restricting Vehicle Use and Increasing Fuel Duty: Fuel is a major element in the perceived cost of making a trip by car. Gasoline is relatively lightly taxed in the Philippines compared to other countries, even in southeast Asia. Increasing fuel duties would not only raise the cost of a private vehicle trip, thus reducing traffic demand, but would also potentially raise a large amount of revenue which could be directed to funding transport projects.

   The analysis in the Interim Report indicated that the price elasticity demand for car travel is quite low, so that a large increase in duty would result in a small reduction in traffic. This small reduction, however, would result in a much larger reduction in congestion (because of the shape of the speed-flow curve) and air pollution.

   The increase would also need to be applied to diesel (affecting buses, jeepneys and trucks) to avoid a widespread switch to diesel-powered private vehicles. This could be combined with rebates to commercial operators, but such a system would be costly to administer and open to widespread abuse.

   In theory, fuel duty increases could be restricted to, for example, the Greater Capital Region (about 100 kilometers around Manila) by levying local taxes on fuel sales (these are commonly used in other countries to fund local projects). But smuggling and driving to a nonsurcharged area to buy fuel are probable reactions, and it is difficult to see how smuggling could be effectively policed. So while the Manila driver will still be paying more, and congestion and air pollution will be less, the financial benefit of higher taxes may be diverted to private interests.

   The measure has no influence on location or time of vehicle use and, as noted, there is limited mode shift or trip suppression.

6) Imposing Area-/Time-specific Charges: These measures involve charging users for using a vehicle in a particular area or a particular road. They are not only location-specific, but can be varied by time of day, week or year. Typical examples are area tolls (Bergen in Norway and Singapore) and parking charges, which can influence choice of trip-end, mode, travel time, and route (to avoid a tolled area).

   Parking charges are the simplest to impose, as there is no need for an additional stop to pay a toll or purchase an area pass. They are also well established and accepted by road users. There are, however, few instances of area-wide schemes where all parking is to be paid for and revenues accrue to the public sector (and can be recycled to transportation investment).

   Illegal parking is a problem, and administrative/enforcement costs may consume most of the revenue, leaving nothing for reinvestment.

   Toll roads are another example of this type of charge, but tolls are usually introduced in connection with a new or enhanced supply of road space, rather than on a previously free facility. In Manila, a network of tolled expressways is being constructed, and this will provide an important element of road pricing.

   Area tolls or 'cordon pricing' has been applied in Singapore since the mid-1970s and has been successful in controlling congestion on radial roads and in the city center. Where the city has a strong center and a traditional radial road system, such measures are a possibility. The problem in a huge metropolis such as Metro Manila, which has a complex urban structure, is that it is difficult to identify what cordon(s) would be effective. Strong government support would be necessary to introduce such measures on formerly free roads.

7) Implementing Electronic Road Pricing (ERP): The technology has existed for some time to enable a vehicle to be fitted with electronic devices that interact with roadside transponders, recording the length of time a vehicle traveled or the distance traveled in a congested area. Despite this, no scheme has yet been implemented comprehensively, although Singapore is in the process of doing so.

   Some serious problems identified with using this approach include the loss of privacy (the authorities could have a record of where vehicles were), the lack of any practical demonstration of the system and the need for all vehicles that might enter a transponder area to be fitted with recorders.

   A number of cities are now considering introducing ERPs, which has the potential of becoming an extremely effective TDM tool. Current thinking is that the recorder on the vehicle should be a stored-value smart card. Vehicle operators would purchase credits in advance, and these would be debited as the vehicle passed roadside transponders, thus overcoming privacy concerns, as there would be no public record of which transponder deleted the credit and when. (The user, on the other hand, could have a record, if needed.)

The number of credits consumed would depend on the area visited and the time of day. In theory, charges could be economically optimized to vary with traffic conditions. The system would be fair and have the greatest TDM potential if the schedule of charges (per km or minute, by area and time of day) is published in advance. Drivers would then know the charges they could expect to incur before setting out and thus make rational choices on travel destination, mode, route, and time.

ERP charges could replace parking charges, as they could also be debited by time spent stationary in a restricted area. Revenue potential is high, and the system could be extremely flexible. However, it would also be costly to install and administer with a high-user cost, as all vehicles that might need to visit the tolled area would need to be fitted with a recorder.[10]

Ideal as the system may seem, it is unlikely to be implemented in Manila in the near future due to its high installation cost, vague public acceptance (in the absence of any successful system operating elsewhere) and the lack of any other transport system with spare capacity to absorb the demand pushed off the roads.

Applicability in Metro Manila: A balanced transportation strategy requires TDM measures, together with other policy and investment measures and institutional changes. The most promising measures for Manila are the following:

1) Physical restraint will be applied only on a major new facility, while the existing road will be downgraded for general traffic with priority given to buses and jeepneys and better pedestrian facilities.

2) Policy restraint
   - Truck ban – as recommended by the MMURTRIP
   - Development control to limit parking spaces in new buildings in areas where traffic congestion is highly problematic

3) HOV lanes for buses (and maybe jeepneys) in selected locations will be identified to insulate to some extent public transport from traffic congestion.

4) Increases in fuel duties must probably be imposed nationwide. This has substantial revenue-raising potential and offers the prospect of additional revenues that can fund transport projects on a sustainable basis.

5) Parking charges and controls in all major centers, when adequately enforced area-wide, have the greatest potential of managing demand by location and time of day. Most of the generated revenue would probably be spent on administration and enforcement.

6) Construction of the tolled expressway system will progressively introduce road pricing across the urban area, creating 'quality' expressway travel for higher-income users and many commercial vehicles, while the existing less congested road is for everyone else.

[10] Alternatively, vehicles visiting from remote areas could pay a flat fee for daily access to the tolled area.

Metro Manila is to a considerable extent a prisoner of its past. Had past policies been different, then the prospect of actually controlling, or 'solving', congestion and bringing wide-ranging improvements is possible. But since 1998 and whatever is done, congestion would likely to remain a feature of city life. The real challenge is to learn to live with it and mitigate its adverse impacts. It is here that TDM measures are very important. The above measures in combination provide a realistic component of the transport strategy that will, at least, considerably lessen congestion and air pollution.

4.6 Attracting the Private Sector

Besides its ability to fund projects, it is necessary to attract private sector participation since, given reasonably competitive transport markets, it is efficient and responsive to changing patterns of demand, something governments are ill-equipped to do. This is a radical political choice requiring a radical change of culture – and time – to bring about. Only when this is achieved will private sector funding follow. The key features to attract private sector participation are as follows:

1) The objective is to provide improved, available and reliable services that offer choice and competitive prices to passengers and freight operators.

2) Political will is the essential starting point. This is strong in the Philippines and provides an important springboard.

3) Institutional restructuring is essential: The private sector will only be attracted when a level playing field is established. One cannot both be transport regulator and operator. The public and private sectors must operate on the same basis.

4) The right regulatory and pricing policies are needed to create competitive markets. Market access must be guaranteed, monopoly practices controlled, and safety standards enforced. Where tariffs are low or are supported by cross-subsidy, the former must be increased and the latter eliminated to force the government to make the political choice of whether subsidies should be made available or not. If subsidies will be made available, these must be targeted to produce the best effect and should normally be the subject of a competitive tendering process.

These actions will send the right signals to private entrepreneurs and encourage their increased participation in constructing, operating and funding transport projects.

Private Sector Funding of BOT Projects

BOT projects may be feasible where demand is high. In the Philippines, this is mostly in and near Metro Manila. BOT projects, which typically cost US$ 0.5 billion or more, must therefore be part of a balanced strategy that covers the whole country, because they will become an increasingly important part of the overall investment picture.

Yet, in contrast to the abundant rhetoric and much effort, there are few such projects operating in Asia today (and just two under construction in Metro Manila). Success in this most demanding of projects requires:

1) Government to set a consistent policy and identify projects it will support (the private sector cannot implement projects without strong government support);

2) Government to prepare projects and face up to the realities behind most projects:

   - Few transport infrastructure projects are financially profitable and most require substantial public funding.
   - Most private proponents want the government to shoulder the risks and provide guarantees (another form of funding).
   - Land is always needed and must be acquired (something only government can do).
   - Tariffs are generally high to reduce the need for public funding (even if not revenue-maximizing), and they must be acceptable to the government.
   - The environmental consequences of new infrastructure must be acceptable.

3) Concessions must be bidded out transparently under international competitive bidding guidelines if the benefits of private sector involvement are to be secured.

4.7 National Transport Issues

Manila is the nation's capital as well as home to 14 million people (in the MMUTIS Study Area). It is also the national gateway for most trade and commerce. There are imperatives therefore dictated by these roles that must impact upon development and transport strategy.[11] Indeed the impact may be large, because major ports and airports often result in massive land development and transport requirements. The PTSS identified these ports and airports as key issues.[12]

Port Strategy for the Greater Capital Region: There is a particular problem in the Greater Capital Region (GCR, about 100-km radius around Manila). It is by far the dominant source of and market for port traffic and is expected to remain so. Present activities are concentrated here, but the port's land operations are severely hampered by Manila's traffic congestion, to which they also contribute.

For the medium term (by about 2005), additional port capacity (outside the existing ports) would be required. There are several options (Batangas, for one, appears promising), but the PTSS suggested a review of the ports strategy for the GCR to determine future strategy. This should define the access requirements by road and maybe rail. Meanwhile in the short term, road management improvements in Manila (new investment and a review of truck routing/regulations) are required to better cater to Manila's port traffic. These improvements have been prepared under the MMURTRIP Study.

[11] Additional funding from the national government should be allocated for projects with national impact.
[12] 'Philippines Transport Strategy Study - Executive Report', Halcrow Fox and the Government of the Philippines, 1997.

Airport Strategy for the Greater Capital Region: Evidently, a convenient airport in Metro Manila is necessary. Like in the west, Asian societies will become increasingly air transport-intensive. Hence, an inaccessible or congested airport will increasingly be an unacceptable handicap.

The PTSS concluded that there was no immediate problem, because the two terminals under construction or committed will improve NAIA's capacity, and while sometimes difficult to reach (access is poor and needs improvement) NAIA is in the right place, close to the economic center-of-gravity of the region.

But air traffic growth is rapid. By about 2010 at the latest[13], NAIA's maximum capacity will probably be reached – about 25-30 million passengers a year. Then a second airport will be needed, with traffic shared with NAIA or possibly all traffic will transfer when the NAIA is redeveloped. The issue of building another airport is of great strategic importance, because it will be a major development effort, causing environmental problems for the NCR and entailing huge costs. No analysis, however, has been carried out to determine future strategy, and this needs remedying quickly because the lead time for building new airports is long. The PTSS recommended such a strategy study to be undertaken.

It has been suggested that Clark should support the NAIA. The PTSS believed it could become an important airport for Central Luzon. But whether it can serve as the future airport for the GCR will depend on positive answers to all three of the following fundamental questions:

1) At 100 km from Manila, Clark would be by some margin the farthest airport in the world serving a major city. Can this problem of distance be overcome? This is partly a matter of fact (how accessible can it be to the economic center-of-gravity of the region) and perception (will passengers, freight users and airlines be prepared to use it?).

2) By any standards it would be a 'mega project', probably at least as complex as any ever carried out in the Philippines. The airport itself will be complex, but the challenge will be in funding and implementing the expressway and express rail links that would penetrate and cross the very heart of Metro Manila, and which would take at least six years to put in place. Is there a strong and consistent sense of purpose on the part of the government to implement such a vast project effectively? And are the risks acceptable?

3) The cost will be very substantial. It is likely to be about US$ 4 billion[14] for the transport links alone. The PTSS believed that the government must shoulder a big part of the total costs and allot to it one-third of the total transport sector budget estimated for the coming six years. Is this level of public funding feasible?

[13] The Asian economic crisis has deferred this date, perhaps to 2015.
[14] The 22- km section inside Metro Manila would cost about US$ 3.3 billion alone.

The PTSS concluded that a major review of the airport strategy should provide the answers, since it will impact hugely on land development strategy and the requirement for high-quality road and rail access.

4.8 Air Pollution

Manilans consider this the second problem in the city after traffic congestion, according to the MMUTIS surveys, and the second fastest-growing problem too.[15] This was confirmed by the recent report of the Metropolitan Environmental Improvement Program report.[16]

Air pollution in Manila is mostly caused by motor vehicles: 80+% of carbon monoxide and nitrogen dioxide and 16% of small particulates (less than 10 microns diameter) which, with lead, cause main health problems. The URBAIR research found that particulates are a major problem in Manila, particularly in heavily exposed streets such as EDSA where they are generally very high. In 1985, the study estimated that particulates might have caused 1,500 excess deaths and 42 million excess person-days of illness (when people experienced symptoms of respiratory illness). Of course, there are other important impacts too like lack of productivity and the costs of damage to clothes and properties, among others.

The government has been conscious of this problem for some years and has started to tackle it. Following the introduction of unleaded gasoline in February 1994, measurements showed that the problem had somewhat lessened. But with increasing vehicle ownership and use and traffic congestion, there is no doubt that Manilans are right to be very concerned about Manila's air quality.

The Asian Development Bank has also developed the Metro Manila Air Quality Improvement Project with the Philippine Government specifically to address Manila's air quality problem. This will mitigate air pollution from:

1) road vehicles
2) power generation and industry
3) vehicle fuels
4) vehicle use specifically from traffic congestion

It will also strengthen the air quality monitoring system, intensify public awareness and strengthen sector institutions including the MMDA.

[15] excluding law and order issues.
[16] URBAIR - Metro Manila Report, October 1996 (an Asian initiative executed by The World Bank).

5 FUTURE LAND-USE/TRANSPORT NETWORK DEVELOPMENT SCENARIO

5.1 Introduction

In this chapter several growth factors driving urban developments in the GMR are presented. Deemed exogenous variables to transport planning exercises, these are population, employment, school enrolment, income, car ownership, and land use. Behavior analyses of these variables over time provide possible ranges up to year 2015. Four scenarios are drawn up and the most likely is chosen as base scenario on which a future transport network is planned.

5.2 Growth of the Metropolitan Area

Metro Manila has grown fast into a mega city with a population of 9.5 million as of 1995, from 1.6 million in 1948, 2.5 million in 1960, 5.9 million in 1980, and 7.9 million in 1990. The actual metropolitan area has expanded beyond its boundary, including most municipalities in the adjoining provinces of Cavite, Laguna, Rizal, and Bulacan (refer to Figure 2.2). The Study Area now has a total population of 14.4 million and has been growing at a significant rate of 4.2% a year. The Metropolitan Manila area shares more than 20% of the country's population (refer to Table 3.1).

Metro Manila is the largest provider of employment and education. It provides 4.6 million jobs and about one million tertiary education (refer to Table 5.1).

Table 5.1
Employment at Workplace and Pupils/Students in School in Metro Manila

	Number (000)		Growth Rate (%/Yr)	% Concentration in Metro Manila (1996)
	1980	1996		
Employment				
– Primary	0	39	9.8	25.5
– Secondary	350	851	5.6	66.2
– Tertiary	1,426	2,818	4.4	76.2
School Attendance				
– Primary	-	1,695	-	63.8
– Secondary	-	478	-	65.3
– Tertiary	-	949	-	79.2

Source: Philippine Statistical Yearbook

Metro Manila has been growing rapidly and expanding its urbanized area. It is predicted that suburbanization would accelerate further as shown in Figure 2.2.

5.2 Future Socio-economic Framework

A set of key socio-economic indices such as population, employment, school enrolment, gross regional domestic product (GRDP), household income, and car ownership have been projected for the planning period up to 2015. They are as follows:

Population

Population in the Study Area has been projected in different assumed scenarios as follows:

Case I: Population will grow continuously at 1990-95 rate – 3.58% a year for Metro Manila and 5.43% for outer areas.

Case II: Population will grow continuously at 1980-95 rate – 3.11% a year for Metro Manila and 4.80% for outer areas.

Case III: Projections made by the Technical Working Group on Population Projection (TWG-PP), contained in the Philippine Population Projections, 1995-2020.

Case IV: Assumptions made in Case III on migration rate to the NCR and decline in fertility rate are considered a little optimistic. Modification was made on these factors.

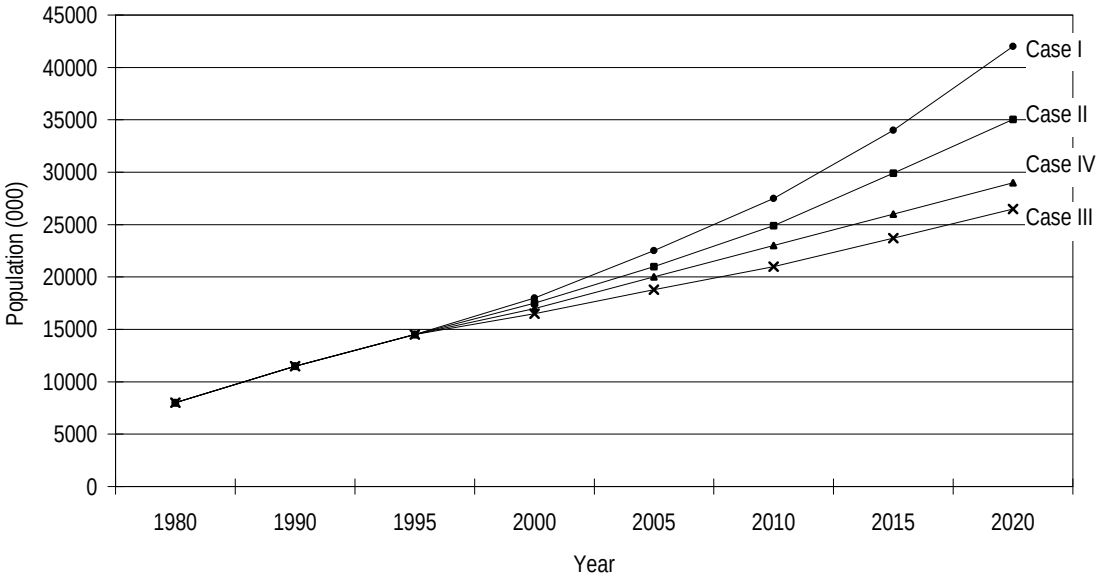
The Study Team initially thought that Case IV was the most realistic. However, most official plans developed in the Philippines and worked out by the government have been based on Case III. Moreover, due to the recent economic turmoil, there arose the need to reduce the projection. As a result, the Study Area would have to accommodate an additional 9.4 million people in the next two decades. By then, the share of the greater metropolitan area would be 24% of the country's population.

Table 5.2
Population Projections for the Study Area

Case	1995 (000)	2005 (000)	2015		Growth Rate (%/yr)		
			000	% to RP	1995-2005	2005-2015	1995-2015
I. 1990-95 Trend	14,368	22,035	33,795	34.0	4.4	4.4	4.4
II. 1980-95 Trend	14,368	20,614	29,574	29.8	3.7	3.7	3.7
III. TWG-PP Projection	14,368	18,967	23,713	23.9	2.8	2.3	2.5
IV. Modified Case III	14,368	19,339	25,720	25.9	3.0	2.9	3.0

Source: Study Team and NSO

Figure 5.1
Population Projections for the Study Area



Source: MMUTIS Study Team

Employment

Employment in the Study Area was projected based on Case III and by estimating productive age population (PAP) rate, labor force rate and employment rate.[1]

The PAP rate, labor force rate and employment rate in the country and the NCR are shown in Figure 5.2. Based on the past trend, the following assumptions were made:

PAP Rate: This will increase by 0.5% every five years due to the decrease in fertility rate. In other words, productive age population will increase as population growth decreases.

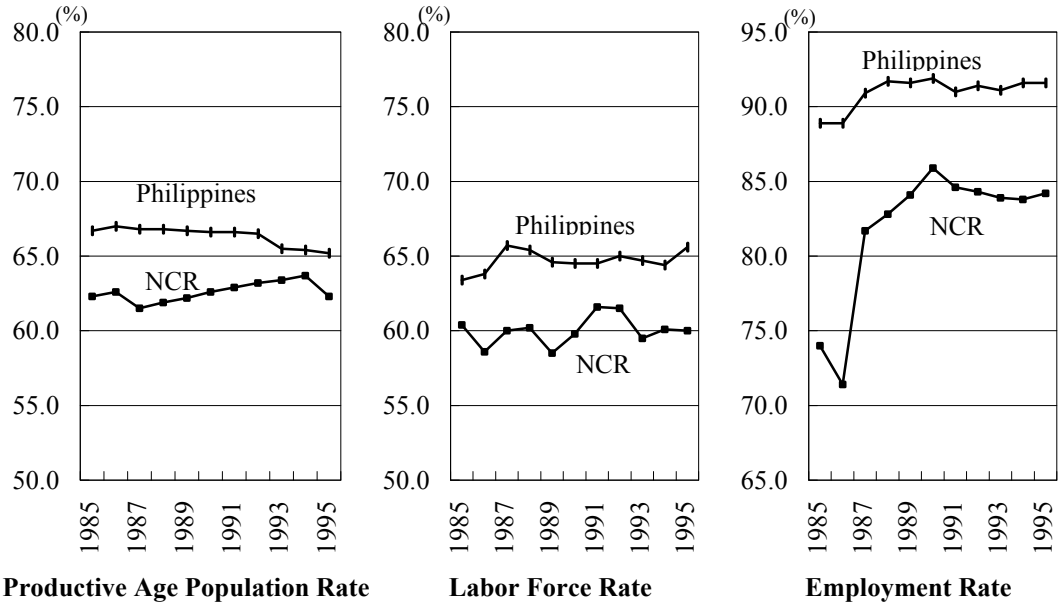
Labor Force Rate: This will remain constant at 60% up to year 2015.

Employment Rate: This will improve by about one percent every five years.

The results of the projections are summarized in Table 5.3.

[1] Definitions are as follows:
Productive Age Population (PAP): 15 years old and above.
Labor Force: Population of productive age who contribute to the production of goods and services in the country, including either employed or unemployed.
Employment Rate: Proportion of the total number of employed persons to the total number of persons comprising the labor force.

Figure 5.2
Rates of Productive Age Population, Labor Force and Employment, 1985-1995



Source: MMUTIS Study Team

Table 5.3
Estimated Employment in the Study Area

	1996	2005	2015	Growth Rate (%/yr)	
				1996-2005	2005-2015
1. PAP Rate: %	65.2	65.6	67.5	-	-
2. Labor Force Rate: %	60.0	60.0	60.0	-	-
3. Employment Rate: %	84.2	85.0	86.2	-	-
4. Employment: 000					
– Metro Manila	3,729	4,341	4,866	1.5	2.1
– Outer Areas	1,446	2,205	3,421	4.8	4.5
– Study Area	5,243	6,547	8,287	2.5	2.4
5. Employment by Sector: 000					
– Primary	157 (3.0)	107 (0.9)	70 (0.9)	-	-
– Secondary	1,263 (24.7)	1,778 (27.2)	2,470 (29.8)	-	-
– Tertiary	3,343 (72.4)	4,661 (71.2)	5,747 (69.3)	-	-

Source: MMUTIS Study Team
1/ This projection, based on Case III (TWG-PP), is used as Scenario 1 in Section 5.3 of this chapter.
2/ Employment is counted at worker's residence.

School Enrolment

The school enrolment level in the NCR is fairly high. Based on official statistics for the region and those from the MMUTIS HIS, the proportion of population to enrolment rates in the elementary, secondary and tertiary levels were estimated (refer to Table 5.4).

Table 5.4
School Enrolment in the NCR and Study Area

(NCR[1/])

Year	Pop. (000)	School Enrolment (000)[3/]				Enrolment Rate (%)			
		Elem.	Second'y	Tertiary	Total	Elem.	Second'y	Tertiary	Total
1989-90	8,116	1,128	567	360	2,055	13.9	7.0	4.4	25.3
1991-92	8,286	1,143	576	211	1,930	13.4	6.4	2.5	22.3
1992-93	8,605	1,190	614	679	2,483	13.7	7.1	7.8	28.5
1993-94	8,936	1,215	652	720	2,587	13.7	7.3	8.1	29.1
1994-95	9,117	-	-	571	-	-	-	6.1	-

(MMUTIS Study Area[2/])

Year	Pop. (000)	School Enrolment (000) [3/]				Enrolment Rate (%)			
		Elem.	Second'y	Tertiary	Total	Elem.	Second'y	Tertiary	Total
(1996)									
Manila	9,817	2,173		949	3,122	23.3		9.1	32.4
Outer A.	5,180	1,138		314	1,452	22.0		6.1	28.0
Study A.	14,997	3,311		1,263	4,574	22.8		8.1	30.9
(2005)	18,967	4,135		1,745	5,880	21.8		9.2	31.0
(2015)	23,713	5,411		2,292	7,703	22.8		9.7	32.5

1/ Philippine Statistical Yearbook, 1992, 1995, 1996.
2/ MMUTIS Person-trip data 1996.
3/ School enrolment is counted at pupil/student's residence.

Gross Regional Domestic Product (GRDP)

The Study Area's GRDP has been estimated based on the Klein-Kosobud Model which espouses the concept that labor productivity is determined by the level of capital equipment ratio (capital accumulation divided by employment).[2] The results are summarized in Table 5.5 (a).

During the MMUTIS study period, ASEAN countries experienced serious financial crisis. The Philippine national economy became stagnant with a devalued currency and inactive investments. Although this recession is still continuing and the future perspective is unclear, its influence can be estimated as presented in Table 5.5 (b), based on Scenario II with explanation given in the footnote of Table 5.5 (a). The assumptions are:

Case 1: Recession ends within this century. The ratio of investment to gross domestic product will be low at 20% for 1998-2000 but recovers to 30% after 2001.

Case 2: Recession will continue up to 2004. The same ratio will be low at 20% for 1998-2000 and 25% for 2001-2004.

[2] Elaborated in a Technical Paper presented in the MMUTIS seminar/workshop.

In the MMUTIS, Case 1 above was adopted. If Case 2 is assumed, the Master Plan will be based on an underestimated traffic demand.

Table 5.5
Economic GRDP of the Study Area

(a) Growth Estimated Before Financial Crisis Since 1998

	1995	2005	2015	Growth Rate : %/yr.		
				1995-2005	2005-2015	1995-2015
GRDP: ₱ billion						
Scenario I (High)	856	1,687	2,846	7.0	5.4	6.2
Scenario II (Med.)	856	1,687	2,705	7.0	4.8	5.9
Scenario III (Low)	856	1,589	2,420	6.4	4.3	5.3
GRDP per Capita: ₱						
Scenario I (High)	59,580	83,810	108,890	3.5	2.7	3.1
Scenario II (Med.)	59,580	83,810	103,490	3.5	2.1	2.8
Scenario III (Low)	59,580	78,950	92,570	2.9	1.6	2.2

Source: MMUTIS Study Team
Note: Scenario I assumes that Capital Formation/GDP rate is 30% throughout the projection period.
Scenario II assumes 30% for 1997-2005, 27.5% for 2006-2010, and 25% for 2011 onward.
Scenario III assumes 27% for 1997-2005, 25% for 2006-2010, and 23% for 2011 onward.

(b) Estimated Growth Affected by Financial Crisis Since 1998

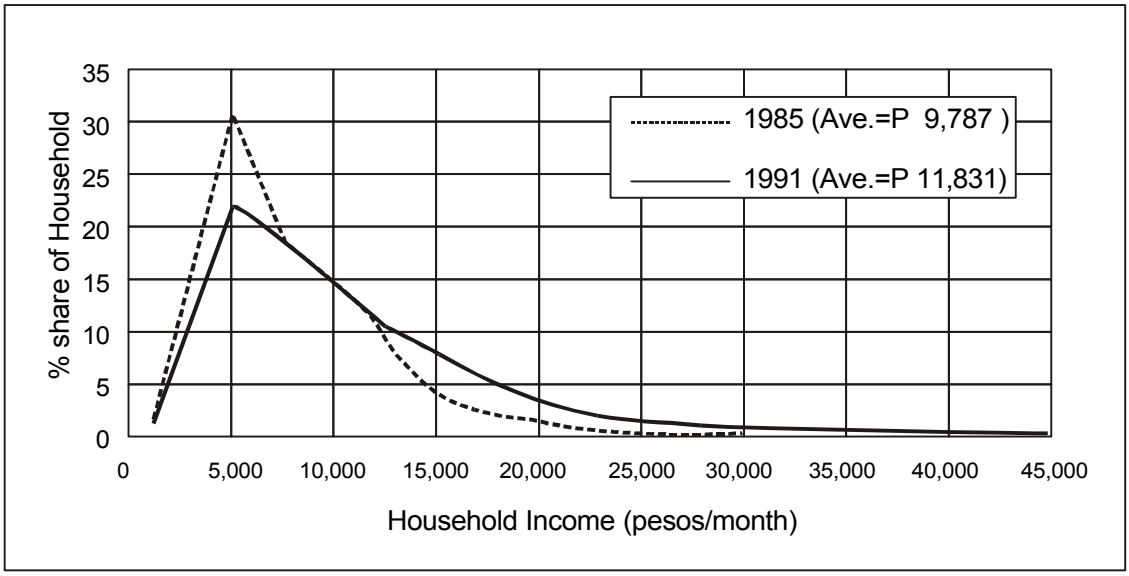
Item	1995	2005	2015	Growth Rate : %/year		
				1995-2005	2005-2015	1995-2015
GRDP (₱ billion)						
Case 1	856	1,480	2,357	5.6	4.8	5.2
Case 2	856	1,424	2,162	5.2	4.3	4.7
GRDP per capita (P)						
Case 1	59,580	73,526	90,175	2.1	2.1	2.1
Case 2	59,580	70,751	82,700	1.7	1.6	1.7

Source: MMUTIS Study Team

Household Income

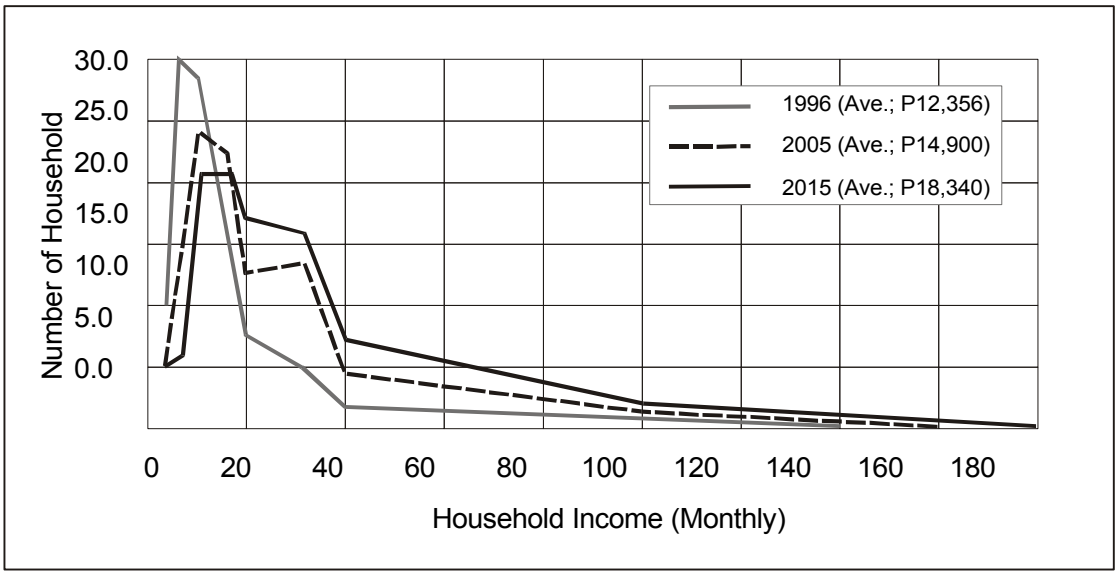
It can be assumed that household income will increase at the same growth rate as the per capita GRDP. With this, the average household income of ₱ 12,356 in 1996 will increase to ₱ 14,900 and ₱ 18,340 in 2005 and 2015, respectively. However, the distribution of the income changes, as shown in Figure 5.3 between 1985 and 1991, shows that the percentage of low-income group decreased while that of the middle-income group increased. Assuming that this trend will continue in the future, the likely income distribution pattern is shown in Figure 5.4.

Figure 5.3
Distribution of Household Income, 1985 and 1991



Source: MMUTIS Person-trip Survey

Figure 5.4
Estimated Distribution of Household Income, 1996, 2005 and 2015



Source: Estimated by the MMUTIS Study Team

Car Ownership

Table 5.6 shows the car ownership rate by income class. As income level increases, so does car ownership level. Future car ownership is estimated by assuming that car ownership rate will remain the same as the 1996 rate (Table 5.7).

Table 5.6
Current Car Ownership Rate, 1996

Income Class (Pesos/month)	% of Car-owning Households				
	No car	1 car	2 cars	3 or more	Total
0 - 3000	91.3	7.9	0.4	0.3	100.0
3000 - 6000	90.2	9.1	0.7	0.1	100.0
6000 - 10000	84.7	13.6	1.4	0.2	100.0
10000 - 15000	76.1	19.6	3.3	0.9	100.0
15000 - 20000	69.7	23.0	5.8	1.5	100.0
20000 - 30000	58.2	30.3	8.2	3.3	100.0
30000 - 40000	40.6	34.7	17.0	7.7	100.0
40000 - 60000	34.0	32.7	19.0	14.4	100.0
60000 - 100000	21.2	38.1	21.2	19.5	100.0
100000 - 150000	45.6	10.1	15.2	29.1	100.0
1500000 -	15.2	21.7	26.1	37.0	100.0

Source: MMUTIS Person-trip Survey

Table 5.7
Estimated Future Car Ownership

	1996	2005	2015	Growth Rate (%/yr)		
				1996-2005	2005-2015	1996-2015
Population (000)	14,997	18,967	23,713	2.6	2.3	2.4
No. of Household (000)	3,102	3,951	4,940	2.5	2.3	2.4
No Car	2,572	2,908	3,705	1.4	2.5	1.9
1 Car	467	766	872	5.7	1.3	3.3
2 Cars	84	190	244	9.5	2.5	5.8
3 Cars and more	32	87	119	11.7	3.2	7.2
Car Ownership Rate (%)	18.7	21.2	25.0	-	-	-
No. of Cars (000)	738	1,407	1,717	7.5	2.0	4.6

Source: MMUTIS Study Team

5.4 Land-use/Transport Network Development Scenario

5.4.1 Urban/Transport Network Development Scenario

Metro Manila's transportation network has strongly affected urban development direction and land use. Land-use development, in turn, has influenced the form of transportation services. Land-use zoning, institutionalized in 1981 and currently being updated, was not effectively enforced and did not guide the area's development as envisioned. Instead, strong market forces and an active private sector have been playing key roles in determining urban formation wherein the availability of transportation infrastructure was their concern.

In preparing a future transportation network plan, incorporating land use in the planning process is critical. Future transportation demand and subsequent network planning should not be done based simply on hypotheses and assumptions. However, it is also difficult to forecast future land-use and urban development patterns especially for a large metropolis like Metro Manila. A practical approach has been taken at this stage of the study to assess land-use scenarios in the Study Area in relation with transport network development.

Figure 5.5 shows conceptually how the scenarios have been developed and are related to each other. They are briefly explained as follows:

1) Scenario I: This assumes that the current urban development trend and transportation network development and management will continue. High density in urban cores and low density in outer areas are the basic features of development. However, population will increase relatively faster in outer areas while employment density will intensify in city centers.

2) Scenario II: This assumes that even as the current land-use/urban development trend continues, transport network would develop more strategically, since it is significantly affected by the former. For example, although most of the existing transport projects/plans are concentrated in Metro Manila, these would be modified and restructured to comply with the fast-growing population in outer areas.

3) Scenario III: In this scenario, land use will be controlled and urban growth managed more effectively, in terms of density control, zoning enforcement, decentralization of excessively accumulated urban function, etc. The transport network in this scenario will remain basically the same as Scenario II's unless drastic change in land-use pattern is introduced.

4) Scenario IV: This scenario assumes that further decentralization and growth management policy would be in force at regional level. The successful development of outside growth centers, such as Subic, Clark, Batangas, etc., would discourage the influx of migrants into the Study Area.

In the land-use and transportation network assessment process, a transport management subscenario is expected to function in all scenarios. A subscenario integrates and increases the effectiveness of two subscenarios through various physical and nonphysical measures such as traffic/demand management, terminals/interchange facilities management, public transport routing, etc.

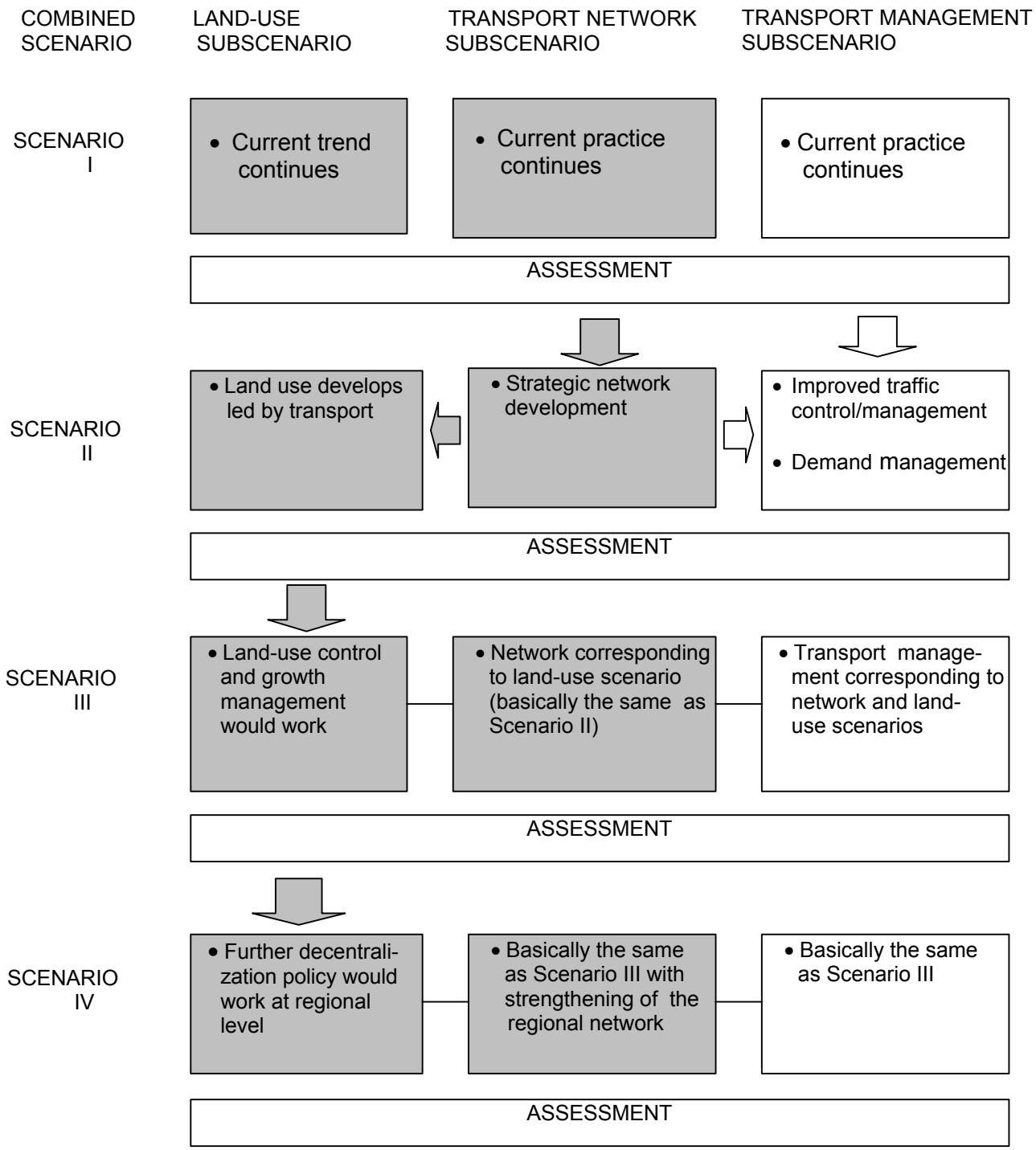
5.4.2 Estimate of Socio-economic Data by Scenario

Necessary socio-economic data, such as population, employment at residence and workplace, school enrolment at residence and school, have been projected for each urban/transport development scenario.

Scenario I

Necessary socio-economic data reflecting land use relevant to traffic analysis include population, employment and school enrolment. The methodologies applied are briefly explained as follows:

Figure 5.5
Preparation and Assessment of Land-use/Transport
Network Development Scenario



1) Population: The growth trend in 1980, 1990 and 1995 is expected to continue. The assumed maximum level of population density used was based on a net area excluding uninhabited lands, such as river/water, transport/terminals, conservation area, etc.[3] Results show that the city of Manila has long reached the level of 600 persons per ha. These also indicate that there are many zones or areas with much higher density probably even exceeding 1,000 persons per ha. On the other hand, Muntinlupa registers only about 110 persons per ha. Average population density of Metro Manila is already 224 persons per ha in 1995, while that of outer areas is only 35, though it varies from 109 in Antipolo to 10 in Rodriguez/San Mateo.

   A logistic curve was worked out based on 1980, 1990 and 1995 population data to estimate the future population wherein maximum population densities were assumed for planning zones, except for Antipolo, Bacoor/Imus and Dasmariñas, where population increase is very high. The results shown in Figure 2.2 indicate strongly that population growth is significant not only in Metro Manila but more so in outer areas particularly in the south and east. On the other hand, Metro Manila's northern inner area will only have a limited growth.

2) Employment/School Attendance at Residence: These are estimated in proportion to population.

3) Employment at Workplace (Secondary Sector): Employment in the secondary sector is strongly affected by location and size of industrial estates. New industries wanting to locate in Metro Manila are discouraged and this has become less attractive to investors. As Figure 5.6 shows most of the planned or ongoing industrial estates are located south of Metro Manila and a few minor ones in the north and east. The total area of these estates is approximately 3,200 ha, while the required area by year 2015 would be approximately 6,000 ha.[4] Here, it is assumed that existing projects/plans will be implemented and will substantially absorb the increased employment, while existing industrial areas will accommodate the remaining portion.

4) Employment at Workplace (Tertiary Sector): Employment in this sector was estimated using the same method in estimating the secondary sector employment. Existing urban development projects shown in Table 5.8 and Figure 5.7 cover a total of 5,000 ha and would provide about half of the planned 1.6 million jobs, while existing commercial/business activities will provide the remaining portion.

[3] With this adjustment, the total Metro Manila area is estimated at 420 sq km.

[4] Future industrial estate requirements were estimated by separating those employed in existing mixed land use and those who belong to the more formal or modern sector. The industrial area was estimated for the latter type of employment sector.

Figure 5.6
Location Map of Industrial Estates

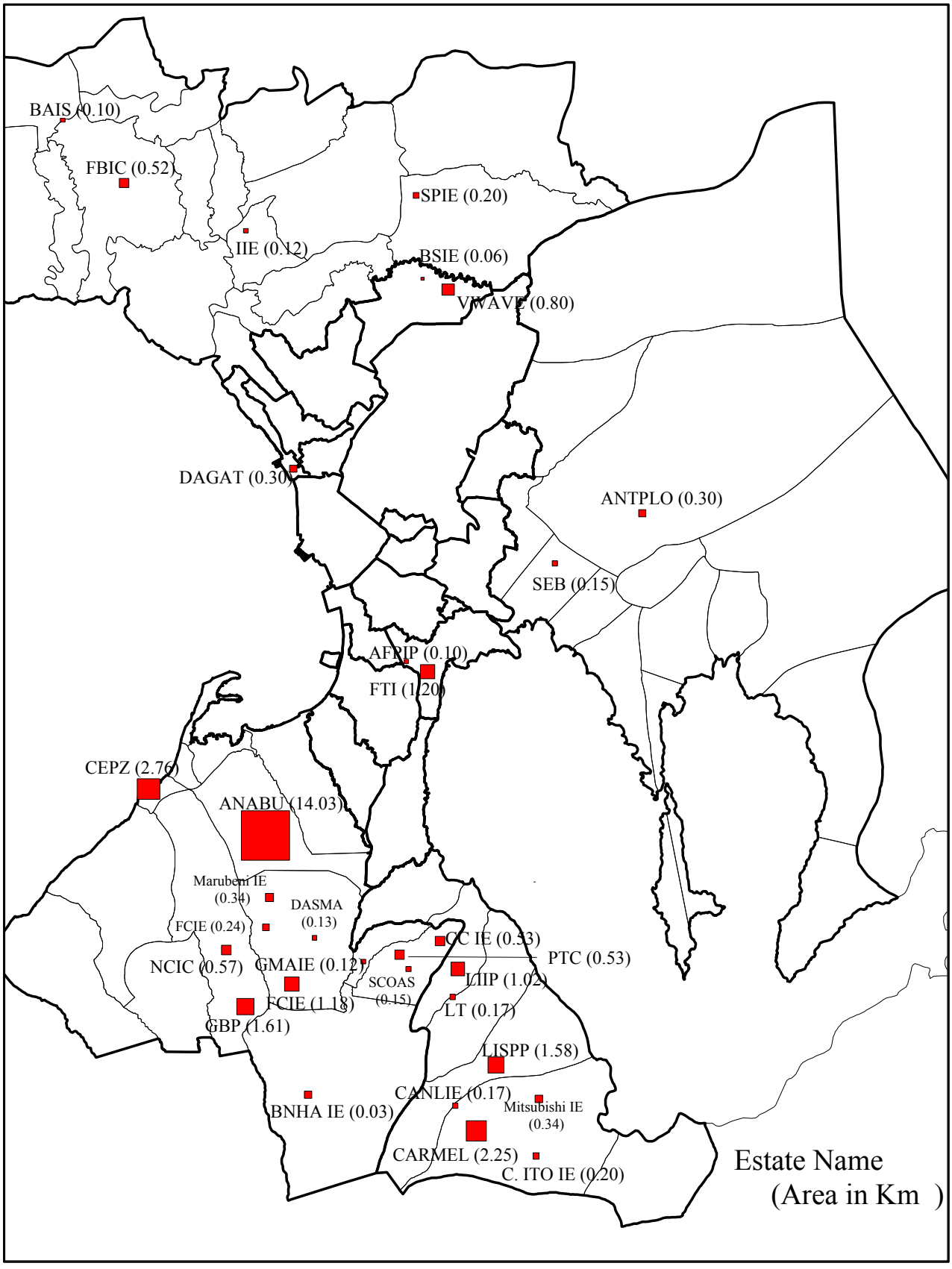


Figure 5.7
Location Map of Large-scale Urban Development Projects

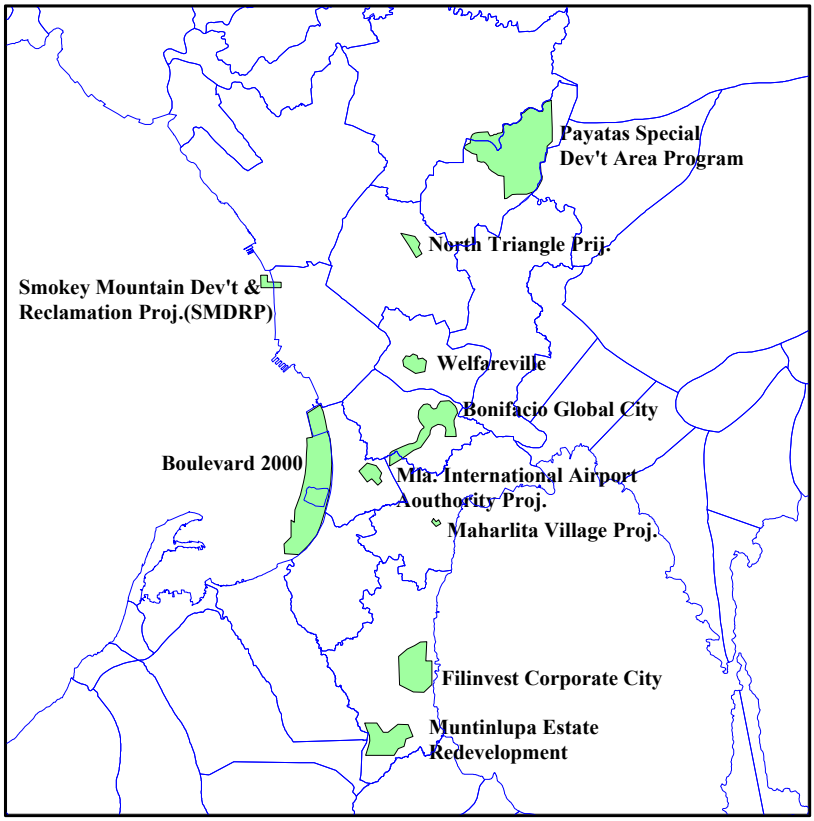


Table 5.8
Large-scale Urban Development Projects

(a) Development Area (ha)

Project / Land Use	Boulevard 2000	Fort Bonifacio	Filinvest Coporate City	Harbour Center	Muntinlupa Estate Redevelop-ment	Payatas Special Area Development PSAD	Total
Residential	450	200	100	23	176	1100	2049
Commercial/Business	300	-	80	45	22	60	507
Institutional	150	40	-	-	20	300	510
Mixed-Use	225	160	40	-	-	-	425
Port Area	-	-	-	135	-	-	135
Industrial	-	-	-	35	-	100	135
Light Industrial	-	-	-	-	20	-	20
Others	375	250	24	-	179	416	1244
Total	1500	650	244	238	417	1976	5025

Source: MMUTIS Study Team

(b) Employment in the Commercial/Service Sector at Fully Developed Stage (1,000 persons)

	Density (pax/ha)	Boulevard 2000	Fort Bonifacio	Filinvest Coporate City	Harbour Center	Muntilupa Estate Redevel-opment	Payatas Special Area Devt. PSAD	Total
Commercial/Business	1500	450	-[1/]	120	68	33	90	761
Institutional	1200	180	48	-	-	24	360	612
Mixed Use	500	113	80	20	-	-	-	213
Total	-	743	128	140	68	57	450	1585

Source: MMUTIS Study Team
[1/] included in mixed use

(c) Zonewide Employment Increase by Year 2000 (1,000 persons)

Development Site	Zoning System		Secondary Industry					Tertiary Industry				
	32 Zone	171 Zone	2000	2005	2010	2015	2020	2000	2005	2010	2015	2020
Boulevard 2000	2	25	0	0	0	0	0	10	104	198	292	386
Bonifacio Global City	3	32	0	0	0	0	0	10	65	120	175	230
		33	0	0	0	0	0	5	42	80	117	154
Filinvest Corporate City	11	88	0	0	0	0	0	8	31	54	77	100
Harbour Center	1	2	2	4	7	10	13	4	17	31	44	57
Muntinlupa Estate	11	89	1	2	3	5	7	3	12	20	29	38
Payatas Special Area	6	53	2	5	8	13	18	4	16	28	40	52
Development (SPAD)		54	2	5	8	13	18	4	16	28	40	52
		55	2	5	8	14	19	6	24	42	60	78
North Triangle Project	5	46	0	0	0	0	0	3	12	21	30	39
Welfareville	4	36	0	0	0	0	0	1	2	3	5	7
Manila Int'l Airport	2	22	0	0	0	0	0	1	2	2	3	4

Source: MMUTIS Study Team

Scenario III

This scenario would have the following socio-economic data:

1) Population: Due to an effective land-use and growth control, expanded transport network to outer areas and past population growth trend, it is assumed that 60% of the population increase estimated between 1995 and 2015 will be distributed outside Metro Manila.

2) Employment in the Secondary Sector: Secondary sector employment in Metro Manila more or less will not increase from the current level. Future increments will occur mainly in planned developments in outer areas.

3) Employment in the Tertiary Sector: Tertiary sector employment in urban centers in outer areas and in Metro Manila will absorb about 800,000 and about a million jobs, respectively, by 2015.

4) School Enrolment: Future increase in student population (approximately 1.3 million by 2015) is assumed to be accommodated in the north and south where a couple of universities can be established.

Scenario II and Scenario IV

Scenarios II and IV were prepared using contrasting assumptions on urban area development and growth management. The former scenario assumes that these would not work effectively, and that the current trend would continue under the restructured transport network. The latter scenario assumes that development and management would work at the regional level. Here, the concentration of population and socio-economic activities in the Study Area would be lessened and shared with other growth centers such as Clark, Subic and Batangas. The estimated socio-economic data are summarized in Table 5.9 and Figure 5.8.

Table 5.9
Macro-demographic Framework for 2015

(000 persons)

Item	Present Condition	Urban Development Scenario			
		(1) Past Trend	(2) Transport Led	(3) (2) + Strict Land Use Control	(4) (3) + Regional Decentralization
Year	1995	2015	2015	2015	2015
1. Population					
(1) Metro Manila	9.454	13.836	12.579	11.323	10.191
(2) Adjoining Provinces	4.914	9.878	11.133	12.390	11.151
Bulucan	1.354	2.319	3.589	4.859	4.373
Rizal	1.312	2.802	2.173	1.545	1.391
Cavite/Laguna	2.248	4.757	5.371	5.986	5.387
(3) Study Area ((1) +(2))	14.368	23.714	23.712	23.713	21.342
2. Employment at work place					
2-1 Secondary Sector					
(1) Metro Manila	837	1.655	1.393	1.133	1.020
(2) Adjoining Provinces	426	813	1.074	1.335	1.202
Bulucan	86	156	261	366	330
Rizal	89	178	197	217	195
Cavite/LAguna	251	479	616	752	677
(3) Study Area ((1) + (2))	1.263	2.468	2.467	2.468	2.222
2-2 Tertiary Sector					
(1) Metro Manila	2.853	4.563	3.899	3.235	2.911
(2) Adjoining Provinces	890	1.183	1.848	2.512	2.261
Bulacan	272	392	597	802	721
Rizal	213	279	318	356	321
Cavite/Laguna	405	512	933	1.354	1.219
(3) Study Area ((1) + (2))	3.743	5.746	5.747	5.747	5.172
3. Student at school place*					
(1) Metro Manila	1.385	2.028	1.866	1.704	1.534
(2) Adjoining Provinces	508	1.160	1.321	1.483	1.334
Bulacan	143	282	391	501	451
Rizal	111	316	286	256	230
Cavite/Laguna	254	562	644	726	653
(3) Study Area ((1) + (2))	1.893	3.188	3.187	3.137	2.868

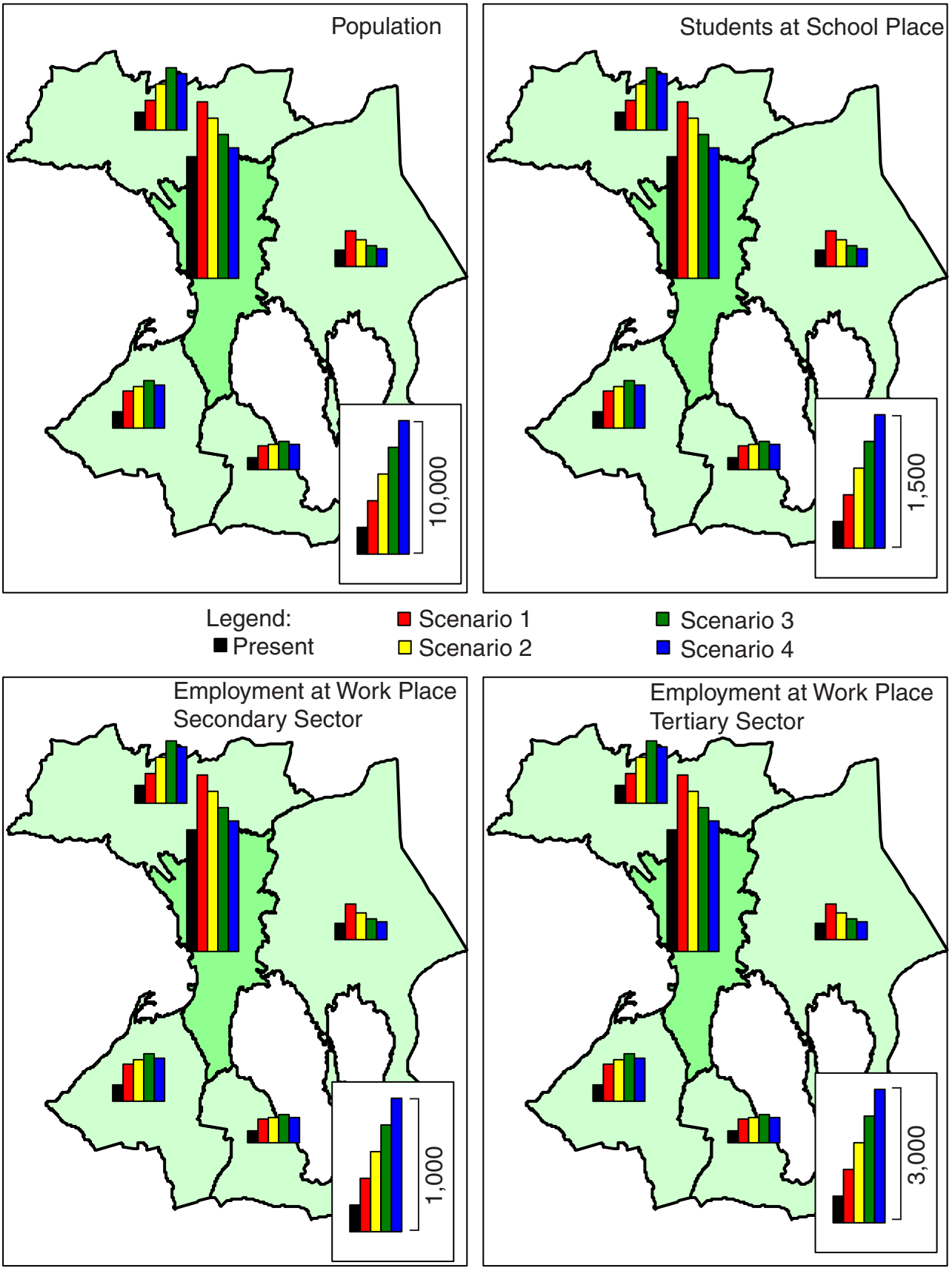
*Students aged 16 years and over

(2) Macro-demographic Framework for 2015, Index

(1196=100)

Item	Present Condition	Urban Development Scenario			
		(1) Past Trend	(2) Transport Led	(3) (2) + Strict Land Use Control	(4) (3) + Regional Decentralization
Year	1995	2015	2015	2015	2015
1. Population					
(1) Metro Manila	100	146	133	120	108
(2) Adjoining Provinces	100	201	227	252	227
Bulucan	100	171	265	359	323
Rizal	100	214	166	113	106
Cavite/Laguna	100	212	239	266	240
(4) Study Area ((1) +(2))	100	165	165	165	149
2. Employment at work place					
2-1 Secondary Sector					
(1) Metro Manila	100	194	164	133	120
(2) Adjoining Provinces	100	185	244	303	273
Bulucan	100	175	293	411	371
Rizal	100	189	210	231	207
Cavite/LAguna	100	186	240	293	263
(3) Study Area ((1) + (2))	100	191	191	191	172
2-2 Tertiary Sector					
(1) Metro Manila	100	166	142	118	106
(2) Adjoining Provinces	100	136	212	299	260
Bulacan	100	145	221	297	267
Rizal	100	133	152	170	154
Cavite/Laguna	100	131	239	346	312
(3) Study Area ((1) + (2))	100	159	159	159	143
3. Student at school place*					
(1) Metro Manila	100	146	135	123	111
(2) Adjoining Provinces	100	228	260	292	263
Bulacan	100	197	273	350	315
Rizal	100	285	258	231	207
Cavite/Laguna	100	221	254	286	257
(3) Study Area ((1) + (2))	100	168	168	168	152

Figure 5.8
Future Population, Employment and Student by Urban Development Scenario



Summary of Socio-economic Data by Scenario

Estimated socio-economic data for each scenario are also shown in Table 5.9 and summarized in Figure 5.8. These are as follows:

1) Under Scenario I, Metro Manila's population will further increase from 9.5 million in 1996 to 13.8 million in 2015, while that of other areas, from 4.9 million to 9.9 million. Scenarios II, III and IV predicted a lower population increase at 12.6 million, 11.3 million and 10.2 million, respectively. These mean a higher increase in outer areas except for Scenario IV.

2) Employment in the secondary sector will rapidly increase in the outer areas. Current employment in Metro Manila and outer areas is 850 thousand and 440 thousand, respectively, and it will be 1.1 million and 1.3 million, respectively, in Scenario III in 2015.

3) Metro Manila will continue to provide significant employment in the tertiary sector, though a relatively faster growth in major urban centers in the outer areas is assumed under Scenarios III and IV.

4) A considerably higher growth in enrolment of tertiary students is seen in the outer areas due to available space and good environment and the current excessive concentration in the city center.

This body of information is expected to provide a good basis for LGUs to analyze their future land-use policy and formulate a zoning policy within the integrated urban development scenario and strategy.

Selected Scenario

In the Study Area, city planning, urban development and land-use control have not worked effectively, while the availability of infrastructure has greatly affected urban formation. Therefore, it is likely that the future urban development pattern would be affected by the current trend and transport network development. Accordingly, in the subsequent analysis, socio-economic data estimated for Scenario II will be mainly used and those of Scenarios I, III and IV will be used for sensitivity tests.