These improvement measures, however, will not fundamentally improve future traffic congestion. Hence, the MMUTIS proposes two new major access roads to Terminal 3. The first proposal will provide a new interchange from the Skyway to Sales Road. The interchange has to shift slightly from the exact location of the Nichols Interchange, but contained on Sales Road as an elevated structure. This facility will connect Terminal 3 directly with the Skyway, which serves SLE near Magallanes Interchange and Pasay Road or Buendia Avenue over the Magallanes Interchange.

The second proposal is an underground tunnel from C-5 South Section to Andrews Avenue to go under the main runway. Although it needs very sensitive construction technologies, it is a technically possible alternative. This facility will directly connect Terminal 3 with C-5, which serves Roxas Boulevard southbound and C-5 northbound.

Table 10.18
Airport Access Improvement Projects

Project Name	Length	Project Cost (₱ million)
Tramo Road-Andrews Avenue Left-turning Flyover	---	120
Nichols Interchange Improvements	---	135
Alternative 1) Skyway New Airport Interchange	1.3 km	1,893
Alternative 2) Andrews Ave. Extension (underground link)	1.3 km	6,146
Total		1) 2,148 2) 6,400

Due to the cost, the better alternative would be the Skyway Interchange, while the second proposal can be for future consideration.

10.4 Proposed Public Transport Projects

1) MRT Integration

This project intends to improve the integration of Lines 1 and 3 and a possible Line 6 at the Baclaran-Pasay Rotonda area. The current plan, which terminates Line 3 at Taft/EDSA Station at-grade, would create serious traffic problem in the area and restrict the opportunity to serve the reclamation area. Meanwhile, the ongoing MRT Line 3 alignment between Magallanes Interchange and Taft Avenue is designed at-grade.

The following options are studied:

Option A: MRT Line 6 from the south will reach the south terminal of the existing LRT 1. MRT Line 3 will be constructed at-grade in accordance with the original design. Passengers who will use it from MRT Line 6 shall transfer through LRT Line 1 via the south terminal. No installation of a railway system is considered in the reclamation area.

Option B: MRT Line 6 is extended to the reclamation area passing by the south terminal of the existing LRT Line 1. MRT Line 3 will be constructed at-grade in accordance with the original design. Passengers who will use MRT Line 3 from MRT Line 6 shall transfer through LRT Line 1 via the south terminal.

Option C: LRT Line 1 will be extended to the reclamation area. MRT Line 6 shall cross over the extension line of LRT Line 1, where the rail level is about 16-m high above the ground. Future railway extension of LRT Line 1 in the reclamation area may not be recommendable.

Option D: MRT Line 3 will be extended to the reclamation area either as an elevated or underground structure. The alignment shall cross the existing LRT Line 1 viaduct and the newly constructed Line 6 station on EDSA-Roxas Boulevard by flyover. MRT Line 6 will extend to F.B. Harrison.

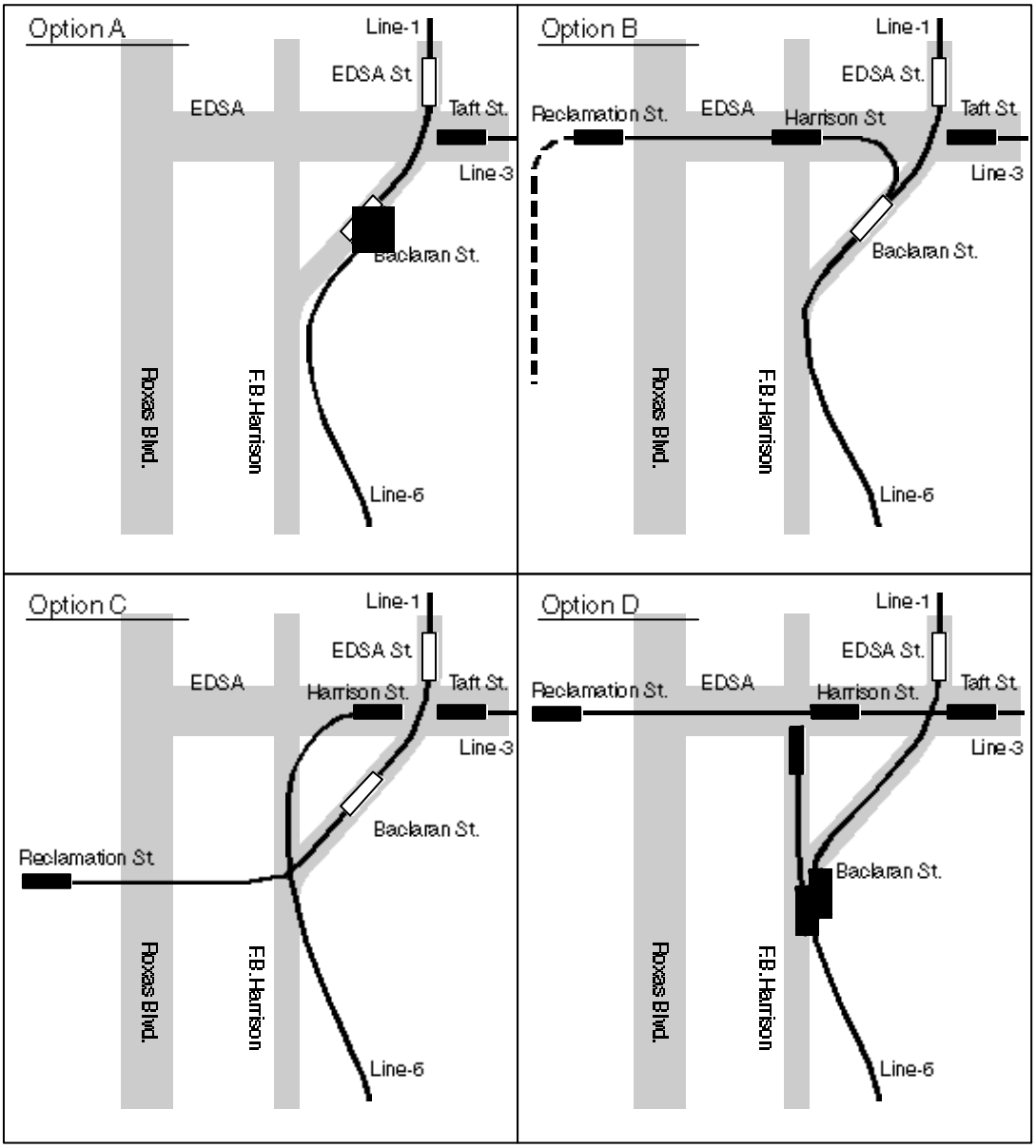
Option D is the most adequate in terms of passenger transfer and future extension of the railway system to the reclamation area, although it requires a substantial modification of MRT 3 terminals and structure as well as vigorous coordination with Line 1 and the proposed Line 6. Integrated development with other urban facilities is also critical. Components for MRT Line 3 extension are shown in the table below.

Table 10.19
MRT 3 Extension to Reclamation Area for Integration of MRT Lines 1, 3 and 6

Item		Description	Remarks
Permanent way	Track length (km) Structure type No. of stations	2 km PC concrete box girder 2	Single-track loop L=30 m span length
Operation	Scheduled Speed Running time	35 3	
Project Cost (US$ million) Estimated by MMUTIS	Infrastructure E & M Total	57 (88) 24 81(112)	( ) shows cost of underground structure

Source: MMUTIS Study Team

Figure 10.5
Options for Integration of MRT Lines 1, 3 and 6 in Baclaran



2) MRT Mode Interchange Facilities

Selection of Priority Projects

Public transportation terminals are indispensable facilities that assure the effectiveness and convenience of a public transport network. Since existing terminal areas were identified as a serious traffic bottleneck, the need to develop terminals has been recognized to eradicate traffic congestion in Metro Manila.

All transportation nodes and terminals including bus stops and jeepney loading/unloading places should be carefully designed to provide a smooth

and safe flow of general road traffic and ensure effective public transport operation.

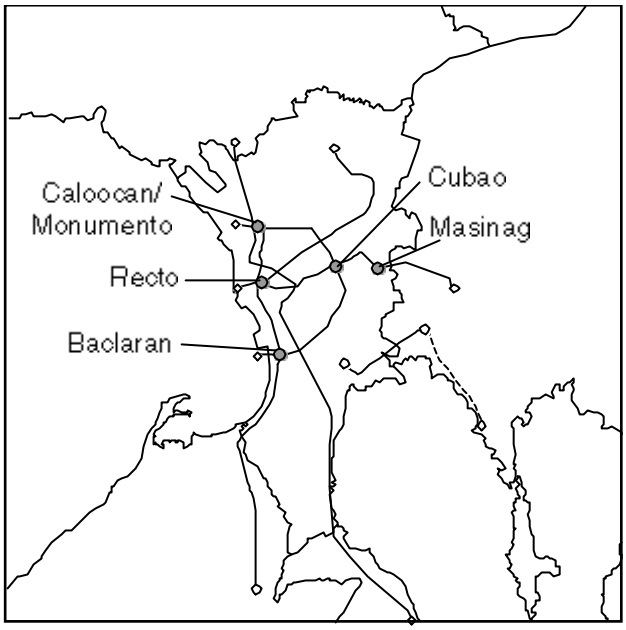
The priority terminal projects in the MTDP are those (1) which are required to examine a development strategy and incorporate it with urban development, (2) which can complement the high-priority rail-based transport system, (3) which expect a large volume of demand, and (4) which will be a reference of other terminals in the long-term development program.

The following five areas were selected:

a) Recto
b) Cubao
c) Masinag
d) Caloocan/Monumento
e) Baclaran

Recto, Cubao and Baclaran are representing the terminals located in the CBD, showing distinct urban structure. Masinag is a suburban bed town. The five terminals are expected to handle a large demand of transfer passengers from rail to rail and from road to rail.

Figure 10.6
Location of Proposed Modal Interchange



Basic Considerations for Plan Preparation

To prepare an effective development plan, it is important to define its goals and the issues it covers. The following section discusses these goals and issues and the basic guidelines and considerations in preparing a plan:

The overall goals of terminal facility development are to provide users with a more accessible and reliable public transport system, to encourage its use and, consequently, to improve urban environment. For better accessibility at terminals, there are two types of passenger flow to be considered: rail to rail and rail to road transport. Hence, sufficient space should be provided for facilities such as pedestrian deck and underpasses. A terminal must also provide access and space for road transport modes to ensure a convenient passenger transfer.

To realize an effective terminal development plan, improving public transport accessibility alone will not be sufficient. A significant issue is its impact on or function in its environment. Urban developments and economic activities within the terminal's location should thus be considered to maximize a

terminal's capacity. For example, existing large-scale commercial centers will ensure that a terminal will be optimized.

Although the need for terminal facilities has been recognized since the 1980s yet, the following reasons have interrupted project implementation:

- Difficult coordination and lack of consensus among many organizations and agencies involved from the construction stage to operation and management
- Difficult land acquisition and insufficient compensation of urbanized or prime areas resulting in high costs and conflict of interests among landowners
- No governmental organization has initiated or led project implementation.

Based on experience then, the following must be considered in preparing the development plan:

- utilize existing facilities effectively
- minimize the initial investment cost
- maximize the development impact
- coordinate with other authorized projects

Planning Issues for Priority Projects

Planning goals and issues for each priority project must be examined by taking into account the proposed public rail transport network and existing land use. The goals and issues identified are summarized in Table10.20.

Proposed Development Plans

Recto: Based on the future MRT construction program, development of the terminal and its related facilities can be constructed in two phases. First priority is a corridor development between Line 1 and Line 2. Second phase will be the overall integration of all LRT/MRT lines and modern bus and jeepney terminals in the Public Estate Authority (PEA) redevelopment area.

Figure 10.7 shows Phase 1 projects included in the MTDP. Major components are a pedestrian deck and jeepney transit mall. The proposed bus and jeepney terminal facing Line 2 station is expected to provide space for existing buses and jeepneys parked on the road. Before constructing these facilities squatters have to be resettled.

For Phase 2, projects can be referred to the development plan prepared in the JUMSUT study.

Cubao: To ensure a safe and uninterrupted pedestrian flow, a 300-m long pedestrian deck is proposed, connecting not only the MRT stations but also the major commercial or entertainment buildings in the Araneta Commercial Center.

Table 10.20
Planning Goals and Issues for Priority Projects

Terminal	Planning Goal	Planning Issues
Recto	Revitalize the economic activities and modernize urban facilities, including transportation terminal, in the old town center based on the accessibility provided by rail-based public transportation systems	(Related Project) - PEA Redevelopment Project and JUMSUT - MMURTRIP (road and intersection improvement) (Issues) - Pedestrian accessibility between LRT/MRT stations - Improvement of inadequate conditions on existing jeepney and bus loading and unloading areas
Cubao	Provide strong linkage between radial route (Line 4) and circumferential route (Line 3), so that efficiency of the network configuration is enhanced.	(Related Project) - MMURTRIP (road and intersection improvement, etc) (Issues) - Pedestrian accessibility between MRT stations - Improvement of inadequate condition on existing jeepney and bus loading and unloading areas - Cooperation with large-scale development (Araneta) - Eradication of traffic congestion on EDSA/Aurora Blvd.
Masinag	Expand the MRT service coverage in the suburban residential area, subsequently encouraging the usage of rail-based public transportation system	(Issues) - Public transport linkage between rail and road-based transport to the hinterlands - Consideration to private vehicle users - Large land area required
Caloocan/ Monumento	Improve the efficiency of rail-based public transportation system, at same time improve the environment in the old urban area based on the desirable accessibility between the proposed and existing transportation system	(Issues) - Location of MRT Line 3 stations - Pedestrian accessibility between MRT and North Rail stations - Visualization of the impact on urban development
Baclaran	As a south gate of the Metro Manila CBD, to provide better accessibility to and transfer to/from the suburban line and intra-CBD lines, as well as improve urban environment by coordinating the present mixed land-use pattern with the large, favorable impact of MRT projects.	(Related Project) - MMURTRIP (road and intersection improvement, etc) (Issues) - Location of the MRT stations - Pedestrian accessibility between MRT stations - Minimization of adverse impacts from the MRT projects - Visualization of the impact on urban development

Jeepneys and tricycles west of EDSA operate on the existing road space. The MMURTRIP is proposing jeepney and tricycle routes on the existing road network in the area. The MMUTIS intends to further strengthen this by providing an appropriate terminal in front of Line 3 station.

Besides the pedestrian deck, sidewalk improvement is also proposed to encourage pedestrian trips to/from commercial and office buildings.

Masinag: The required area for the proposed terminal (Station Square), accommodating loading and unloading area for bus and jeepney, Park & Ride and Kiss & Ride facilities, as well as amenity space, is estimated at about 70,000 sq m.

Since most of the adjacent land to the Marcos-Sumulong Highway intersection from Santolan to Masinag are occupied either by commercial buildings or factories, the terminal is proposed to be located in Masinag before the junction.

Due to the distance between the proposed terminal and the intersection, it is important to provide an effective traffic management in the intersection to avoid congestion.

Caloocan and Monumento: To provide better connection with road transport, Line 3 stations in Monumento and Caloocan will be strongly proposed at an off-road area currently occupied by commercial buildings and residential houses. However, since the EDSA widening project for the MRT Line 3 extension project will clear this area, the problem would be solved. It is thus necessary to come up with a comprehensive urban redevelopment plan that includes the EDSA widening project, MRT Line 3 Extension project.

Baclaran: Construction of a pedestrian deck for large-volume transfer passenger is proposed, using available space to avoid affecting existing commercial buildings and a church. New bus and jeepney terminals should also be proposed to provide an alternative transport mode for LRT users, as well as to avoid traffic congestion on the arterial network due to uncontrolled loading and unloading on the road. Urban redevelopment will be proposed to make the area more attractive and interesting, including construction of new commercial buildings and adjustment of the land shape with an appropriate local road system.

Project Cost

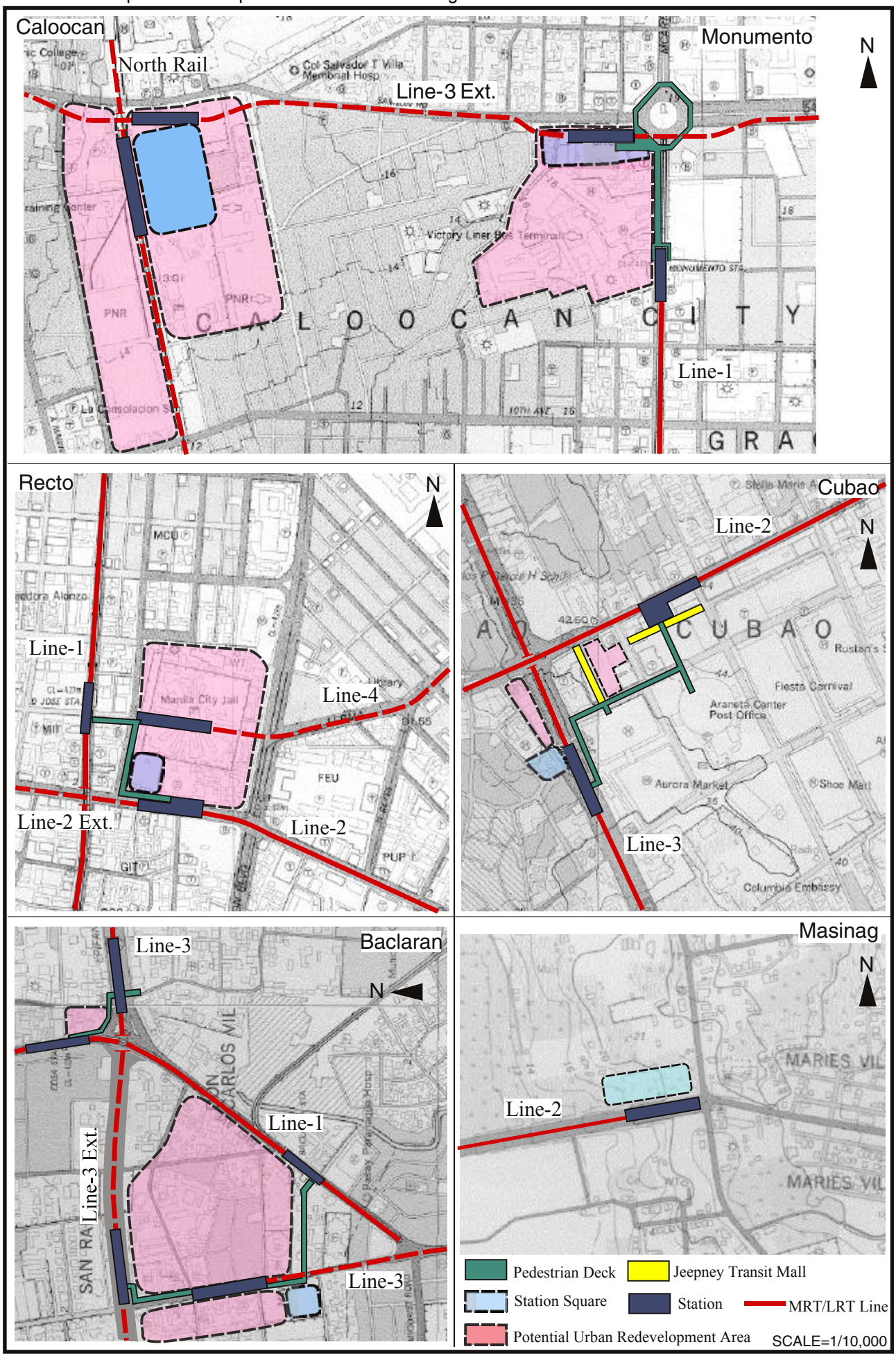
Table 10.21 presents the estimated development cost of the proposed terminal facilities. Total development cost amounts to ₱ 2.3 billion. The commencement in Caloocan/Monumento will be after the period of the MTDP, due to the necessity to adjust its schedule to that of North Rail and MRT Line 3 Extension whose development will extend over the MTDP period.

Table 10.21
Development Cost of Modal Interchange Facilities

Site	Item	Quantity	Project Cost (₱ million)[1/]
Recto	Pedestrian Deck	310 m	42.7
	Jeepney Transit Mall	240 m	3.6
	Station Square	7,000 sq m	61.8
	Subtotal		108.0
Cubao	Pedestrian Deck	530 m	37.2
	Jeepney Transit Mall	335 m	4.4
	Sidewalk & Landscape	545 m	1.0
	Station Square	6,600 sqm	185.5
	Subtotal		228.1
Masinag	Station Square	6,600 sqm	23.5
	Subtotal		23.5
Caloocan/ Monumento	Pedestrian Deck	570 m	95.4
	Station (Monumento)	30,000 sqm	1,075.0
	Station (Caloocan)	30,000 sqm	25.0
	Subtotal		1,195.4
Baclaran	Pedestrian Deck	320 m	112.2
	Jeepney Terminal	5,400 sqm	220.5
	Subtotal		498.5
Total			2,302.7

Source: MMUTIS Study Team
1/ Estimated by the MMUTIS

Figure 10.7
Proposed Development of Modal Interchange Facilities at Critical MRT/LRT Stations



3) New MRT/LRT Lines

Four new MRT/LT lines have been proposed to initiate more concrete actions during the MTDP period. They are explained as follows and shown in Figure 10.8:

MRT Line 2 Extension (Santolan-Masinag)

LRT Line 2, which is an ongoing project, has a route length of 13.9 kilometers between Old Bilibid and Santolan. The project is composed of four packages funded by OECF Japan and local GOP portions.

Top priority of the line extension is given to the Masinag Extension. The depot of the ongoing Line 2 project is located in Santolan which is the end of the track, while the route is proposed to extend to Masinag with a route length of about 4 km. Three stations will be constructed. The expected passenger catchment areas are Masinag and Antipolo, the latter now developing and expanding as a commuter town of Metro Manila and from where future passenger growth is expected.

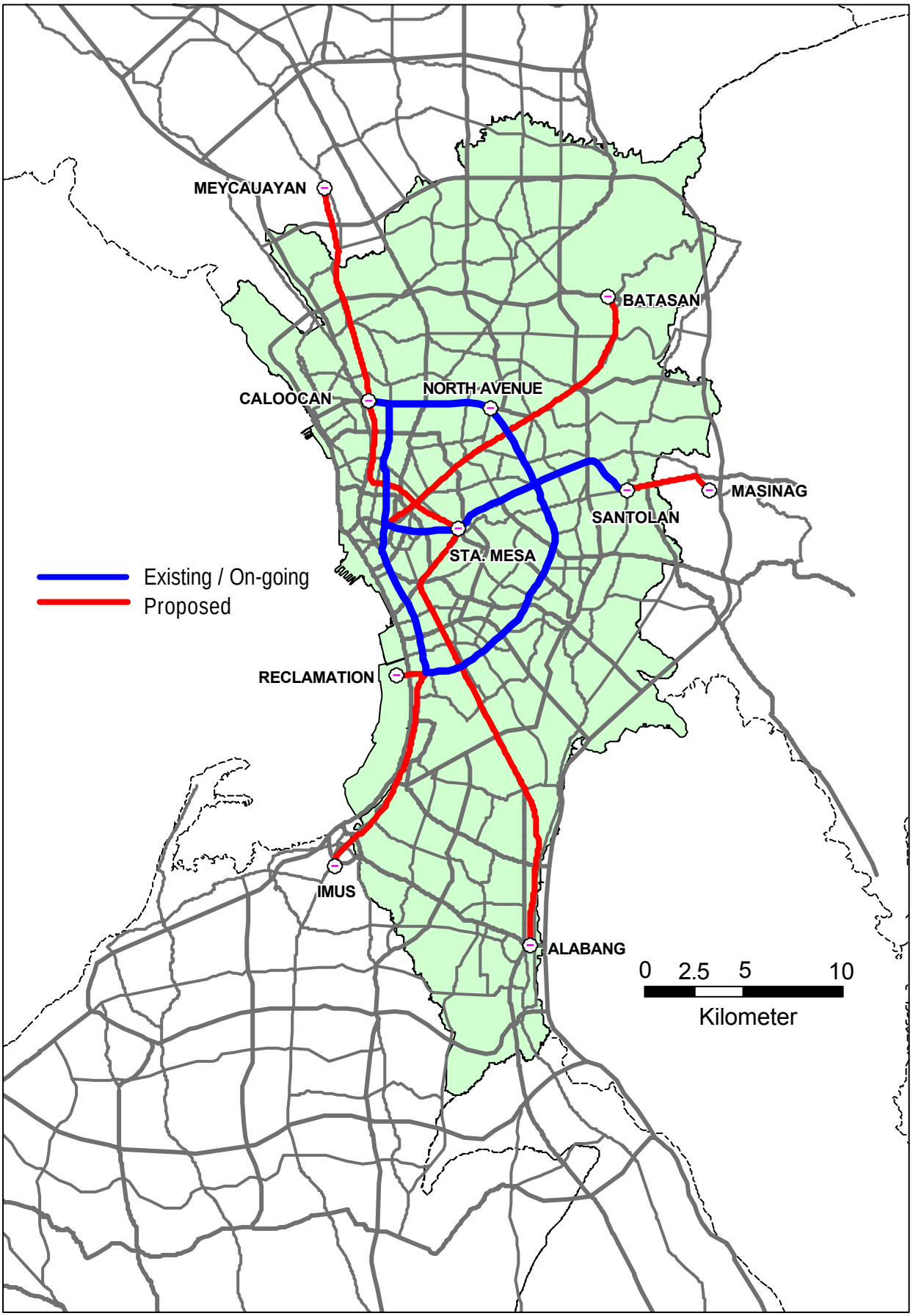
The outline of the railway systems is as follows:

Table 10.22
Technical Characteristics of Line 2 Extension

Item		Description
Permanent way	Superstructure Substructure Length Gauge Rails Sleeper Minimum curve radius Maximum gradient	Prestressed concrete box girder Spread footing and pile foundation 13.9 km 1435 mm UIC 54 kg / m rail Concrete slab track 175 m in main line, 100 m at depot 5 percent
Station	Platform length Platform width	100 meters
Electric power	Voltage Feeder system	1500 V DC Over Head Contact
Train Control		ATP, ATO, ATS
Rolling stock	Body length Total width Floor height Axle load Train consist Capacity Speed	22,500 mm 3,200 mm 3,700 mm 16.6 ton/m 4-units/train 1,660 pax/train 80 kph
Headway		2 minutes
Cost (US$ million) Estimated by MMUTIS	Infrastructure E&M Total	137 91 228

Source: MMUTIS Study Team

Figure 10.8
Railway Network (MTDP)



MRT Line 4 (Recto-Batasan)

Line 4 has a total stretch of 28 km with a spur line to San Mateo. The route alignment of the main line is along Quezon Avenue and Commonwealth Avenue to Quirino Highway, while the spur line branches off to the east at Batasan North up to San Mateo. All lines are elevated structures.

The elevated system is proposed to operate providing a capacity of 550,000 pax/day with a total number of 36 LRVs along the alignment from Old Bilibid to Quirino Highway via España, Quezon Avenue, Commonwealth Avenue, and Regalado Avenue. The elevated viaduct structure shall cross over the viaduct of MRT 3 in Diliman on the third level which is under construction along EDSA. The expressway will be constructed along almost the same alignment from Araneta Avenue toward Quirino Highway along Quezon Avenue, hence, close coordination is required in both the planning and construction stages.

The first stage of the construction will cover from Old Bilibid to UP with an approximate length of 15 km. The estimated ridership is 25,000 pax/hr per peak hour direction by the year 2000 and will increase to 35,000 by the year 2010. The total estimated project cost of Phase 1 (Old Bilibid - UP) is about ₱ 15.3 billion.

The proposed implementation of the project is composed of two phases:

Phase 1: The segment between Old Bilibid and UP (Batasan A station) with a route length of 15.1 km.
Phase 2: The segment between Batasan A and Quirino Avenue with a route length of 7.5 km.

The characteristics of the railway system are listed below.

Table 10.23
Technical Characteristics of Line 4

Item		Description
Permanent way	Superstructure Substructure Length Gauge Rails	Elevated details are unknown Ditto 23 km (15.2 km in Phase 1) 1435 mm UIC 54 kg/m
Rolling stock	Body length Total width Train consist Capacity Scheduled Speed No. of units	15,000 2,800 mm 5-unit per train 1,100 pax/train 35 kph 36 LRVs
Electric power	Voltage Feeder system	750 V DC Third rail
Headway		2.5 minutes
Cost (US$ million) Estimated by MMUTIS	Infrastructure E&M Total	453 453 906

Source: MMUTIS Study Team

MCX PNR Commuter Improvement (Caloocan-Alabang)

The PNR's south commuter line used to have a total length of 60 km of track for commuter services between Malolos and Calamba. However, PNR's railway business has tremendously depreciated recently, transporting only about 12,000 pax/day along the commuter line. The number of trains operated per day per direction is only 10-12 for commuter service and only two for long-distance service.

The ongoing improvement and modernization of the commuter line is financed by the OECF of Japan. The project involves rehabilitation of the railway between España and San Pedro including the Carmona spur line.

Meanwhile, the International Container Terminal Service Inc. (ICTSI) has rehabilitated the railroad between the North Harbor and Tayuman via the Tutuban commercial area to transport containers to its inland depot in Calamba. The ICTSI has started its container train operation.

The PNR's south commuter line is running almost parallel to the Manila South Road and Maharlika Highway. It can serve a potentially strong demand for transport because the Calabarzon area in the south, which has a total area of 46,926 sq km, is growing.

The proposed rail-based mass transport system is inevitably required to ease the present congested condition of road-based transportation and sustain the development in the south and the continuing decentralization of Metro Manila by providing punctual and safe transportation with low fare.

The technical characteristics of the railway system are as follows:

Table 10.24
Technical Characteristics of the MCX System[1/]

Item		Description
Permanent way	Track gage	1067 mm (Proposing standard gage conversion plan)
	Rails	75 lb. ASCE rails (To be welded by flash butt process to 60 meter long)
	Sleeper	Prestressed concrete ties
	Ballast	200 mm depth
Rolling stock	Speed	100 kph
Train Control	Signaling	Automatic Block Signal (ABS) System
	Control	Centralized Traffic Control (CTC) System
Cost (US$ million)	Infrastructure	675
	E&M	940
Estimated by MMUTIS	Total	1,615

Source: MMUTIS Study Team
1/ MCX: Manila Calabarzon Express

MRT Line 6

The project proposes to develop a 15-kilometer elevated MRT linkage between Line 1 in Baclaran and Imus in Cavite, which would be extended to Dasmariñas (in Cavite) in the future to provide suburban type of services toward the south of Metro Manila. The large volume of demand and long trip length require high-capacity and high-speed services on Line 6.

The Cavite area represents the highest concentration of industrial and commercial establishments, where a strong pressure of southward urbanization and industrialization is observed, so traffic congestion along the coastal road is getting worse.

Line 6 Phase 1 project has a planned capacity of 36,000 per peak hour per direction with a 2.5-minute headway operation. This will be the solution to the current heavily congested traffic along the proposed route.

The characteristics of the system are as follows:

Table 10.25
Technical Characteristics of Line 6

Item		Description
Permanent way	Structure type Track gauge Minimum curve radius Maximum gradient	See above table 1435 mm 200 m in main line, 80 m in side line
Rolling stock	Carbody length Height from top of rail Height from rail to roof Height of floor above rail Axle load Train consist Capacity Max. speed Scheduled speed	19,000 mm 3,900 mm 3,500 mm 1,100 mm 14 tons 6-unit per train, 10 trains 1,100 pax/train 80 kph 35 kph
Electric power	Voltage Feeder system	25 kV AC Overhead contact
Headway		6.0 minutes at initial stage/ 2.5 minutes
Cost (US$ million) Estimated by MMUTIS	Infrastructure E&M Total	450 450 900

Source: MMUTIS Study Team

Busways

Busways are considered an alternative and effective mass transit system to the expensive LRT under certain conditions. The MMUTIS initially identified a number of potential routes in the suburban areas in the north, east and south where ROW acquisition is relatively easy and demand level is appropriate. When busways are connected or integrated with LRT/MRT terminals, they will amplify the ridership of both systems.

10.5 Performance of the MTDP

Figures 10.9 and 10.10 show the result assignment of the MTDP in the year 2005. The analyses by area and corridor are shown in Tables 10.26-10.28.

Results show that the average VCR is in an acceptable level of 0.9, a little higher than that of 1996 as shown in Table 10.26. The increase in VCR is particularly noticeable outside Metro Manila, while in Metro Manila it remains the same. This result does not necessarily mean that MTDP projects will not be able to solve the current traffic congestion, because the 1996 VCR was calculated with the assumption that there was no construction of mega projects, which often cause traffic congestion. Furthermore, since the Cavite coastal and Laguna corridors marked lower VCRs than those of 1996, this means the railway services (MCX, Line 6) would contribute in easing the load on roads (see Tables 10.26-10.27).

In other words, the MTDP would have provided enough infrastructures that would meet the increase in future traffic demand and have improved critical corridors suffering from serious congestion. However, in case no projects supported the MTDP after it was finished, the infrastructures would be unable to meet the increased demand in 2015, and the VCR is expected to reach 1.7 as shown in Table 10.26.

Table 10.26
VCR of Roads by Area, MTDP, 2005

Zone No.	Area	Capacity		Assigned		VCR
		PCU x km (Million)	Ratio to 1996	PCU x km (Million)	Ratio to 1996	
1	W/in EDSA	12.9	1.2	10.3	1.2	0.8
2	MMNorth 1	4.7	1.5	4.2	1.6	0.9
3	MMNorth 2	8.2	1.5	6.7	1.4	0.8
4	OutNorth3	1.8	1.2	2.6	1.8	1.5
5	OutNorth4	3.3	1.0	2.9	1.8	0.9
6	OutNorth5	1.2	1.0	1.5	2.1	1.3
7	MMEast1	4.1	1.1	3.6	1.2	0.9
8	MMEast2	2.9	1.3	2.7	1.5	0.9
9	OutEast3	1.0	1.0	1.6	1.8	1.7
10	OutEast4	2.5	1.0	2.8	1.7	1.1
11	MMSouth1	3.3	1.2	2.6	1.2	0.8
12	MMSouth2	7.5	1.6	6.5	1.6	0.9
13	OutSouth3	3.8	2.9	3.4	2.3	0.9
14	OutSouth4	1.5	1.0	1.1	1.7	0.7
15	OutSouth5	1.9	1.0	2.3	1.6	1.2
16	OutSouth6	5.2	1.0	2.8	1.9	0.5
Total		65.6	1.3	57.7	1.5	0.9
(1996)		51.6	-	38.4	-	0.7
(Committed, 2005)		53.6	1.0	59.7	1.6	1.1
(MTDP, 2015)		65.6	1.3	113.0	2.9	1.7

Table 10.27
Transport Capacity and Required Capacity across Mini-Screenlines by Corridor
MTDP, 2015

Corridor/ Mini-Screeline		Demand (000) pax/day)				Required Capacity				VCR on Roads
		Rail [1] (No. of Lines)	Road			Rail [1] (No. of Lines)	Road (000 PCU/day			
			Hi-way	Express -way	Total		Hi-way	Express -way	Total	
Cavite Coastal	IS1	1.0	270	-	270	0.5	184	-	184	0.7
	OS1	-	149	-	149	-	134	-	134	0.9
	OS2	1.0	27	-	27	0.1	26	-	26	1.0
Laguna	IS2	1.0	279	148	427	0.7	253	105	359	0.8
	OS3	1.0	273	148	421	0.7	215	98	314	0.7
Rizal	IE1	-	272	-	472	-	213	-	213	0.8
	IE2	1.0	159	-	159	0.4	194	-	194	1.2
	OE	1.0	201	-	201	0.2	203	-	203	1.0
North-east	INE	1.0	77	-	77	0.6	90	-	90	1.2
	ONE	-	95	-	95	-	48	-	48	0.5
North Plateau	IN1	-	96	-	96	-	145	-	145	1.5
	ON1	-	216	-	216	-	240	-	240	1.1
North Coastal	IN2	-	0	296	296	-	0	238	238	0.8
	IN3	1.0	93	-	93	0.3	173	-	173	1.9
	ON2	-	98	-	98	-	206	-	206	2.1
EDSA	KK	2.0	156	-	156	0.5	153	-	153	1.0
	GLP	2.0	185	-	185	0.5	161	-	161	0.9
	SSH	2.0	156	-	156	0.3	138	-	138	0.9

Table 10.28
Assessment of Demand Magnitude by Corridor/Mini-Screenline
MTDP, 2015

Corridor/ Mini-Screeline		Demand (000) pax/day)				Required Capacity				VCR on Roads
		Rail	Road			Rail [1] (No. of Lines)	Road (000 PCU/day			
			Public	Private	Total		Public	Private	Total	
Cavite Coastal	IS1	416	463	294	758	0.5	28	155	184	0.7
	OS1	-	420	206	626	-	26	108	134	0.9
	OS2	111	139	33	172	0.1	8	17	26	1.0
Laguna	IS2	627	185	660	845	0.7	11	347	359	0.8
	OS3	574	175	575	751	0.7	10	303	314	0.7
Rizal	IE1	-	794	310	1105	-	49	163	213	0.8
	IE2	330	419	319	739	0.4	26	168	194	1.2
	OE	171	569	319	888	0.2	35	168	203	1.0
North-east	INE	475	350	130	480	0.6	21	68	90	1.2
	ONE	-	130	76	206	-	8	40	48	0.5
North Plateau	IN1	-	467	220	687	-	29	116	145	1.5
	ON1	-	665	377	1042	-	41	198	240	1.1
North Coastal	IN2	-	807	357	1164	-	50	188	238	0.8
	IN3	239	524	268	792	0.3	32	141	173	1.9
	ON2	-	584	323	908	-	36	170	206	2.1
EDSA	KK	427	672	211	884	0.5	42	111	153	1.0
	GLP	447	477	249	726	0.5	29	131	161	0.9
	SSH	219	426	212	639	0.3	26	112	138	0.9

1/ Capacity of railway was assumed to be 850,000 passenger per day for both directions at any cross-section.

Figure 10.9
Traffic Volume and VCR of Highways, MTDP, 2005

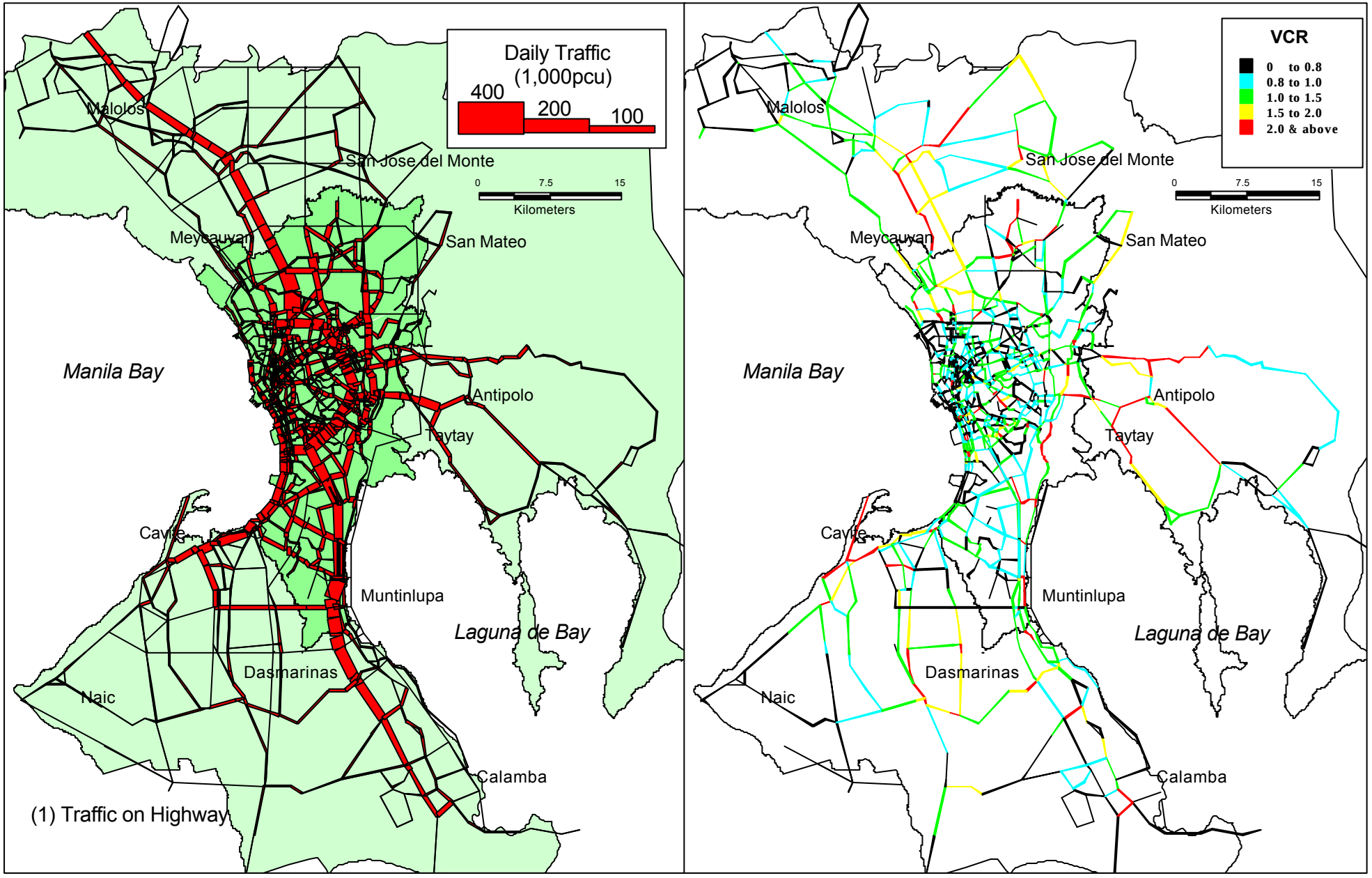
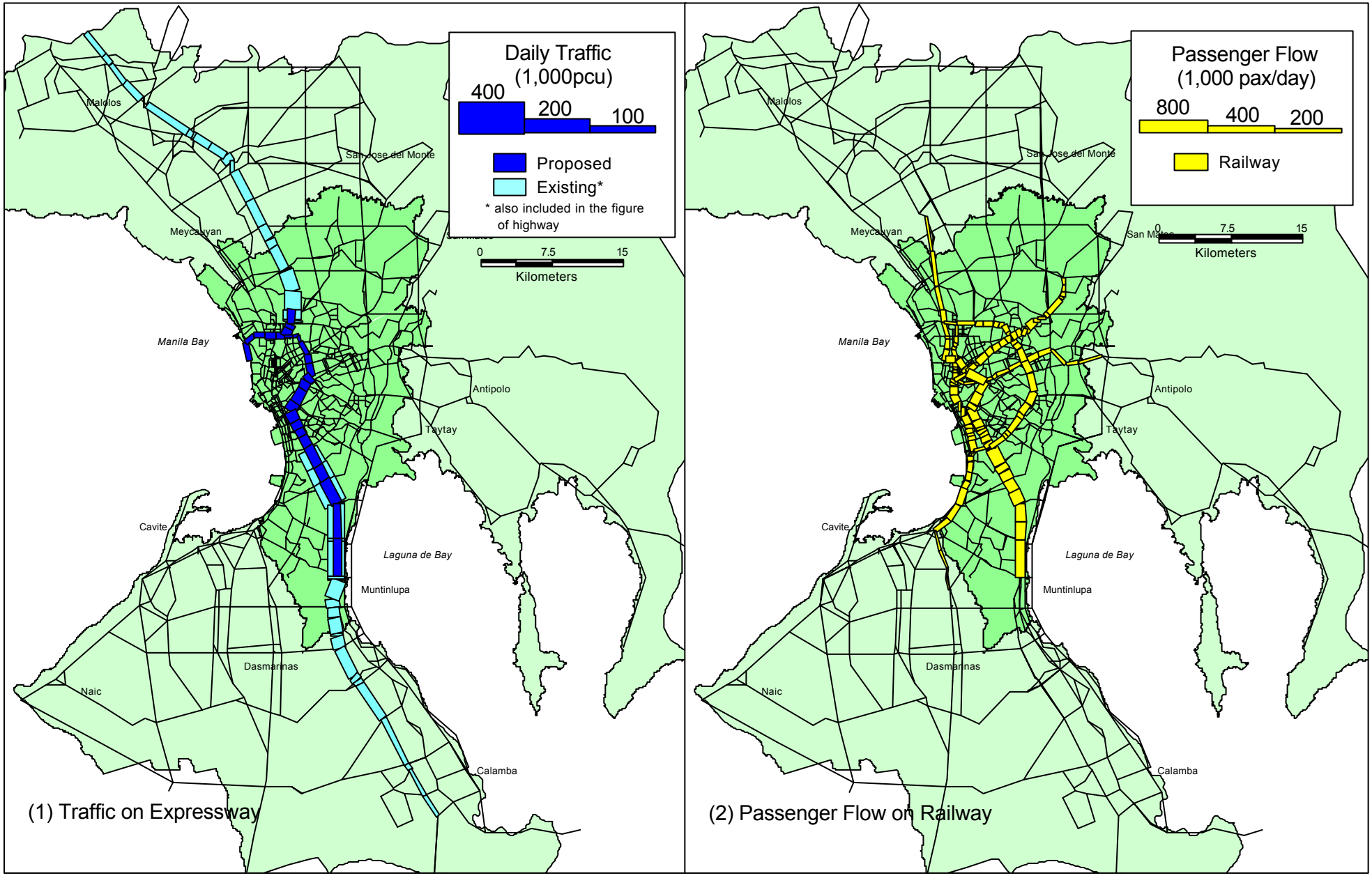


Figure 10.10
Expressway Traffic and Railway Passenger Flow, MTDP, 2005



11 PROJECT EVALUATION

11.1 Economic Evaluation

General

An economic evaluation of the major projects included in the MTDP was conducted using the same methodology used in the Master Plan (refer to Chapter 7.9). Other assumptions inherent to the MTDP project are:

1) All the projects will be implemented during the MTDP period, i.e. 1999-2004. Construction period for each proposed project depends on the project size and maturity.

2) For the determined construction period, land acquisition and compensation costs were allocated in the first year, while machinery and equipment costs, if any, were allocated in the last year. Costs of construction and civil works were distributed equally within the construction period.

3) At-grade road projects are packaged by area (north, south, east, and central), since the objective is to form a network that will serve the respective urban areas. Other rail and road projects are evaluated individually.

Evaluation Results

Table 11.1 presents the results of the economic evaluation of the proposed projects. Its benefit and cost streams are included in Appendix II-12, together with the results of the sensitivity tests. The main points are as follows:

1) All projects demonstrate relatively high economic viability, though the EIRR varies between 14.6% and 61.5%. The projects with the highest EIRR are:

   - Skyway Stages 2 and 3 which connect the north and south expressways and provide the first north-south urban axis.
   - The Southern Road Package which improves the network configuration for the southern urban area where urbanization has been actively taking place.

   The projects with relatively low EIRR are as follows:

   - MRT Extension (North Avenue-Caloocan): 14.6%
   - MRT 2 Extension (Santolan-Masinag): 19.1%
   - Central Road Package: 19.8%

2) Among the MRT projects, the MRT 4, MCX/PNR and MRT show relatively high EIRRs. However, it must be noted that the economic viability of MRT projects is highly dependent on their ridership which is in turn highly sensitive to fare structure (fare level and system including interline fare structure). The economic viability of MRT projects needs to be assessed taking into consideration their respective financial viability.

Table 11.1
Economic Evaluation of MTDP Projects

Project	EIRR (%)	BCR (%)	NPV (₱ million)
MTDP Projects	30.9	2.4	181,737
North Package (Road)	28.3	3.7	22,765
Southern Package (Road)	52.8	6.8	64,703
Central Package (Road)	19.8	1.6	4,133
Eastern Package (Road)	29.0	3.3	3,554
Skyway Stage 2 and 3	61.5	7.2	118,715
Port Access (R10/C3)	30.3	2.8	10,827
C5 North Section	30.1	3.8	28,841
MRT 2 Extension (Santolan-Masinag)	19.1	1.4	1,439
MRT 3 Extension (North Avenue-Caloocan)	14.6	1.0	234
MRT 4 Phase 1	29.7	2.3	18,977
North Rail (Meycauayan-Caloocan)	21.4	1.6	8,305
MCX/PNR Improvement (Caloocan-Alabang)	27.7	2.2	31,646
MRT 6 (Baclaran-Imus)	23.8	1.9	13,614

11.2 Financial Evaluation

General

For revenue-generating projects proposed in the MTDP (i.e., expressways and railways), a financial evaluation was carried out using discounted cash flow analysis. Major assumptions introduced were as follows:

1) Passenger time value:

   - ₱ 60/hr in 1996, ₱ 82/hr in 2005 and ₱ 100/hr in 2015 for public transport passengers
   - ₱ 170/hr in 1996, ₱ 232/hr in 2005, and ₱ 283/hr in 2015 for private vehicle users

2) Project life: 25 years
3) No. of operating days/year: 330
4) Operation/Maintenance Cost:

   - 1% per year of expressway's construction cost
   - ₱ 0.254/passenger km for railway

5) Fare/toll rates:

   - ₱ 4/km for expressways
   - ₱ 15 flat fare/trip for MRT 1, 2, 3, and 4
   - ₱ 15 plus P 1/km for North Rail, MCX/PNR and MRT 6

The fare and toll rates above were based on the results of a series of highway and transit traffic assignments. Generally speaking, the number of passengers in the traffic assignment is sensitive to the level of fare/toll, while total fare/toll revenue remains almost constant at around ₱ 10-20 flat rate. For long-distance travels in suburban railways, such as North Rail, MCX/PNR and MRT 6, fare and toll rates were based on the distance traveled.

Evaluation Results

Table 11.2 shows the results of the financial evaluation of the proposed revenue-generating projects in the MTDP. Its revenue and cost streams are presented in Appendix II-13, together with the results of the sensitivity tests.

Table 11.2
Financial Evaluation of Revenue-generating Projects in the MTDP

Project	FIRR (%)	
Skyway Stages 2 and 3	11.7	
Port Access (R10 - C3)	3.5	
MRT 2 Extension (Santolan-Masinag)	10.1	(25.7)
MRT 3 Extension (North Avenue-Caloocan)	4.8	(13.2)
MRT 4 Phase 1	9.5	(20.2)
North Rail (Meycauayan-Caloocan)	6.7	(14.1)
MCX/PNR Improvement (Caloocan-Alabang)	16.2	(30.3)
MRT 6 (Baclaran-Imus)	10.1	(20.3)

Note: Figures in parenthesis show FIRR when only M & E costs are considered.

The following can be pointed out:

1) The FIRR is not high for expressway projects, particularly the Port Access. Considering, however, their high EIRRs (refer to Table 11.1), the FIRR can be significantly improved if toll rates are set higher than assumed.

2) For railway projects, the estimated FIRRs are also moderate except for the MCX/PNR Improvement. The following measures may be needed to interest the private sector in participating in the proposed projects:

   - Public-Private Cost Sharing: If the government shoulders the cost of land acquisition/compensation and infrastructure, the financial viability of the proposed projects is largely improved as shown in Table 11.2.

   - Setting higher fare: For projects with high EIRRs but low FIRRs (e.g. MRT 4 Phase 1 and MRT 6), the latter can be improved by raising, to a certain limit, the fare levels.

11.3 Environmental Consideration

General

The Philippine environmental impact statement (EIS) system was formally established in 1978 by virtue of Presidential Decree (PD) No. 1586. Reiterating the policy statement under PD 1151, it requires environmentally critical projects (ECPs) and those in environmentally critical areas (ECAs) to submit (EIS). It provides that *"no person, partnership or corporation shall undertake or operate any such declared ECP or project within an ECA without first securing an Environmental Compliance Certificate (ECC)"*. Hence, a project that has submitted an EIS shall be issued an ECC.

The application for an ECC should follow the steps below.

1) Scoping
2) EIA Study
3) EIS Preparation
4) EIS Review and Assessment

This section describes the possible environmental impact of the ECPs proposed in the MTDP.

Road Projects

Overall results indicate that both positive and negative impacts are concentrated on the socio-environment sphere (see Table 11.3). Although the proposed developments are expected to improve the traffic situation in Metro Manila, they will create considerable amount of resettlement due to right-of-way acquisition. A comprehensive relocation policy and methodology must be formulated to implement these projects in a limited period. However, since project locations are diverse, each project would have some particular requirements. Another aspect to be considered is the possibility of physically dividing a community with the construction of wide arterial roads. This impact can and should be mitigated by providing a pedestrian deck in appropriate locations.

Pollution and the impact on the natural environment are generally low. Although it is expected that soil or groundwater contamination/pollution may occur, the experience in Metro Manila shows that no serious soil erosion or water contamination is caused by road construction. Air pollution, noise and vibration that usually accompany construction of new roads will occur. These will be higher when building new roads but lower if improving intersections only.

Table 11.3
Assessment of the Possible Environmental Impact of MTDP Projects

No.	Environmental Items	Northern Package			Central Package								Eastern Package			Southern Package					Others			Expressways	
		PN3	SM13	SM14	SM1	SM2	SM3	SM4	SM5	SM6	SM17	GS1-5	SM18	SM20	GS7-8	PS1	PS3	PE1	SM21	GS6	REF	C5N	AAI	MMS	R10C3
Socio-environment																									
1	Resettlement	B-	B-	B-	B-	B-	A-	A-	B-	A-	A-	C-	A-	B-	C-	B-	B-	B-	B-	C-	C-	B-	C-	C-	C-
2	Economic Activities	A+	A+	A+	B+	B+	B+	B+	B+	B+	B+	C+	B+	B+	C+	A+	A+	A-	B+	C+	B+	B+	C+	C+	C+
3	Traffic / Public Facilities	A+	A+	A+	B+	B+	B+	B+	B+	B+	B+	A+	B+	B+	A+	A+	B+	B+	B+	A+	A+	B+	A+	A+	B+
4	Split of Community	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	C-	B-	B-	C-	B-	B-	B-	B-	C-	C-	B-	---	---	---
5	Cultural Property	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	---	---	---
6	Water Right / Right of Common	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-
7	Public Health	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-
8	Waste	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-
9	Hazard (Risk)	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-
Natural Environment																									
10	Topography/Geology	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	C-	B-	B-	C-	B-	B-	B-	B-	C-	B-	B-	C-	C-	C-
11	Soil Erosion	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	C-	B-	B-	C-	B-	B-	B-	B-	C-	B-	B-	C-	C-	C-
12	Groundwater	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-
13	Hydrology	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-
14	Coastal Zone	---	---	---	C-	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	C-
15	Fauna/Flora	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	---	---	---
16	Meteorology	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
17	Landscape	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-
Pollution																									
18	Air Pollution	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-
19	Water Pollution	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-
20	Soil Contamination	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-
21	Noise and Vibration	B-	B-	B-	B-	B-	B-	B-	B-	B-	B-	C-	B-	B-	C-	B-	B-	B-	B-	C-	B-	B-	C-	C-	C-
22	Land Depression	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-
23	Offensive Odor	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-

Note: Evaluation Grade

A+: Significantly Positive Impact
B+: Moderately Positive Impact
C+: Negligible Positive Impact
A-: Significantly Negative Impact
B-: Moderately Negative Impact
C-: Negligible Negative Impact

Abbreviations:

REF: Road Environment Facilities
C5N: C-5 North Section
AAI: Airport Access Improvement
MMS: Metro Manila Survey
R10C3: R-10/C-3 Expressway

Rail Projects

Results of the preliminary assessment of the environmental impact of the proposed MRT projects are shown in Table 11.4. In the socio-economic sector, a significant negative impact will be expected in resettling squatters in Line 6 and MCX project areas. The development of MRT projects, however, is expected to stimulate economic activities along these corridors.

There will be no significant negative impact on the natural environment, since no proposed line will pass through reservation areas, only the ROW of existing or planned roads. A rail transport system is expected to reduce air pollution, since it counters the demand for a number of road vehicles. However, major terminals and depots should be maintained to contain water pollution, noise and vibration.

Negative impacts are also expected during the construction stage of the projects and may require proper traffic management and operation of construction vehicles.

MRT Modal Interchange Facilities

The environmental impact of the proposed terminals will be negligible on the whole. No natural environment will be affected. Although air pollution, noise and vibration will occur due to increased traffic demand at terminals, the impact will be insignificant. Furthermore, appropriate traffic measures will be applied (see Table11.5).

The negative impact on public health and safety due to waste and construction hazards will occur in the construction stage. The impact will be remarkable in highly dense and developed areas. Hence, construction methods and management should be examined carefully to minimize the adverse effects.

Some adverse impact will also be expected on the socio-economic sphere. The most significant will be the squatter problems, particularly in Recto, where squatters have occupied more than 20,000 sq m of land around the old prison building. The squatters here are involved in small commercial activities such as selling food and small items. The government should also help them maintain their source of income.

Developing terminals generally effects a significant positive economic impact on subject areas because commercial activities will develop to cater to the passenger flow. Conversely, it will decrease the economic activities in areas where business and trade have depended on passenger flow. This may happen in Baclaran.

Table 11.4
Assessment of the Possible Environmental Impact of MTDP MRT Projects

		Line 2 Extension	Line 3 Extension	Line 4 Phase 1	Line 6	MCX PNR Improv't.	North Rail
Socio-environment							
1	Resettlement	C-	C-	B-	A+	A-	B-
2	Economic activities	B+	B+	A+	A+	A+	A+
3	Traffic/Public facilities	B+	B+	A+	A+	A+	B+
4	Split of community	C-	C-	C-	B-	C-	C-
5	Cultural property	D	D	D	D	D	D
6	Water right/Right of Common	D	D	D	D	D	D
7	Public health	C-	C-	B-	B	B-	C-
8	Waste	B-	B-	B-	B	B-	B-
9	Hazards (Risks)	C-	C-	C-	C-	C-	C-
Natural Environment							
10	Topography/Geology	D	D	D	D	D	D
11	Soil erosion	D	D	D	D	D	D
12	Ground water	C-	C-	C-	C-	C-	C-
13	Hydrology	D	D	D	D	D	D
14	Coastal zone	D	D	D	D	D	D
15	Fauna/Flora	D	D	D	D	D	D
16	Meteorology	D	D	D	D	D	D
17	Landscape	C-	C-	C-	C-	C-	C-
Pollution							
18	Air pollution	D (B-)	D (B-)	D (B-)	D (B-)	C (B-)	C (B-)
19	Water pollution	B- (B-)	B- (B-)	B- (B-)	B- (B-)	B- (B-)	B- (B-)
20	Soil contamination	D	B- (B-)	B- (B-)	B- (B-)	B- (B-)	B- (B-)
21	Noise and vibration	B- (B-)	C- (C-)	B- (B-)	B- (B-)	B- (B-)	B- (B-)
22	Land depression	D	C- (C-)	D	C- (C-)	C- (C-)	C- (C-)
23	Offensive odor	D (C-)	D (C-)	D (C-)	D (C-)	D (C-)	D (C-)

Note: Evaluation Grade

A	:	Serious impact is expected.	A+	:	Significantly Positive Impact	A-	: Significantly Negative Impact
B	:	Some impact is expected.	B+	:	Moderately Positive Impact	B-	: Moderately Negative Impact
C	:	Extent of impact is unknown. (Examination is needed. Impacts may become clear as study progresses.)	C+	:	Negligible Positive Impact	C-	: Negligible Negative Impact
D	:	No impact is expected.					

Assets enclosed in parenthesis are under the construction phase.

Table 11.5
Assessment of the Possible Environmental Impact
of the Proposed Modal Interchange Developments

No.	Environmental Items	Recto	Cubao	Masinag	Baclaran	Caloocan/ Monumento
Social Environment						
1.	Resettlement	A-	C-	D	D	B-
2.	Economic activities	A+	B+	B+	B-	A+
3.	Traffic / Public facilities	A+	A+	A+	A+	A+
4.	Split of Community	D	D	D	D	D
5.	Cultural property	D	D	D	D	D
6.	Water rights/Right of common	D	D	D	D	D
7.	Public health	C-	C-	C-	B-	C
8.	Waste	B-	B-	C-	B-	C
9.	Hazards (Risks)	C-	C-	C-	C-	C
Natural Environment						
10.	Topography/Geology	D	D	D	D	D
11.	Soil erosion	D	D	D	D	D
12.	Ground water	D	D	D	D	D
13.	Hydrology	D	D	D	D	D
14.	Coastal zone	D	D	D	D	D
15.	Fauna / flora	D	D	D	D	D
16.	Meteorology	D	D	D	D	D
17.	Landscape	D	D	D	D	D
Pollution						
18.	Air pollution	C+	C+	C-	C+	C+
19.	Water pollution	D	D	-	D	D
20	Soil contamination	D	D	C-	D	D
21.	Noise and vibration	C-	C-	B-	C-	C-
22.	Land subsidence	D	D	D	D	D
23.	Offensive odor	D	D	B-	C-	D

A+ : Significant Positive Impact
B+ : Moderately Positive Impact
C+ : Negligible Positive Impact
D : No Expected Impact
A- : Significant Negative Impact
B- : Moderately Negative Impact
C- : Negligible Negative Impact

12 IMPLEMENTATION PLAN

12.1 Funding

ODA and the private sector are the primary sources of funding for public infrastructure projects, but both require counterpart local funds. While traffic management, low-cost measures and at-grade primary and secondary roads mostly require public funds, expressways and the MRT/LRT/busway could attract private support. If they are properly handled, capital and operation costs which the government normally shoulders can substantially be reduced. Moreover, if land acquisition is minimal, 80% of construction costs can be shouldered by the private sector on a BOT basis. However, if the government shoulders the infrastructure cost of building a mass rail transit, the system can be operated by the private sector on a BOT basis.

12.2 Investment Plan

The investment schedule is shown in Table 12.1. Table 12.2 shows the detailed cost allocation plan for road projects proposed in the MTDP.

Table 12.1
MTDP Cost Allocation Plan

		Project/Project Package	Cost to Govt.		Cost Allocation for Mid-term Plan Period					
			Total (₱ bil)	MTDP (₱ bil)	1999	2000	2001	2002	2003	2004
1. Commited										
1.1 BOT	1)	LRT 3	Rental	18.0		2.0	4.0	4.0	4.0	4.0
	2)	Skyway (Stage I)	4.0	2.0	1.0	1.0				
	3)	C-5 South Section	1.1	0.5	0.2	0.3				
1.2 IFI Loans (committed)	4)	LRT 1 Capacity Expansion, OECF (revenue surplus)	6.3	-10.8	-1.2	-1.2	-1.2	-1.2	-3.0	-3.0
	5)	LRT 2, OECF	27.4	21.0	6.0	6.0	5.0	4.0		
	6)	Interchange (3 nos.), OECF	1.5	1.5	0.1	0.6	0.6	0.2		
	7)	TEAM 4, AusAid	1.6	0.9	0.4	0.5				
(almost committed)	8)	ADB Air Quality Improvement	18.6	18.6	3.7	3.8	3.7	3.7	3.7	
	9)	World Bank LIL	5.0	5.0	2.0	2.0	1.0			
	10)	World Bank MMURTRIP (Priority 1 & 2)	7.9	7.9	0.1	1.5	2.3	2.3	1.7	
	11)	OECF Interchanges (4 nos.)	1.2	1.2			0.4	0.4	0.4	
	12)	PNR Commuter Improvement: North Rail I	14.0	(8.4)			(1.4)	(1.4)	(2.8)	(2.8)
	13)	MRT Line 3 Extension (Monumento/Caloocan)	7.6	(3.8)				(0.8)	(1.5)	(1.5)
1.3 Government-funded	14)	Primary & Secondary Roads/Flyovers	2.8	2.8	0.7	0.7	0.7	0.7		
Subtotal			**99.0**	**68.6**	13.0	17.2	16.5	14.1	6.8	1.0
2. MMUTIS Strategy										
2.1 Management/	1)	MMURTRIP 2	5.0	5.0				1.0	2.0	2.0
Low-cost Measures	2)	TEAM 5	2.0	2.0				0.4	0.8	0.8
	3)	Provincial TEAM (South, North, East)	2.0	1.2				0.4	0.4	0.4
2.2 Roads: Primary and	1)	Northern Package	10.6	7.1			1.0	1.8	1.8	2.5
Secondary Arteries	2)	Southern Package	13.7	10.6		0.1	1.2	3.2	3.8	2.3
	3)	Central Package	10.8	8.3		0.7	1.7	2.4	1.4	2.1
	4)	Eastern Package	3.6	3.4		0.2	0.7	1.4	0.9	0.2
	5)	Road Environmental Facilities	2.0	2.0		0.4	0.4	0.4	0.4	0.4
Expressway (BOT)	6)	Expressway, N-S Link (Skyway Stage 2 & 3)	8.1	4.8			0.8	0.8	1.6	1.6
	7)	Expressway, Port Access (R-10/C-3)	2.5	1.5			0.2	0.3	0.5	0.5
	8)	C-5 North Section	2.8	2.0		0.3	0.3	0.3	0.5	0.6
2.3 Airport Access	1)	Skyway I.C., Nichols Improvement, etc.	0.7	0.7		0.1	0.1	0.2	0.2	0.1
2.4 Public Transport	1)	MRT Integration	2.3	2.3		0.3	1.0	1.0		
	2)	MRT Modal Interchange Facilities	2.3	1.1		0.2	0.2	0.2	0.2	0.3
MRT (BOT)	3)	MRT Line 2 Extension (Masinag)	5.5	1.6					0.5	1.1
	4)	MRT Line 4 (Recto-Batasan) Phase I	18.1	(10.6)				(2.2)	(4.2)	(4.2)
	5)	MRT Line 6 (Baclaran-Imus) Phase I	18.0	(9.0)				(2.0)	(3.5)	(3.5)
	6)	PNR Commuter Improvement: MCX	27.0	(27.0)				(9.0)	(9.0)	(9.0)
Subtotal			**137.0**	**53.6**	0.0	2.3	7.6	13.8	15.0	14.9
Total			**236.0**	**122.2**	13.0	19.5	24.1	27.9	21.8	15.9

Table 12.2
Detailed MTDP Cost Allocation Plan for Road Projects

Package	Code	Name	Length (km)	Project Cost (₱ mil)	Cost to Govt. 1/ (₱ mil)	Cost Allocation for Mid-term Plan Period						(overflow)	
						1999	2000	2001	2002	2003	2004	(2005)	2006-
Northern Package	PN3	North Central Road (Quirino Hwy- SM16)	11.0	8,087	8,087			809	1,617	1,617	1,617	2426.1	
	SM13	Don M. Marcos Ave. Ext. to N. Central Rd.	4.5	2,116	2,116					212	846	1058	
	SM14	Quirino Hwy Novaliches Bypass	1.5	418	418		42	167	209				
Subtotal			**17.0**	**10,621**	**10,621**	0	42	976	1,826	1,829	2,464	3,484	0
Central Package	SM1	Aurora Ave. Ext. to R-10	2.5	1,727	1,727		173	691	864				
	SM2	A.M. Maceda & Ext. to Aurora Blvd.	3.5	838	838		84	335	419				
	SM3	F. Martinez Ext. to Ortigas Ave.	1.7	523	523		52	209	262				
	SM4	SLE Ext. (Pres. Quirino-J.P. Laurel)	1.8	2,709	2,709					271	1,084	1,355	
	SM5	Gilmore Ave. Ext. to Roosevelt	1.5	1,062	1,062			106	425	531			
	SM6	Victoneta Ave. Ext. to Congressional Ave.	2.5	865	865					87	346	433	
	SM17	Kalayaan Ave. Ext. to 20th Ave.	1.0	725	725					73	290	363	
	GS1-5	Primary/Primary Grade Separation Projects	---	2,400	2,400		401	401	401	401	401	396	
Subtotal			**14.5**	**10,849**	**10,849**	0	710	1,742	2,370	1,362	2,120	2,546	0
Southern Package	PS1	Talaba-Kawit Road	6.0	1,496	1,496					150	598	748	
	PS3	Kawit-Bucandala Road	5.5	1,052	1,052					105	421	526	
	PE1	Bucandala-Muntinglupa Road	16.0	5,450	5,450			545	1,090	1,090	1,090	1,635	
	SM21	Pasay Road Ext. (Lawton-Gen. Santos)	5.5	4,805	4,805			481	1,922	2,403			
	GS6	Primary/Primary Grade Separation Projects	---	480	480					48	192	240	
	---	New Link for Subdivision Road Openeing	22.2	429	429		143	143	143				
Subtotal			**55.2**	**13,712**	**13,712**	0	143	1,169	3,155	3,795	2,301	3,149	0
Eastern Package	SM18	New Marikina Road	3.2	1,242	1,242			124	497	621			
	SM20	Col. B. Serrano Ave. Ext. to Marcos Hwy	2.0	1,438	1,438		144	575	719				
	GS7, 8	Primary/Primary Grade Separation Projects	---	960	960			48	192	288	192	240	
Subtotal			**5.2**	**3,640**	**3,640**	0	144	747	1,408	909	192	240	0
Others	---	Road Environmental Facilities	50.0	2,000	2,000		400	400	400	400	400		
	---	C-5 North Section	15.0	14,100	2,820		282	282	282	564	564	846	
	---	Airport Access Improvement Projects	---	2,148	690		104	104	190	190	104		
Subtotal			**65.0**	**18,248**	**5,510**	0	786	786	872	1,154	1,068	846	0
Expressway	XMMS	Metro Manila Skyway (Stages+C64 2 & 3)	23.8	40,400	8,080			808	808	1,616	1,616	1,616	1,616
	XR10C3	R-10/C-3 Expressway	7.5	12,700	2,540			254	254	508	508	508	508
Subtotal			**31.3**	**53,100**	**10,620**	0	0	1,062	1,062	2,124	2,124	2,124	2,124
Mid-term Grand Total			**53.5**	**91,922**	**54,953**	0	1,824	6,482	10,693	11,173	10,269	12,389	2,124
Percentage of each year						0.0%	3.3%	11.8%	19.5%	20.3%	18.7%	22.5%	3.9%

1/ The cost allocation between private and public sectors is assumed to be 80% and 20%, respectively, for anticipated BOT projects.

13 OVERVIEW

13.1 Background

Current State of Urban and Transportation Planning

Large-scale urban and transportation planning is costly to undertake. In other developing economies, such studies are usually done with outside technical assistance and funding sourced largely through the ODA and the like.

In Metro Manila, beneficiary agencies attempt to establish their own databases for their planning projects. It is, however, expensive and time-consuming given the number of such planning projects.

Necessity of Urban Transport Database

A reliable database is an essential input to urban transportation planning, especially in large urban areas, such as Metro Manila, where traffic movements are complex and interactions among different transport modes and land uses exist. Without an adequate database and analytical tools that can handle large amounts of different data, planning cannot be done scientifically. The lack of proper database for common use by different projects or for different planning purposes always makes sound decision-making difficult and tends to invite arbitrary political intervention.

At present, there is no existing comprehensive database being used as a unified basis for transport planning in Metro Manila. This clearly undermines the inter-relationship between urban and transportation systems. It does not promote coherence and integration of different planning activities. There is a need, therefore, to establish a common database that can be used as a firm basis for planning in Metro Manila.

MMUTIS

The MMUTIS is a three-year transportation planning project for Metro Manila which started in July 1996 and was completed in early 1999. It was conducted by the DOTC and the MMUTIS Study Team with technical assistance provided by the Japan International Cooperation Agency (JICA). A counterpart study team was composed of key representatives from the DOTC, DPWH, MMDA, NCTS, and other government agencies.

The MMUTIS has produced a variety of transportation and traffic data, as well as land use, socio-economic and environmental information based on numerous surveys. The database comprises primary data, secondary data which were compiled or expanded from the primary data, and tertiary data which were forecast based on selected development scenarios. Undoubtedly, the MMUTIS database covers a larger study area and a wider scope compared to other existing transportation databases on Metro Manila.

The database was utilized in the course of the study's planning stages. However, it is also expected to be used in subsequent studies and planning activities. Similar to the JUMSUT (1983-1985) database which was utilized for about 12 years, the MMUTIS database would be a valuable data source.

In December 1997, the MMUTIS Steering Committee identified the UP NCTS as the central repository of the MMUTIS database. The MMUTIS database has already been transferred to the NCTS.

13.2 Approach for MMUTIS Database Formulation

Identification of Agency Needs

The actual implementation and operation of the planning database relies mainly on specific concerns and data needs of the agency that will access or utilize the database. The table below shows a matrix of data requirements for each concerned key agency.

Table 13.1
Data Requirements by Agency

DOTC	DPWH	MMDA	NEDA
-Road network data -Road inventory data -Socio-economic data -OD data -Public transport data -Car ownership -Commodity flow -Ongoing projects -Urban/Transport GIS	-Road network data -Road inventory data -Traffic data -Infrastructure data -OD data -Public transport data -Traffic accidents -Highway capacity -Vehicle characteristics -Ongoing projects	-Road network data -Facility inventory -Land-use GIS -Traffic data -Accident data -Building data -Car registration -Traffic management -Ongoing projects	-Socio-economic data -Land-use data -Car ownership -Infrastructure data -Ongoing projects

Source: MMUTIS Study Team

The above table demonstrates that while a particular data may be of interest to most agencies, it may not be of importance to another.

Basic Directions for Database Development

In order that the MMUTIS database can be effectively utilized by various agencies and planning bodies and be properly managed over the years, the following have to be duly considered:

1) Items and coverage of data should meet the needs of relevant agencies for actual planning;

2) The MMUTIS database should basically cover the data items of the JUMSUT database to make historical comparison possible;

3) Access and use of the database should be easy, with a simple and clear structure, easy data search and retrieval, direct access through computer

network, availability of optional output forms such as lists, maps, prints, floppy disks, etc. It should also be readable using current software;

4) Management of the MMUTIS database should be within the existing administrative framework; and

5) Updating of the database should be done periodically to maintain its sustainability, particularly in relation to the data that determines responsibility.

14 MMUTIS TRANSPORT SURVEYS

14.1 MMUTIS Surveys

During the course of the study from 1996 to 1998, the MMUTIS conducted a series of field surveys, as listed below.

Table 14.1
Outline of Transportation Surveys Conducted for the MMUTIS

No.	Survey	Objective	Coverage	Method
1	Person-trip Survey	• Socio-economic profile of residents • Trip information of residents	• 235,000 samples in Metro Manila (2.5%) • 39,000 samples in adjoining areas (0.8%)	• Direct interview with household head/members
2	Cordonline Survey	• Traffic volume on cordonlines • Socio-economic profile and trip information of residents outside the Study Area	• 19 stations on Metro Manila's boundary • 14 stations on the Study Area boundary	• 16- or 24-hour traffic count and vehicle occupancy survey with 16-hour roadside direct interview survey
3	Screenline Survey	• Traffic volume of screenlines	• 37 stations along the Pasig River, San Juan River, and PNR	• 16- or 24-hour traffic count and vehicle occupancy survey
4	Public Transport Operation/ Utilization Characteristics Survey	• Operation and utilization characteristics of bus and jeepney	• Representative routes: jeepney (102), bus (45), time periods: morning/evening peak, interpeak	• On-board observation to obtain no. of passengers boarding/alighting and arrival and departure time by stop
5	Public Transport Passenger Interview Survey	• Transfer characteristics • Time value and willingness-to-pay attitude	• Selected major terminals: jeepney (12), bus (8), LRT (5)	• 16-hour direct interview with passengers
6	Bus/Jeepney/ Tricycle Terminal Survey	• Route identification • Service frequencies	• All operating routes • All terminal locations/characteristics • Service frequencies at major terminals: jeepney (83), bus (30)	• Route reconnaissance • Terminal location/ characteristics survey • 8- or 16-hour service frequency count survey
7	Parking Survey	• Parking capacity • Service frequency	• On-road parking on all roads in Metro Manila • Off-street parking spaces in the CBD	• Parking inventory survey • 16-hour number plate survey • 16-hour direct interview with off-road parking users
8	Travel Speed Survey	• Travel speed on major road sections	• 15 major routes, time periods: morning/evening peak, interpeak	• Floating car method • 3 round trips by time period by route
9	Truck Survey	• Approximate goods flow characteristics	• 7 cordonline stations on Metro Manila boundary • 8 gates of Manila Port	• 16-hour traffic count and roadside interview with truck driver

Cont. Table 13.1

No.	Survey	Objective	Coverage	Method
10	Bus/Jeepney/ Tricycle/Taxi Driver Interview Survey	• Working condition of drivers and operational characteristics	• 10 terminals for each mode	• Direct interview with jeepney/bus/ tricycle/taxi drivers
11	Airport Survey	• Characteristics of NAIA-related traffic	• NAIA (Ninoy Aquino International Airport) • Domestic terminal • Cargo terminal	• Airport employee survey • 24-hour traffic count and vehicle occupancy survey at all gates • 24-hour direct interview with passengers, well-wishers/visitors
12	Bus/Jeepney Operator Survey	• Characteristics of bus/jeepney industry	• Public transport operators: bus (51), jeepney (49+18)	• Direct interview with operators
13	Garbage Truck Movement Survey	• Traffic volume, vehicle type, loading volume, and service area of garbage trucks	• 5 major dump sites of Metro Manila	• one-week continuous observation
14	Willingness-to-Pay Survey	• Willingness-to-pay attitude and value of time	• 6 public transport mode and private car • Major terminal areas for public transport, and EDSA, SLE, and NLE for private car • 1,000 samples per mode (total of 7,000)	• Direct interview with passenger/ driver
15	Water Transport Demand Survey	• Socio-economic characteristics of river ferry passengers • Opinions/Preferences on river ferry	• 600 river ferries, 400 bancas, 1800 jeepneys, and 600 bus passengers	• Direct interview with passengers at selected terminals/ routes
16	Traffic Accident Survey	• Traffic accident records • Procedure of accident data	• 18 police districts • 3,200 accident files in 1997	• Collection of records • Interview with investigators
17	Road Inventory Survey	• Basic planning information by road section	• All major roads in the study area	• Observation and measurement if necessary
18	Subdivision Road Inventory Survey	• Basic planning information of selected roads in selected subdivisions	• 24 subdivisions/ areas	• Observation and measurement of roads
19	Land-use Survey	• Updating present land-use map	• Metro Manila (detailed) • Study Area (general classification)	• Observation
20	Road Environmental Survey	• Environmental quality of MMUTIS Study Area	• 14 selected points in the Study Area • Air pollution (NOx, CO, SO_2,, SPM, and Pb) and noise level coupled with meteorological and traffic data	• Direct measurement and analysis in laboratory

Of all these surveys, the most important is the person-trip survey conducted in 1996. The number of samples was 274,000 persons, and the results provided the core of the MMUTIS database. The results of other surveys, all of which have been effectively utilized in the study's planning activities, also form an integral part of the database.

The major surveys are briefly explained in the next sections.

14.2 Person-trip Survey

Objective

The primary objective of the person-trip survey (otherwise known as the Household Interview Survey or HIS) is to acquire information on the travel and socio-economic characteristics of the residents of the Study Area.

Methodology

Sampling

At the onset of the survey, the 1990 NSO Census of Population was used in deriving the number of household samples in every barangay. The sampling was later updated using the 1995 NSO Census, which was made available only before the implementation of the survey. For Metro Manila, a sampling rate of 2.5% was used while for the adjoining areas, it was 0.8%.

The exact number of households, as calculated per barangay in Metro Manila, was sampled by the interviewers, while those in the adjoining areas underwent the following modifications:

1) Barangays within the same zone and with less than 10 samples were merged (to reach a total of at least 10 households) when these barangays showed similar characteristics in terms of density, type of dwelling places and economic activity (farming village, fishing village, etc.).

2) Barangays deemed hazardous to the surveyors were not covered. Samples intended for these barangays were added to the sample of nearby ones.

3) Barangays inaccessible by public transportation (e.g., barangays located near or in the mountains) were not covered. Samples intended for these barangays were added to the sample of a nearby barangay.

Samples for each barangay were, as much as possible, taken from at least three different streets. This is true in most areas except in the City of Manila where some barangays would only be composed of two streets. All the names of the streets in every barangay were predetermined based on available maps and listed by area coordinators at the survey office. The streets to be sampled were then randomly selected from the list and verified by area coordinators on the field. The final list was then given to field supervisors to survey.

The first house to be sampled on the selected street was randomly picked (either the first, second or third house). Succeeding samples were selected based on the density of the area. Low-density areas (with lot areas of more than 500 sq m) were sampled at an interval of three houses, while high-density areas with lot areas of less than 500 sq m) were sampled at an interval of six houses.

To replace households that for some reason refused to be interviewed, the next interval house was sampled.

Field Survey Proper

The following procedures were adopted for the field survey proper:

1) A survey office was established as headquarters of all HIS-related activities.

2) Recruitment and selection of interviewers were done based on the following requirements:

   - Residents of the sample area (i.e., from Metro Manila and adjoining municipalities);
   - Preferably college graduates; and
   - As much as possible, a survey team must be composed of 50% males and 50% females.

3) A survey team was composed of 10 interviewers under one supervisor.

4) There were eight area coordinators for the eight study areas. Four coordinators were assigned to cover areas outside Metro Manila, each having four supervisors. The other four coordinators were assigned within the metropolis, each having eight supervisors divided into two batches of four.

5) The supervisors and interviewers were provided with manuals during the training. These contained all instructions related to the field survey, i.e., how to proceed with the interview and how to coordinate with their team and the HIS office.

6) Deployment of the interviewers was done in two batches. The first batch of surveyors (four teams in each area) was deployed on August 10, 1996. The second batch of interviewers for Areas 1 and 4 in Metro Manila was deployed on August 31, 1996, while the second batch for Areas 2 and 3 was deployed on September 7, 1996.

7) Two dry-runs were done to test the interviewers' understanding of the survey forms and to familiarize them on the conditions in the survey areas. The first dry-run involved a sampling of friends and neighbors for each interviewer. The second dry-run was held in the actual area of coverage assigned to the interviewers.

8) Male-female pairing of interviewers was followed for each team. The interviewers were provided with survey uniforms (white shirt with blue collar/cuffs and the words "DOTC-JICA MMUTIS HIS Surveyor" printed on the

shirt). They were also provided with identification cards and were required to wear their uniform and ID while on field.

9) Duly signed letters were provided the supervisors to coordinate with barangay captains. In some instances, the supervisors were also provided with letters addressed to various homeowner associations of private subdivisions.

10) To better monitor the progress of the survey and smoothen the flow of reports from the field to the HIS survey office, a field progress reporting flow was established, shown in Figure 14.1.

Survey Forms

The survey was carried out by sending the interviewers to sample households in the Study Area. The survey forms used in the survey were as follows:

1) Form 1: Household Information

   covers the socio-economic characteristics of household members, household structure, car ownership, income level, location of residence, and number of years in said residence, etc.

2) Form 2: Household Member Information

   covers the socio-economic characteristics of household members four years old and above. These include age, sex, occupation, work and/or school address, among others.

3) Form 3: Trip Information

   covers the characteristics of trips made by household members. These include origin and destination, trip purpose, travel mode, transfer point, departure and time of arrival, etc.

4) Form 4: Information on Vehicle Use

   covers vehicle-use patterns during the implementation of the Unified Vehicular Volume Reduction Program (UVVRP) as well as parking practices.

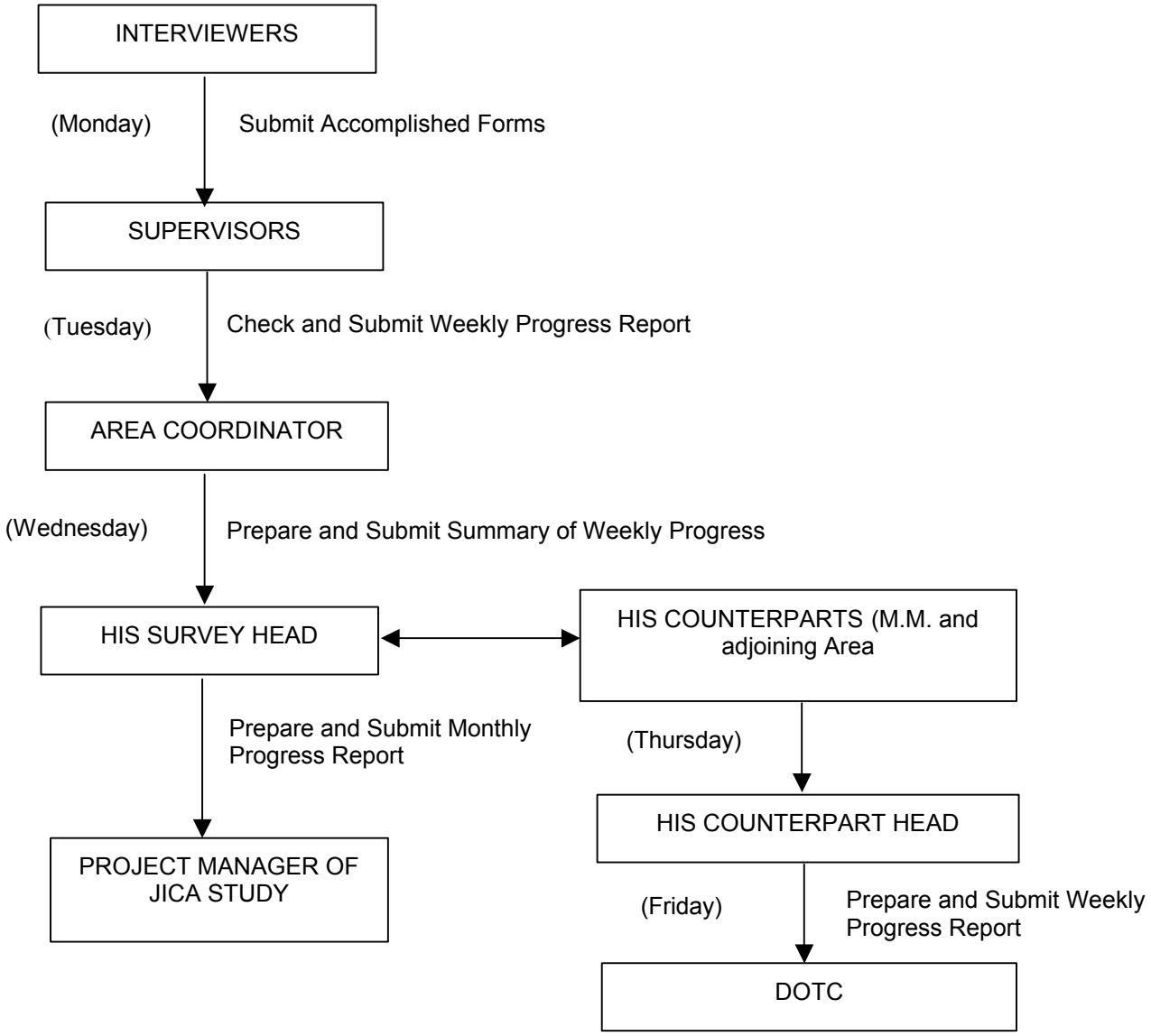
5) Form 5: Information on the Specially Abled and Elderly

   covers trip patterns of the specially abled and elderly (70 years old and above).

6) Form 6: Environmental and Leisure Information

   covers characteristics of leisure trips of household members as well as their positions on environmental issues. These include awareness, views for improvement and willingness to contribute to environmental conservation.

Figure 14.1
Procedure of HIS Field Progress Reporting



Zoning System

In the MMUTIP and JUMSUT, Metro Manila was divided into 202 zones, and the external areas into 15 zones. Although this was the finest zoning system then, various aggregated zoning systems (e.g., 30-80 zones) were used for planning purposes due to the limitation in computing capabilities. For the MMUTIS, this zoning system was changed due to the following reasons:

- Information technology and support hardware have advanced and there is no actual limitation on the computer's ability (even with the PCs).

- The Study Area was extended to the adjoining areas of Metro Manila.

- Inside Metro Manila, zoning for the peripheral areas of Quezon City, Valenzuela, Las Piñas, and Muntinlupa is considered too coarse judging from recent urbanization.

For these reasons, the following changes were adopted for the MMUTIS zoning system:

- For zones within Metro Manila, the previous 202 zones were subdivided further into 265 (refer to Table 14.2).

- For areas outside Metro Manila but within the Study Area, 51 new zones were established (refer to Table 14.3), with each zone corresponding to one municipality or city.

- Outside the Study Area, about 78 zones were established. The area surrounding the Study Area and some strategically important areas, such as Angeles, Infanta Real and Batangas, were considered as one single zone.

On the whole, the number of zones was 394. Depending on the planning purposes, this zoning system was aggregated into medium or large zone.

Coverage of the Study

The survey covered Metro Manila and the 17 adjoining municipalities of Bulacan, 14 municipalities of Cavite, six municipalities of Laguna, and 14 municipalities of Rizal. All barangays in the Study Area were sampled (except for some where problems of peace and order and accessibility existed).

Some 235,000 persons representing about 50,000 households were targeted for Metro Manila while 39,000 persons representing 7,900 households were targeted for the adjoining areas.

Table 14.2
MMUTIS Zoning System

Area	No. of Zones	
	JUMSUT	MMUTIS
City of Manila	52	57
Pasay City	13	15
Makati City	15	23
City of Mandaluyong	8	9
San Juan	5	5
Quezon City	42	59
Caloocan City	11	17
Valenzuela	8	9
Malabon	7	7
Navotas	4	6
Marikina	8	8
Pasig City	8	11
Pateros	1	1
Taguig	5	6
Parañaque	8	14
Muntinlupa	3	7
City of Las Piñas	4	8
Total	202	265

Table 14.3
Zoning of Areas Outside Metro Manila

Area	Total of Outside Zones	Zones within Study Area
Adjoining Municipalities		
Bulacan	24	17
Cavite	23	14
Laguna	30	6
Rizal	14	14
External Areas	38	-
Total	129	51

14.3 Cordonline Survey

Survey Objectives

Metro Manila has strong connections with other regions economically and socially. Therefore, there are significant transport movements of passengers and goods among these regions.

The cordonline survey aimed at determining the trips to/from the Study Area made by nonresidents and to calibrate the origin-destination (OD) matrices obtained from the person-trip survey on the Study Area boundary. To obtain such data, roadside OD interview survey, traffic count survey and vehicle occupancy survey were conducted along the boundaries of the Study Area.

Coverage of the Survey

Survey Stations

Survey stations were located along the boundaries of the Study Area. There were 19 survey stations for Metro Manila boundaries and 14 for Study Area boundaries. Most were strategically located on roads while some were located on expressways and passenger ferry terminals for Metro Manila boundaries.

Their locations are shown in Figures 14.2 and 14.3.

The locations and code numbers of the survey stations were principally the same with those of the following previous studies:

1) MMUTIP (Metro Manila Urban Transport Improvement Project, 1980)
2) JUMSUT (Metro Manila Transportation Planning Study, 1984)
3) MMUESS (Metro Manila Urban Expressway System Study, 1993)

Survey Duration

The 24-hour traffic count and vehicle occupancy survey, together with a 16-hour roadside interview survey, were conducted in four stations (CH04, CH09, CH12, and EX02) along Metro Manila boundaries. In addition, a 16-hour traffic count and vehicle occupancy survey, coupled with a 16-hour roadside interview survey, were

Figure 14.2
Location of Cordonline Survey Stations (Metro Manila Boundary)

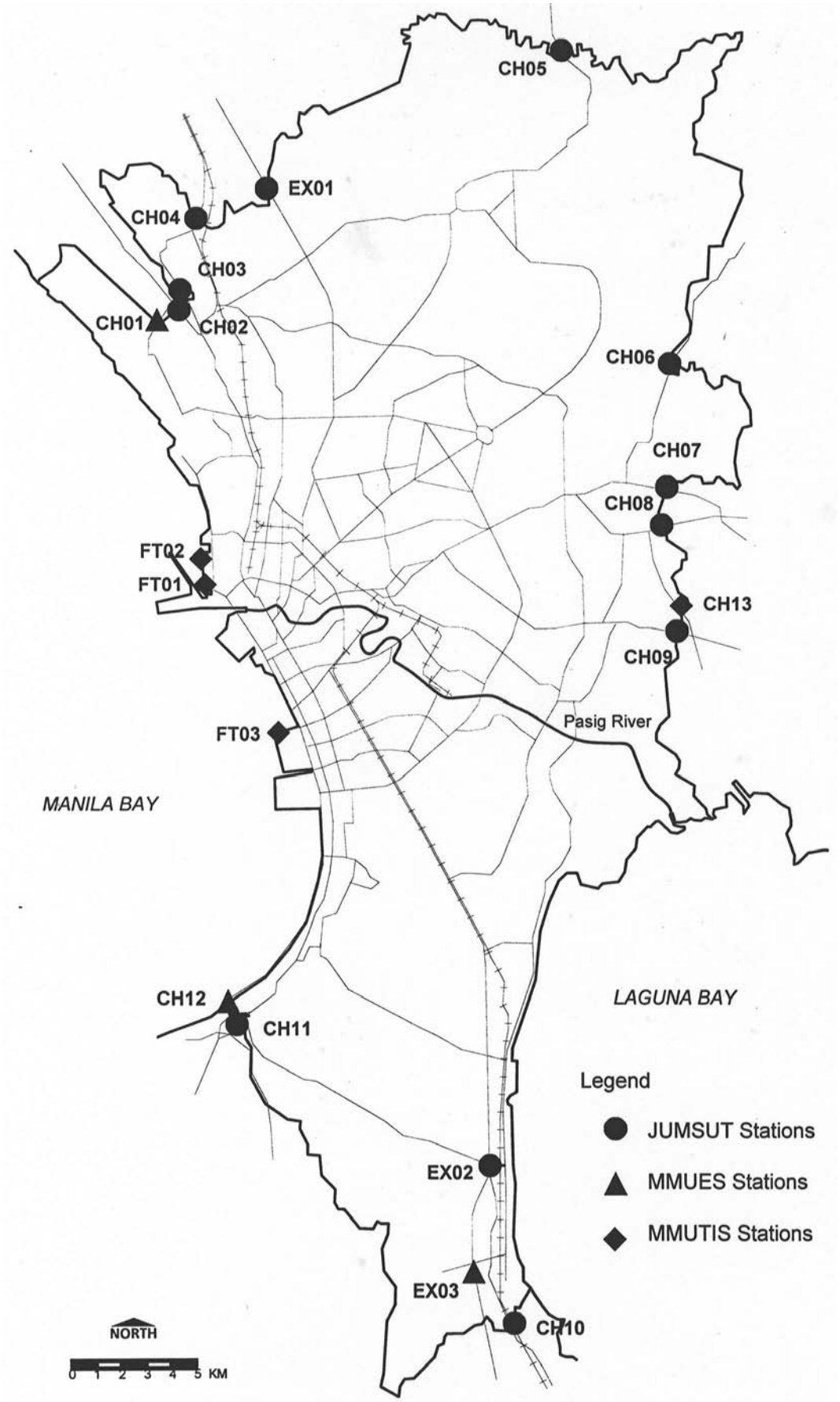
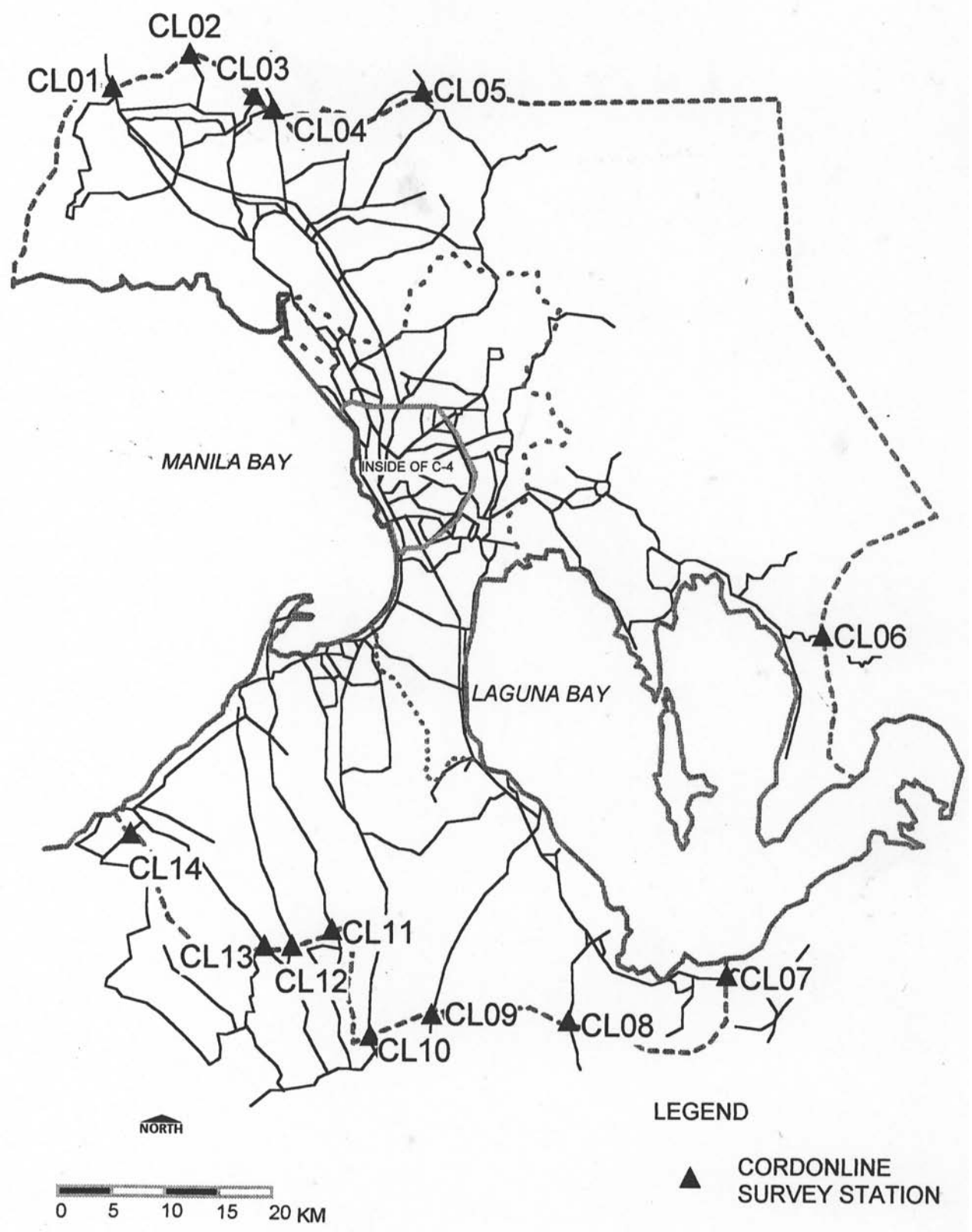


Figure 14.3
Location of Cordonline Survey Stations (Study Area Boundary)



conducted in the remaining 15 stations along Metro Manila boundaries and 14 stations on Study Area boundaries.

The surveys were conducted one workday per week, while the traffic count survey was conducted continuously for one week (seven days) at the above-mentioned 24-hour stations. The survey coverage is summarized in Table 14.4.

Table 14.4
Survey Period and Duration by Survey Station

Code	Survey Station	Survey Period (Hours)		
		Traffic Count	Vehicle Occupancy	Roadside Interview
Metro Manila Boundary				
CH01	Malabon-Obando	16	16	16
CH02	Panghulo Road	16	16	16
CH03	Gen. Vililla	16	16	16
CH04	McArthur Highway	24 *	24	16
CH05	Quirino Highway	16	16	16
CH06	Marikina-San Mateo Road	16	16	16
CH07	Marikina-Cargo Road	16	16	16
CH08	Antipolo Road	16	16	16
CH09	Ortigas Avenue	24 *	24	16
CH10	San Pedro	16	16	16
CH11	Bacoor	16	16	16
CH12	Manila-Cavite Coastal Road	24 *	24	16
CH13	Imelda Avenue	16	16	16
EX01	Malinta-Meycauayan	16	16	16
EX02	Alabang-Carmona	24 *	24	16
EX03	Susana Heights	16	16	16
FT01	Ferry Terminal (Pier 4)	16	16	16
FT02	Ferry Terminal (Pier 14)	16	16	16
FT03	Ferry Terminal (PICC)	16	16	16
Study Area Boundary				
CL01	Calumpit-Apalit 1	16	16	16
CL02	Calumpit-Apalit 2	16	16	16
CL03	Pililan-Baliuag	16	16	16
CL04	Plaridel-Bustos	16	16	16
CL05	Plaridel-Angat	16	16	16
CL06	Pililia-Mabitac	16	16	16
CL07	Los Baños-Bay	16	16	16
CL08	Calamba-Santo Tomas	16	16	16
CL09	Silang-Tagaytay 1	16	16	16
CL10	Silang-Tagaytay 2	16	16	16
CL11	General Trias-Amadeo	16	16	16
CL12	Trece Martires-Indang	16	16	16
CL13	Naic-Indang	16	16	16
CL14	Naic-Maragondon	16	16	16

* Traffic count survey was conducted continuously for one week (seven days).

Field Survey Method

Traffic Count Survey

The hourly vehicular traffic volume by vehicle type and direction was counted. With the exception of four stations (CH04, CH09, CH12, and EX02), the survey was conducted for 16 hours, starting from 6:00 a.m. In the four stations aforementioned, the survey was conducted for 24 hours, starting from 6:00 a.m. and continuously for one week (seven days). The types of vehicle were classified as follows:

1) Pedicab
2) Bicycle
3) Motorcycle
4) Tricycle
5) Jeepney
6) Minibus
7) Standard Bus
8) Taxi
9) HOV Taxi
10) Car/Jeep
11) School/Company/Tourist Bus
12) Utility Vehicle
13) Truck
14) Trailer
15) Others

Vehicle Occupancy Survey

The number of passengers on board and the seating capacity of the sample vehicles chosen at random were observed and recorded by hour and vehicle type. The survey was conducted for 16 hours starting from 6:00 a.m. in all stations except four, where the survey was conducted for 24 hours starting from 6:00 a.m. and continuously for one week (seven days).

The number of observed vehicles was determined to be at least one per minute for buses, two per minute for other vehicles, or all vehicles when traffic volume was small.

Roadside OD Interview Survey

The roadside OD interview survey was conducted for 16 hours, starting from 6:00 a.m.

Private vehicle drivers and public transport passengers/drivers were interviewed. Information such as origin-destination, trip purpose, number of passengers, seating capacity, etc., were asked.

Although it was desirable that as many vehicles as possible were to be interviewed, the sampling rate of this survey was carefully determined by the supervisor at the site to ensure that the survey itself does not create traffic.

14.4 Screenline Survey

Survey Objectives

The screenline survey aimed at calibrating the current origin-destination matrices obtained from the person-trip survey in terms of vehicular and passenger traffic. To obtain the data, traffic count and vehicle occupancy surveys were conducted in road sections crossing the screenlines set inside the Study Area.

Coverage of the Survey

Survey Stations

Survey stations were located on road sections crossing the screenlines, which were set along the Pasig River and the San Juan River/PNR, as in the case of the previous studies.

The number of stations has increased since the previous studies due to the construction of new roads. There were 37 survey stations located on bridges and at PNR crossings. Their locations are indicated in Figure 14.4. These and their code numbers are principally the same as those used in previous studies.

Survey Duration

The traffic count and vehicle occupancy surveys were conducted for 24 hours in six stations (SL04, SL08, SL12, SL14, SL19, and SL21), and for 16 hours in 31 stations. These surveys were conducted one workday per week. The coverage of the screenline survey is summarized in Table 14.5.

Field Survey Method

Traffic Count Survey

The hourly vehicular traffic volume by vehicle type and direction was counted. The survey was conducted for 16 hours, starting from 6:00 a.m. in all but six stations where the survey was conducted for 24 hours, starting from 6:00 a.m. continuously for one week (seven days).

Vehicle type classification was the same as that used in the cordonline survey.

Vehicle Occupancy Survey

The number of passengers on board and the seating capacity of sample vehicles chosen at random were observed and recorded every hour and by vehicle type. The survey was conducted for 16 hours in all but six stations where a 24-hour survey was conducted. The number of observed vehicles was determined to be at least one vehicle per minute for buses, two vehicles per minute for other types of vehicles, or all vehicles when traffic volume was small.

Figure 14.4
Location of Screenline Survey Stations

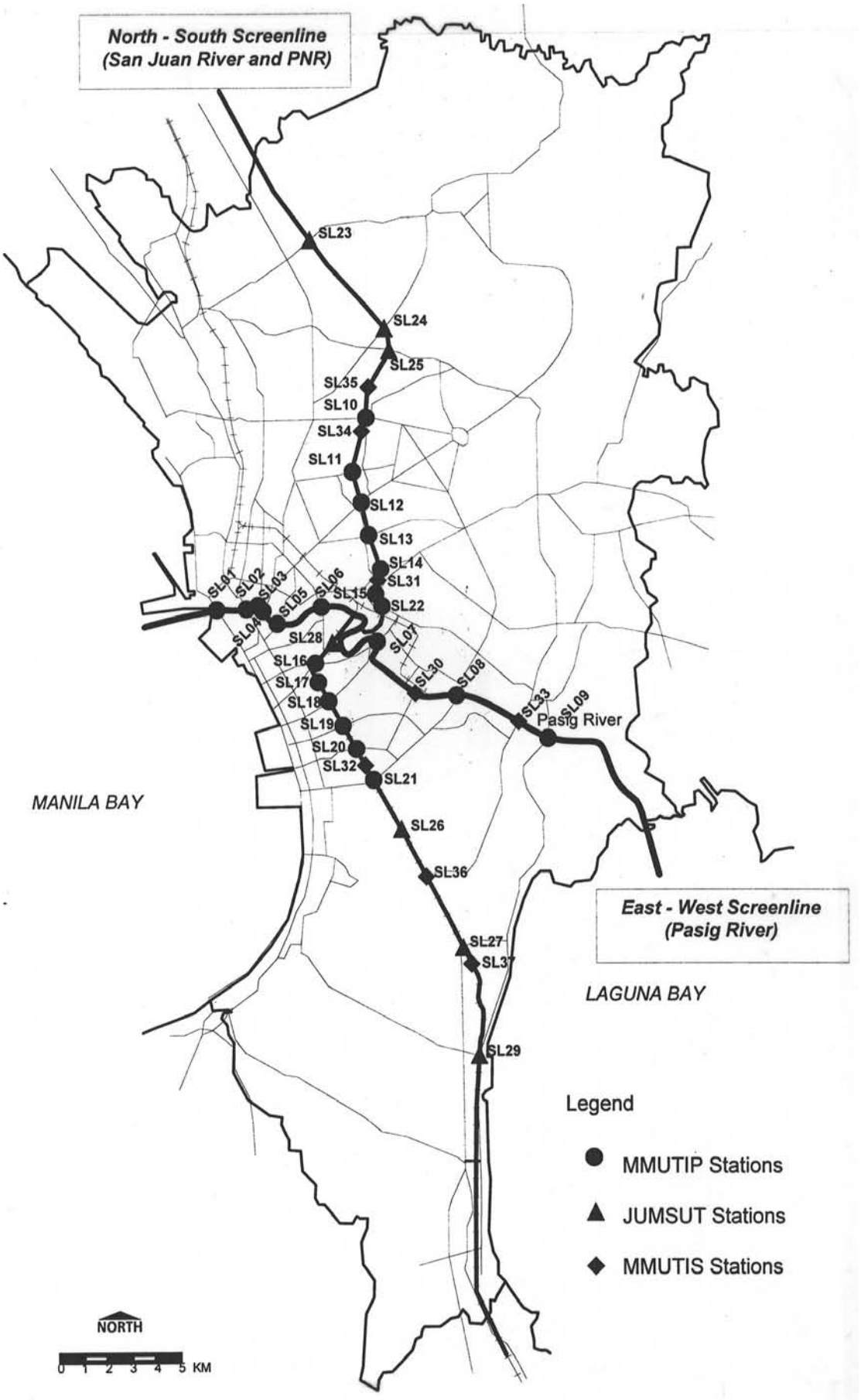


Table 14.5
Survey Period and Duration by Screenline

Screenline	Code No.	Survey Station	Survey Period (Hours)	
			Traffic Count	Vehicle Occupancy
East-West Screen	SL01	Roxas Bridge (Del Pan Bridge)	16	16
(Pasig River)	SL02	Jones Bridge	16	16
	SL03	McArthur Bridge	16	16
	SL04	Quezon Blvd.	24 *	24
	SL05	Ayala Bridge	16	16
	SL06	Nagtahan Bridge	16	16
	SL07	Lambingan Bridge	16	16
	SL08	Guadalupe Bridge	24 *	24
	SL09	Bambang	16	16
	SL30	Makati-Mandaluyong Bridge	16	16
	SL33	C5	16	16
North-South Screen	SL10	EDSA near Roosevelt	16	16
(San Juan River)	SL11	Del Monte Avenue	16	16
	SL12	Quezon Avenue	24 *	24
	SL13	E.Rodriguez Avenue	16	16
	SL14	Aurora Avenue	24 *	24
	SL15	N.Domingo	16	16
	SL22	Shaw Blvd.	16	16
	SL23	Bagbaguin	16	16
	SL24	Quirino Highway -Tandang Sora	16	16
	SL25	Quirino Highway	16	16
	SL31	Araneta Avenue	16	16
	SL34	Caroline	16	16
	SL35	Road 20	16	16
North-South Screen	SL16	Pedro Gil	16	16
(PNR)	SL17	San Andres	16	16
	SL18	Vito Cruz	16	16
	SL19	Buendia Avenue	24 *	24
	SL20	Pasay Road	16	16
	SL21	EDSA	24 *	24
	SL26	Nichols McKinley Road	16	16
	SL27	Doña Soledad Avenue	16	16
	SL28	Dr.M.L. Carreon	16	16
	SL29	M.L. Quezon	16	16
	SL32	Don Bosco	16	16
	SL36	C5	16	16
	SL37	Mañalac Avenue	16	16

* Traffic count survey was conducted continuously for one week (seven days).

14.5 Public Transportation Surveys

14.5.1 Bus/Jeepney/Tricycle Terminal Survey

In conducting a comprehensive transportation planning based on an updated transportation database, one important data is the current service level and characteristics of public transport modes such as buses, jeepneys and tricycles.

With regard to the data on public transport route, the available bus/jeepney route inventory was updated by the DOTC in 1994. However, there have been changes since then. Furthermore, the existing data on terminal facilities of each mode, as well as service levels of public transport, are insufficient for transportation planning.

Therefore, a bus/jeepney/tricycle terminal survey was conducted to fill the gaps in the existing database. To understand current conditions, the survey was broadly divided into three, namely:

1) Route Reconnaissance Survey

   This survey aimed at revising the list of bus and jeepney routes and comparing it with the existing official list.

2) Terminal Location/Characteristics Survey

   This survey was carried out to obtain data on the location, operation and physical characteristics of all terminals/turning points of all public transportation modes in the Study Area.

3) Bus/Jeepney Service Frequency Count Survey

   This survey intended to obtain the service levels of bus and jeepney by getting data on trip frequencies by route and hour. Vehicular traffic count survey was conducted in selected major terminals of each mode.

The results of these surveys provided the basis for expanding the data of other public transportation surveys conducted on a sampling basis. At the same time, the surveys themselves gave an overview of public transportation operations in the Study Area.

14.5.2 Public Transportation Operation/Utilization Characteristics Survey

The existing data regarding the operational aspects of bus and jeepney was limited, except for the one generated during the JUMSUT study. However, the data needed updating.

Hence, the public transportation operation and utilization characteristics survey was undertaken to obtain current operational characteristics of bus and jeepney, such as travel speed, number of passengers, load factor, and number of units running on a route. This survey was conducted as an on-board interview survey for selected bus and jeepney routes.

14.5.3 Public Transportation Passenger Interview Survey

The objective of this interview survey was to obtain the present transfer characteristics of public transport passengers at terminals as well as their "willingness-to-pay" attitude for terminal improvement.

14.5.4 Bus/Jeepney/Tricycle/Taxi Driver Interview Survey

In Metro Manila, it is not unusual to find drivers who are not operators or owners of public transport vehicles. A majority of drivers lease their vehicles from operators for a price usually called "boundary fee". These drivers derive profits from earnings excluding the boundary fee and other costs such as fuel.

Therefore, to know the actual working conditions of drivers of public transport, it was necessary to survey them. This is also to supplement the operational characteristics data obtained from the operator survey.

14.5.5 Bus/Jeepney Operator Survey

This survey was undertaken with the following objectives:

1) To understand the existing institutional/regulatory framework related to bus/jeepney operators;

2) To make a list of bus/jeepney operators; and

3) To look further into the operational/financial conditions of bus/jeepney operators, including the following: organization, owned/operating vehicles, employment system, financial performance (balance between cost and revenue), and other information.

To obtain detailed information from bus/jeepney operators, a direct interview survey was conducted based on a specific questionnaire. This survey generated substantial information on the bus/jeepney industry and operation.

14.6 Road Inventory Survey

Survey Objectives

This survey was designed to establish a base road network for data collection, analysis and planning of various MMUTIS tasks with regard to road development in the Study Area.

Coverage of the Survey

This survey covered all major roads in the Study Area, which were determined as follows:

1) All roads covered by the JUMSUT were taken;
2) New major roads completed after JUMSUT were added; and
3) All roads serviced by bus or jeepney were added, if not yet included.

Survey items were identified by road section, as follows:

1) Road Name, Section Name, Road Length (km)
2) Road Width: No. of lanes

Carriageway Width (m)
Sidewalk Width (m)- right/left
Median Strip Width (m)

3) Pavement: Type (Asphalt/Concrete)
Pavement Condition (indicative)
- Crack
- Pothole
- Patchwork
- Others

4) Side Friction: (indicative) Parking (On-road, On-sidewalk)
Vendors/hawkers
Passengers waiting for PUJ/PUB on the road
Market

The last two items (pavement and side friction) were not covered by the JUMSUT. Considering the worsening traffic situation, however, they were included in this study.

Survey Method

A team of two surveyors went around in a car to all the predetermined streets in the Study Area. They observed the streets at first and, if any difference from the JUMSUT road inventory was observed, or if it was a new road, they measured the road with a tape measure. Pavement condition of and side friction in all the streets were observed and recorded.

14.7 Land-use Survey

Objective

The land-use survey was principally conducted to determine the present land-use patterns in the Study Area. The information derived from this undertaking was greatly needed to outline the type of traffic-generating and attracting areas and to determine the changes and trends in land use.

Methodology

In preparing the 1996 land-use data for the Study Area, a number of available maps and data had to be secured. Likewise, validating, checking and updating these data had to be done.

Figure 14.5 shows the tasks required to generate the 1996 land-use database. First, available data, such as the 1986 JICA-NAMRIA maps (for the metropolitan area only), had to be validated with the 1986 LANDSAT data (also from NAMRIA) and the latest aerial photo of the Study Area (1992). Then, a land-use survey was conducted to update the land-use map. However, time and resource constraints did not allow for a detailed and comprehensive survey. As such, survey efforts were concentrated in the following areas:

1) Urban cores
2) Regional centers
3) Town proper (*poblacion*) in the Study Area
4) Areas where substantial land-use changes have been noted

The 1996 LANDSAT data were also used to complete the 1996 land-use map. Processing and execution of the land-use data was done using the geographic information system (GIS).

The methodology of the land-use survey entailed the identification of land area according to use and plotting of the approximate location on the base map. Surveyors were trained in identifying the types of land uses based on the following categories:

1) R1: area with residential buildings of single-dwelling types
2) R2: area with residential buildings of multistorey types
3) R3: area with temporary housing units
4) RC: area of mixed residential-commercial buildings (i.e., houses with "sari-sari" stores, dress shops, barber shops, etc. and commercial buildings with residential units
5) BR: mixed business-residential area
6) BC: mixed business-commercial area
7) B: business
8) C: buildings utilized solely for commercial purposes: department stores, markets, shopping centers
9) Ind1: large-scale industrial area
10) Ind2: small-scale industrial area
11) Ind3: mixed industrial-residential area
12) Inst1: area and buildings used as government offices
13) Inst2: area and buildings used as schools, learning institutions and for cultural activities.
14) Inst3: area and buildings used for hospitals and health centers
15) Inst4. area and buildings used as churches, shrines, cemetery, and other religious facilities
16) Rec: area and buildings used for recreational purpose, theaters, gymnasiums, sports center
17) M: military camps, etc.
18) S: service utilities and related facilities
19) T: transportation
20) P: parking areas

The surveyors investigated all buildings, structures and open spaces in the survey area. For buildings and structures, they noted the predominant activities within the buildings or of the area. The data gathered were translated and consolidated on scaled maps by central business district (CBD).

Survey Coverage

The land-use study covered the entire Metro Manila and the municipalities and cities in adjoining provinces (i.e., Rizal, Bulacan, Laguna, and Cavite), as follows:

Within Metro Manila

1. Makati
2. Ermita
3. Cubao
4. Ortigas
5. Binondo
6. Mandaluyong
7. Novaliches

North of Metro Manila within the Study Area

1. Meycauayan
2. Malolos
3. Plaridel
4. Calumpit

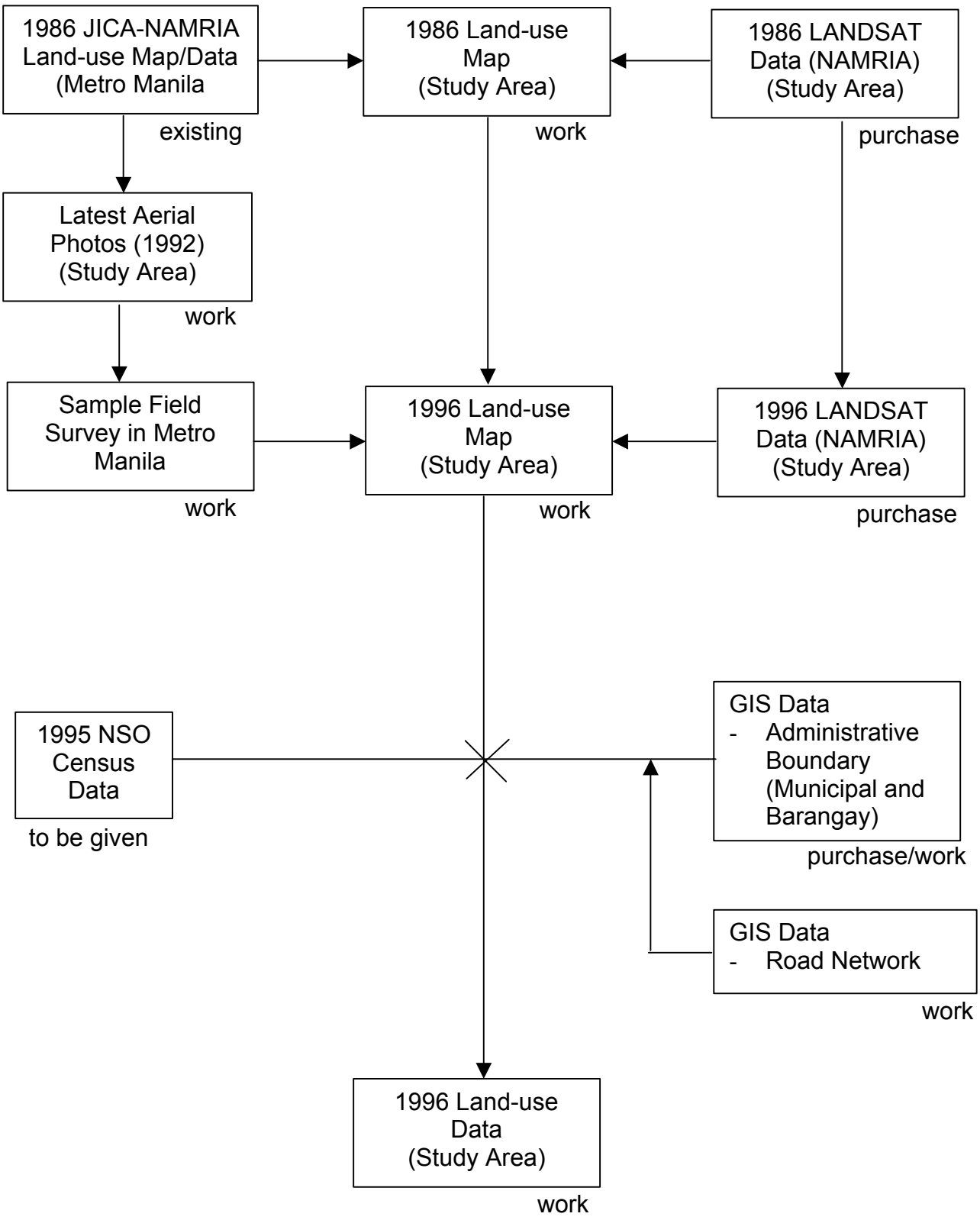
East of Metro Manila within the Study Area

1. San Mateo
2. Cainta
3. Antipolo

South of Metro Manila within the Study Area

1. Kawit
2. General Trias
3. Trece Martires City
4. San Pedro
5. Dasmariñas
6. Carmona
7. Calamba

Figure 14.5
Methodology in the Preparation of the Land-use Map and Data



15 TRANSPORT MODELS

15.1 Transport Demand Forecast Models

An overview of the transport demand forecast models developed for the MMUTIS was briefly discussed earlier in Chapter 6. This chapter intends to further explain the technical aspects of these models.

Trip Generation/Attraction Model

Car Owner vs. Noncar Owner and Home-based vs. Nonhome-based

Table 14.1 summarizes the number of home-based and nonhome-based trips by trip purpose and by car ownership. More than 90% of to-work and to-school trips are homebased, without significant difference between car owners and noncar owners. For trips with other purposes, however, the difference becomes significant. This is the reason the MMUTIS trip generation/attraction model considered this difference as business or private trips.

Table 15.1
No. of Home-based and Nonhome-based Trips
by Trip Purpose and by Car Ownership

Trip Purpose	NonCar Owner				Car Owner			
	Number of Trips (1,000)				Number of Trips (1,000)			
	Home-based	Nonhome-based	Total	Ratio (%)	Home-based	Nonhome-based	Total	Ratio (%)
To-home	9,825	0	9,825	100.0	4,192	0	4,192	100.0
To-work	3,321	243	3,564	93.2	1,218	139	1,357	89.8
To-school	3,476	62	3,538	98.2	1,422	31	1,453	97.9
Private Business	313	66	379	82.6	202	66	268	75.4
Employers Buss.	541	669	1,210	44.7	426	419	845	50.4
Private	1,709	379	2,089	81.8	639	263	902	70.8
Others	419	62	482	87.1	301	86	387	77.7
TOTAL	19,605	1,482	21,086	100.0	8,400	1,005	9,405	100.0
Ratio (%)	93.0	7.0	100.0		89.3	89.3	100.0	

Source: MMUTIS Person-trip Survey, 1996

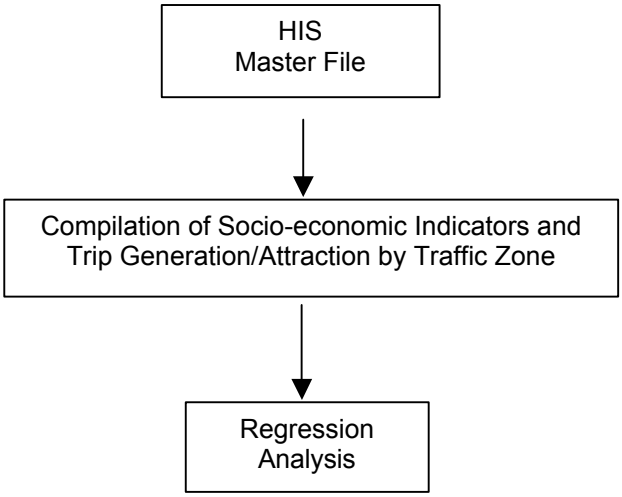
Handling To-home Trips

Usually, there are two ways to handle to-home trips. One is to construct a model similar to other trip purposes, while the other is to assume the ratios of to-home trips from the destination of other trips and automatically enumerate to-home trips. However, the latter will not be able to cope with structural changes brought about by future changes in land use, though there will be no discrepancy arithmetically. In the MMUTIS, the former method was adopted to accommodate the future expansion of urbanization.

Process of Model Construction

Based on the HIS master file, socio-economic indicators and trip generation/ attraction were extracted by survey zone. A regression analysis was then conducted, having socio-economic indicators as explanatory variables for estimating trip generation/attraction. This process is shown in the figure below.

Figure 15.1
Process of Constructing Trip Generation/Attraction Model



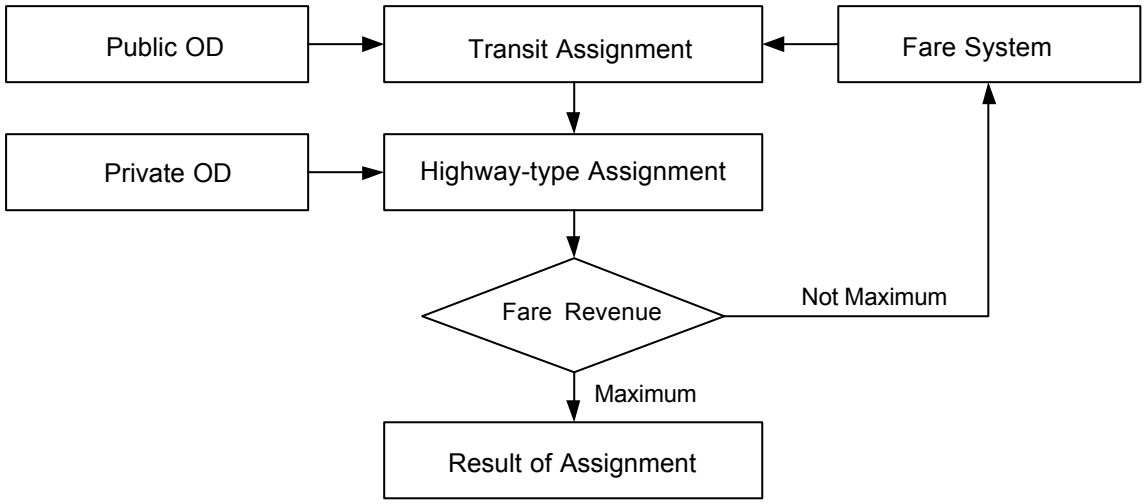
Modal Split Model

Trip End vs. Trip Interchange Model

The trip end model determines the modal split in terms of trip generation/ attraction by zone based on some zonal parameters, while the trip interchange model determines it by OD pair based on interzonal characteristics (e.g., distance, service level, etc.).

In the MMUTIS Study Area, there is apparently a tendency for car owners to use cars regardless of their destination, as indicated in Figure 15.2. Hence, the MMUTIS decided to adopt the trip end model. Interzonal change, such as travel time and cost, can be reflected in the latter stage of estimating the modal shift from private to public transport.

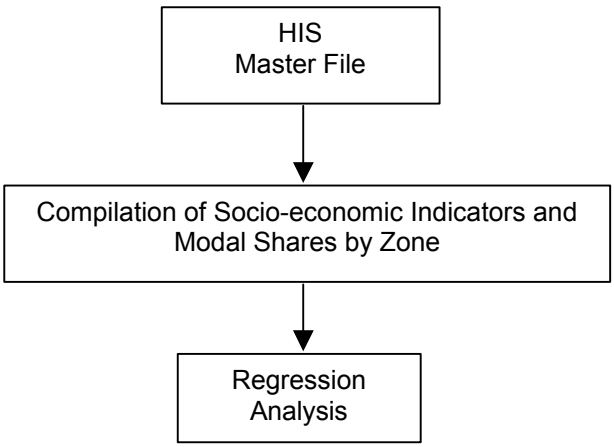
Figure 15.2
Interrelation of Car Ownership and Modal Share, 1996



Process of Model Construction

Similar to the trip generation/attraction model, socio-ecocomic indicators and shares of pedestrian, private and public modes were compiled by zone, after which a regression analysis was conducted as shown in Figure 15.3.

Figure 15.3
Process of Constructing a Modal Split Model



Trip Distribution Model

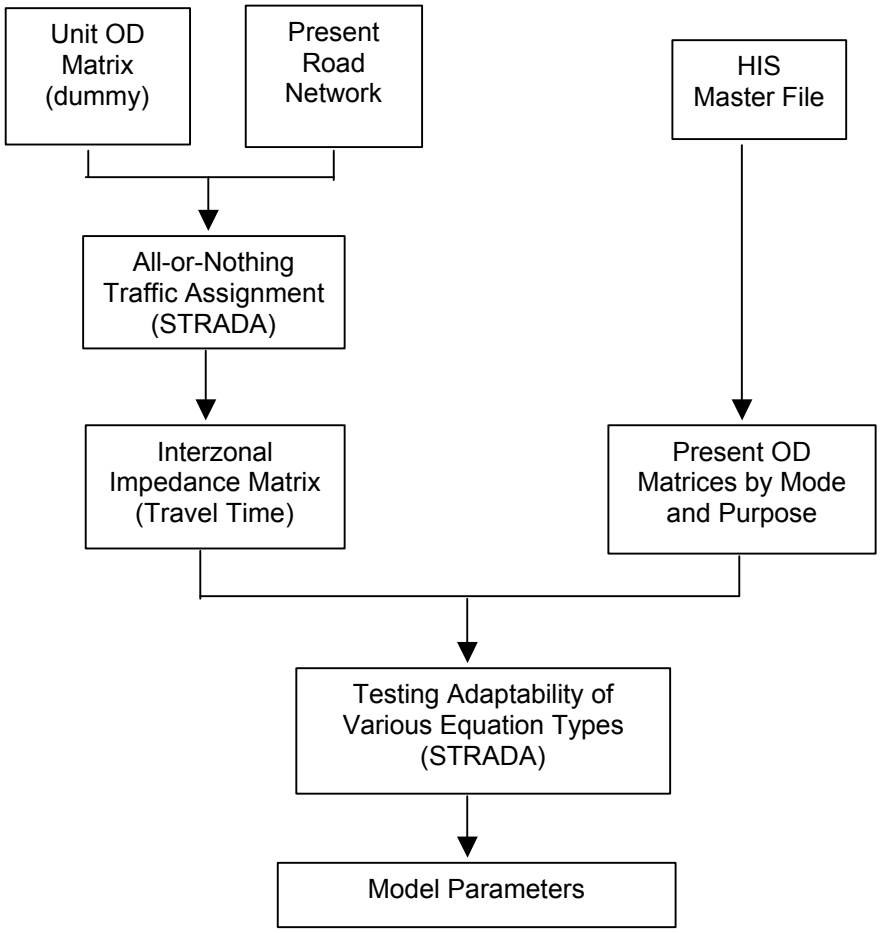
Selection of Model Type

The MMUTIS trip distribution model has two submodels: intrazonal and interzonal. For the interzonal submodel, various types of equations including the BPR gravity model, Voorhees gravity model, and trip opportunity model were used, and their applicability tested. Of these, the Voorhees gravity model was selected due to its best correlation.

Process of Model Construction

Figure 15.5 shows the process of model construction, where the STRADA (System for Traffic Demand Analysis) was used effectively as an indispensable tool for analysis and evaluation.

Figure 15.4
Process of Constructing Trip Distribution Model



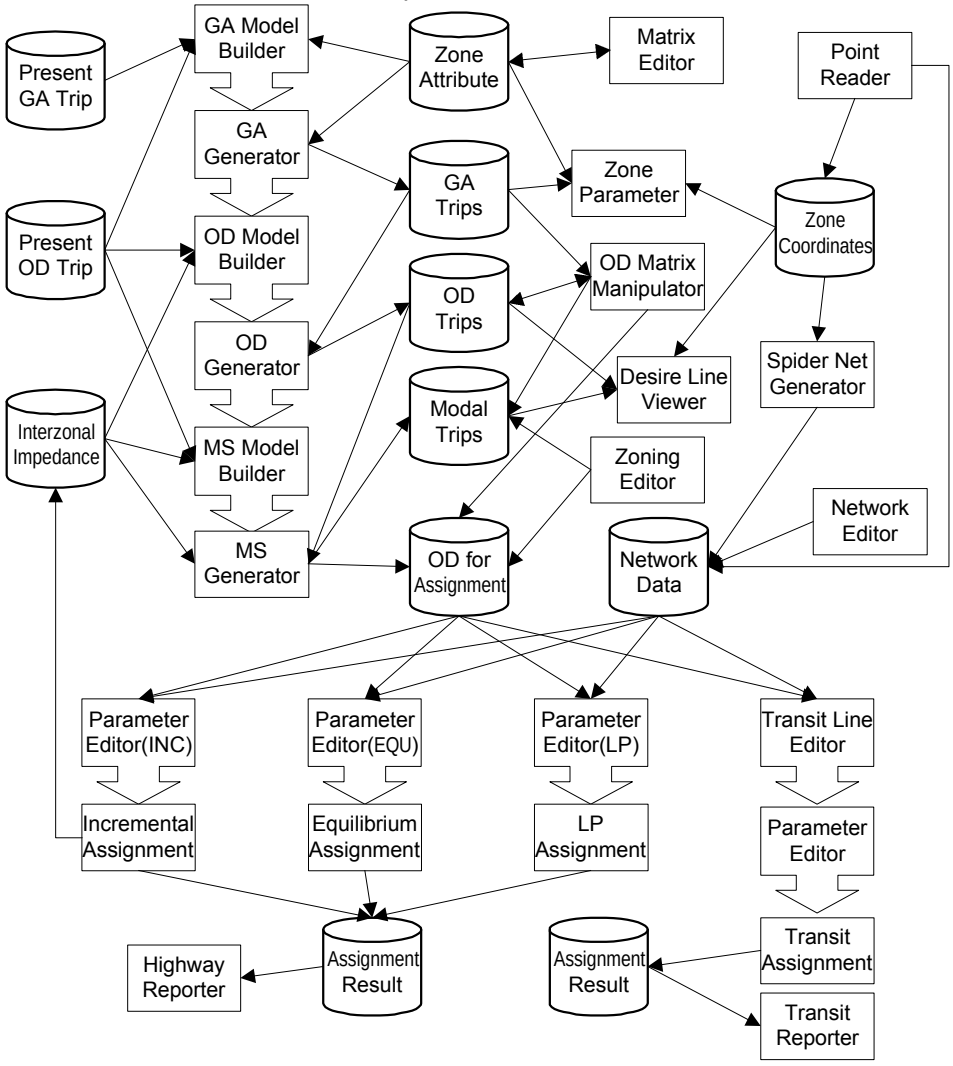
15.2 STRADA

Overall Structure

The JICA STRADA consists of 25 program modules as illustrated in Figure 15.5. Each module has a graphical user interface so that the user can visually check the progress of his or her forecasting effort. The user is free to choose a set of program modules appropriate to his or her purpose. The STRADA is capable of serving various needs in transport planning because of its flexibility in program sequencing and combination.

In addition, the STRADA uses data files of the text file format and publishes its standard record formats. It is possible to write necessary data files in the standard STRADA formats by some commercially available applications, and conversely, use the STRADA data files in such applications.

Figure 15.5
Components of STRADA



Source: JICA STRADA Manual

File Types of the STRADA Databases

Data files used by the STRADA program are classified into seven types. Each type is identified in principle by the default suffix in the file name. The program modules are built to identify file types according to this classification, and any other names given by the user must be specified accordingly in the file selection.

1) Zonal indices files (***.IDX, ***.GAD, etc.)

   This file type records zonal indices in matrix format, with zones listed in rows and various zonal attributes in columns. Zonal indices include socio-economic attributes (*** IDX) and generated and attracted trips (***GAD).

2) OD table files (***.? OD)

   As typically seen in the origin/destination trip table, this file type records the data in matrix format with zones listed both in rows and columns. In addition to OD trip tables, interzonal impedances are written by this file type.

3) Network data files (***.? NT)

   This file type records the network data, e.g., the road network and the transit line network.

4) Parameter files (***.? MP and ***.? PA)

   This file type records various parameters used by the STRADA program, such as model parameter output by the three Model Builders (***.? MP) and assignment parameter input to the four assignment programs (***.? PA).

5) Control files (***.? CN)

   This file type records the control data on the input and output of files to run the Model Builders and the Assignment Programs.

6) Coordinate files (***.? XY)

   This file type records the point data such as X and Y coordinates for node positions and zone borders. The STRADA program modules for graphic display use this file type.

7) Assignment Result File (***.? RE)

   This file type records the results of the STRADA Assignment Programs, including the intermediate outputs. The files contain such information as link traffic, link ODs, trip length distribution, minimum routes, directional analysis, and project evaluation indices.

Trip Generation/Attraction Models

The GA model-building module consists of two programs, namely: the GA Model Builder that builds the model parameters and the GA Generator that forecasts generated/attracted trips based on model parameters. The GA Model Builder offers five alternatives of model building that are very basic to G/A forecasting. The five mathematical model types are as follows:

1) Linear Function : $y = a_1 x_1 + a_2 x_2 + \ldots.. + a_n x_n + b$

2) Square Root Function : $y = \sqrt{ax + b}$

3) Exponential Function : $y = be^{ax}$

4) Power Function : $y = bx^{a}$

5) Growth Curve Function : $y = \frac{k}{\left(1 + be^{-ax}\right)}$

In these formulas, *y* signifies the dependent variable (i.e., generated or attracted trips), while *x* stands for the explanatory variable (e.g., zonal socio-economic attributes). The GA Model Builder calculates *a, b* and other model parameters by regression analysis.

The STRADA GA Model Builder can run regression analysis by excluding the user-specified singular data or by shifting the analysis for the user-specified dummy variables.

Trip Distribution Model

The OD model building consists of two programs, namely: OD Model Builder that builds the model parameters and the OD Generator that forecasts origin/destination trips based on model parameters. The OD Model Builder offers four alternatives of model building that include the basic gravity model with its two variations, as shown below.

1) Basic gravity model : $T_{ij} = K \bullet \frac{G_i^{a} A^{b}}{f\left(d_{ij}\right)}$

2) Voorhees gravity model : $T_{ij} = G_i \bullet \frac{A_j f\left(d_{ij}\right)}{\sum A_j \bullet f\left(d_{ij}\right)}$

3) BPR gravity model : $T_{ij} = G_i \bullet \frac{A_j f\left(d_{ij} K_{ij}\right)}{\sum A_j \bullet f\left(d_{ij}\right) K_{ij}}$

4) Opportunity model : $T_{ij} = G_i \bullet \left[\frac{e^{-LV_j - 1} - e^{-LVj}}{1 - e^{-L\sum Vj}}\right]$

In addition, the basic gravity model offers the following three alternatives of interzonal impedance to apply:

- $f(d_{ij}) = d_{ij}^{-1}$
- $f(d_{ij}) = d^{-bd_{ij}}$
- $f(d_{ij}) = ae^{-bd_{ij}} d_{ij}^{-1}$

The OD model builder provides two models for the intrazonal OD trips, as shown below:

- Trip rate model, with three alternative formulas to calculate the rate from the present trip distribution data.
- Trip volume model which is the function of GA trips, as in:

$$X_{ii} = aG_i^b A_i^g$$

The STRADA OD Model Builder can run regression analysis by excluding the user-specified singular data. The OD Generator can adjust the OD forecasts on the zone pairs according to the user specifications made in the model parameter file.

Modal Split Models

The MS model building module consists of two programs, namely: the MS Model Builder that builds the model parameters and the MS Generator that forecasts modal trips based on model parameters. The MS Model Builder offers three alternative trip interchange models, as shown below.

- Exponential function : $y = \Sigma be^{ax}$
- Power function : $y = bx^a$
- Growth curve function : $y = \frac{K}{(1+be^{-ax})}$

Traffic Assignment Modules

Traffic assignment models are usually based on three principles: the principle of equal travel time, the principle of assigning more trips to shorter paths, and the principle of total travel time minimization (or system optimization). The incremental assignment is based on the principle of equal travel times. In terms of the OD pairs, an increased traffic volume in a given route causes a slowdown of travel time on that route. As a result, part of the traffic diverts to another route with shorter travel time. This process of diversion will repeat itself in the network until no alternative shorter route is available, or until the point of equal travel time is reached.

The principle is used in the traffic assignment techniques without capacity restraint (e.g, all-or-nothing assignment and the Japan Highway Public

Corporation's (JHPC) model of the diversion rate assignment) and also in the assignment techniques with capacity restraint (e.g., the modified minimum route search, the incremental assignment and the assigning-rate loading).

The STRADA provides four program modules of traffic assignment. Salient features of these modules are briefly explained below. "Travel time" as used in the following description signifies impedance, the basis of the minimum route search in the traffic demand assignment.

1) Incremental Assignment

In Japan, the JHPC diversion rate model and the variations of incremental assignment with capacity restraint are commonly used for demand forecast. The incremental assignment with the QV formula is often employed in JICA study projects on urban transportation in developing countries. In western countries, the incremental assignment is occasionally used with the BPR formula, rather than the QV formula, to express the relationship between traffic volume and travel time. However, the equilibrium assignment is by far the most common there.

2) Equilibrium Assignment

The equilibrium assignment is based on the total system optimization and loads the OD trips to the network to minimize total travel time in the network. The results of the incremental assignment mentioned above are the sum of the individual traveler's decision to minimize travel time. The equilibrium assignment does not concern itself with individual behavior, but on optimization of the centralized transport system as a whole by using the Lagrangian multiplier to find the equilibrium assignment.

Given the OD traffic for assignment expressed as $v^{k-1} + l\ (y^k - v^{k-1})$, this method calculates the Lagrangian multiplier l that minimizes the total area below the service function curve $S(v)$, and reloads the given traffic to the network by direct iteration.

3) Transit Assignment

Transit assignment is used to load passenger trips to the fixed route network, or the public transit lines. It is based on the principle of assigning more trips to shorter paths. Among the available routes connecting a pair of zones, the route of shorter travel time has a share of the OD traffic demand.

The incremental and equilibrium assignment programs are applied to motor vehicle traffic on the road network. While these programs might be used to load the public transit network, they lack the concepts of fixed routes (or lines) and transfer nodes. Their complicated methodologies of route search and network loading do not yield the kinds of information useful for planning transit lines and transfer terminals. The transit assignment methodology with its techniques of using fixed routes, transfer nodes, transfer penalties, and others can provide the basic information needed by public transportation

planners. However, the transit assignment performs the multipath search and loading, tasks that take considerable time to complete. In addition, many specifications of route conditions often make it harder to calibrate the model.

The STRADA transit assignment program adds the congestion factor to route conditions to perform multipath search and combines the technique of incremental loading with multipath loading. In addition, the program is capable of amending the service frequency on the basis of the assigned results.

In other words, the program can generate the necessary information for two important issues of public transportation planning, i.e., transit routing and route assignment. The program provides an easy link-up with the highway assignment, by providing automated procedures of overlaying transit lines on the road network with dummy links for transfer nodes.

4) LP Assignment

The LP assignment is different from the other three programs that load traffic demand between OD pairs. The LP assignment is more suitably applied for logistical optimization of physical distribution. The program applies linear programming method to minimize the cost of moving transport demand from the generating (producing) zones to the attracting (consuming) zones. The JICA STRADA program incorporates into its model the network capacity restraint and the minimum path search. Therefore, the program generates not only interzonal traffic (OD trip table) but loaded traffic on the network. The program standardizes the LP transportation problem and automates the procedure of programming and operation, thus freeing the user from the tedious work of specifying the objective function, link restraints and so on.

15.3 Others

Specification of Link Capacity and Initial Speed for Road Network

Capacity

1) Base capacity: See Table 15.2.

Table 15.2
Base Capacity by Road Type

Area	Expressway, Inter-city Artery	Primary Road	Secondary Road	Narrow Streets
Inside EDSA	2,200 (2,200)	660 (880)	440 (660)	220 (330)
Inside Metro Manila (Outside EDSA)	2,200 (2,200)	770~825 (1,045)	770~825 (1,045)	462~495 (693~743)
Outside Metro Manila	2,200 (2,200)	1,540 (1,540)	1,100 (1,100)	660 (660)

Note: Figures in parentheses stand for improved traffic management situation, i.e., Master Plan and MTDP.

2) Adjustment by carriageway width: See Table 15.3

Table 15.3
Adjustment of Capacity by Carriageway Width

Carriageway Width (m/lane)	Adjustment Factor
3.50	1.00
3.25	0.98
3.00	0.94
2.75	0.88
2.50	0.80
2.25	0.70

3) Adjustment by lateral clearance: See Table 15.4 below.

Table 15.4
Adjustment of Capacity by Lateral Clearance

Lateral Clearance (m/)	Adjustment Factor
1.00	1.00
0.75	0.98
0.50	0.96
0.25	0.92
0.00	0.88

Note: Applicable only when carriageway width exceeds 3.50 m/lane.

4) Adjustment by existence of sidewalk: 0.98 in the absence of sidewalk excluding NLE, SLE, and C-5.

5) Peak Hour Ratio: 9%

Initial Speed

- Major Arterial Road

  90 km/hr: R1, SLE, NLE, EDSA, C5 (SLE-Aurora)
  80 km/hr: R2-R10 excluding R4, C1-C3, C5 (Aurora-Quezon Ave.)

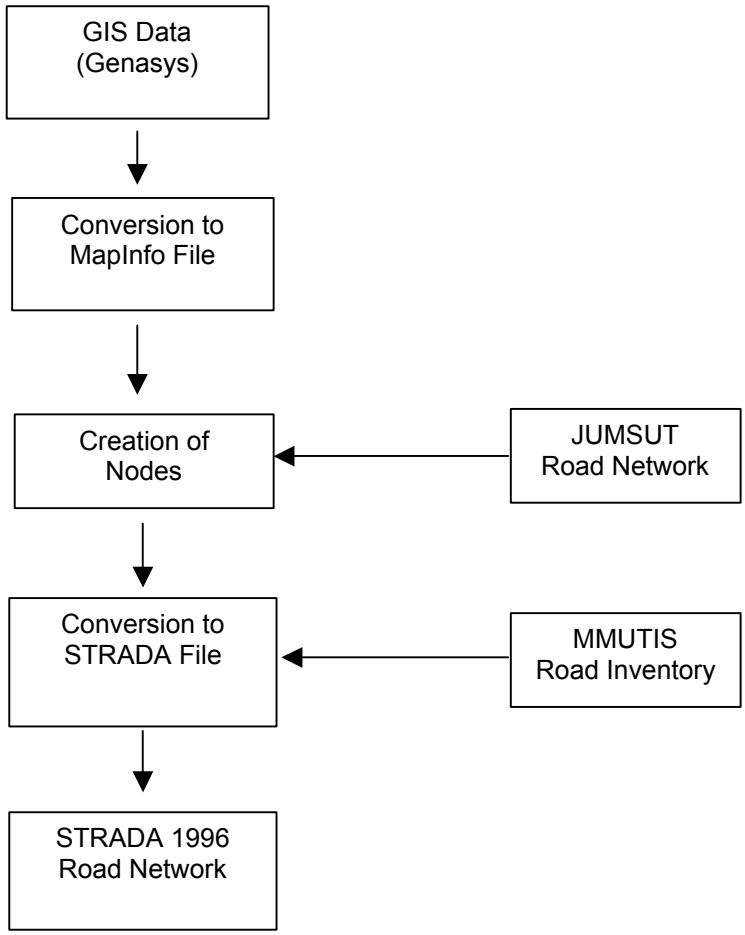
- Other Roads

  70 km/hr: 6-lane road and above
  60 km/hr: 4-lane road
  40 km/hr: 2-lane road (lane width more than 3 m)
  30 km/hr: 2-lane road (lane width less than 3 m)

Creation of Road Network for Traffic Assignment

The MMUTIS' present road network for traffic assignment was produced based on existing GIS data as shown in Figure 15.6. The nodes were generated on the GIS (MapInfo) to accurately define the X-Y coordinates.

Figure 15.6
Process of Present Road Network Creation



16 PROPOSED DATABASE AND MMUTIS CONTRIBUTION

16.1 Structural Concept

Objectives of the Proposed Database

This proposal has been prepared to provide a framework and a reliable basis for the creation of a comprehensive urban and transportation planning database for Metro Manila, and possibly for the whole country. This shall be achieved by the provision of up-to-date and readily available data. Such a database can be maintained properly and provided to end-users through a system of network servers and component personnel.

The database accumulated during the MMUTIS will initially form part of the core. It is expected to be the most extensive transportation database for Metro Manila for the next several years. Hence, it is imperative to maintain the integrity and security of the data. Maintenance, upkeep and constant development of the database are crucial.

This proposal has also been prepared to identify crucial issues and considerations for the institutionalization of the database, responsibilities and cooperation of key agencies and its overall sustainability.

The objectives of this proposal are as follows:

1) To propose the creation of a common comprehensive database to provide base information for the conduct of urban and transportation planning.

2) To identify issues and concerns for the development, implementation, utilization, and maintenance of a comprehensive planning database.

3) To provide a strategic plan for the implementation and operation of the planning database.

4) To identify cost-effective and feasible strategies.

5) To promote cooperative undertaking among concerned transport-related agencies.

Preliminary System Design

Figure 16.1 shows the design concept of the overall database system. The host agency shall install servers at the network center. The main server shall maintain the homepage of the system. All information pertaining to the planning database can be viewed by the database user in remote workstations. The main server shall also contain applications that will process data requests.

The remote user shall be lead to an application form where he inputs the type and extent of data requests. A facility to show sample data as well as full explanation of available data will also be on hand. After some checking procedures,

appropriate actions regarding the user's request can be taken. The output can be in different formats: The user can view the material on-line or request for a hard copy or file copy.

Negotiations with the main server shall be under clearly defined access and subscription rules.

Figure 16.2 shows the network system's configuration. Network server components shall be installed at the host agency side. Remote workstations, on the other hand, can be installed on the key planning agency's side.

16.2 Contribution of the MMUTIS Database

Purpose of Database Development

As briefly stated in Chapter 14, various kinds of transport surveys were conducted for the MMUTIS. The results of the surveys were compiled in the form of a database together with other relevant data independently prepared by government agencies. It is one of the main objectives of the MMUTIS to develop such a comprehensive database for general use in planning, policy-making, management, and project appraisals in the field of urban transportation and development.

The database was fully utilized in the course of the analysis and planning stages of the MMUTIS itself and is expected to be used in other succeeding studies and planning after the study's completion. In the JUMSUT conducted in 1983 to 1984, a comprehensive transport database was created which has been repeatedly utilized in many studies for more than 15 years and updated or modified with the latest available data. The MMUTIS database would also be a valuable data source through the coming decade without doubt.

Basic Policy

The database was developed, in principle, following the same policies and framework as those of the JUMSUT database for historical comparison. However, technological advance and the wider use of computers in the past 15 years have allowed the development of a new database. The MMUTIS database has been developed based on the following policies:

1) It should cover the data items of the JUMSUT database as much as possible.
2) It should have a simple and clear structure for easy understanding of users.
3) It should have a program package to compile a requested data file for easy data search and retrieval.
4) It should allow data output in the form of hard copy, map or file in a floppy disk.
5) It should be readable with prevailing software for database handling, map drawing and transportation planning.
6) It should be directly accessible to users through a computer network.

Figure 16.1
Planning Database Information System

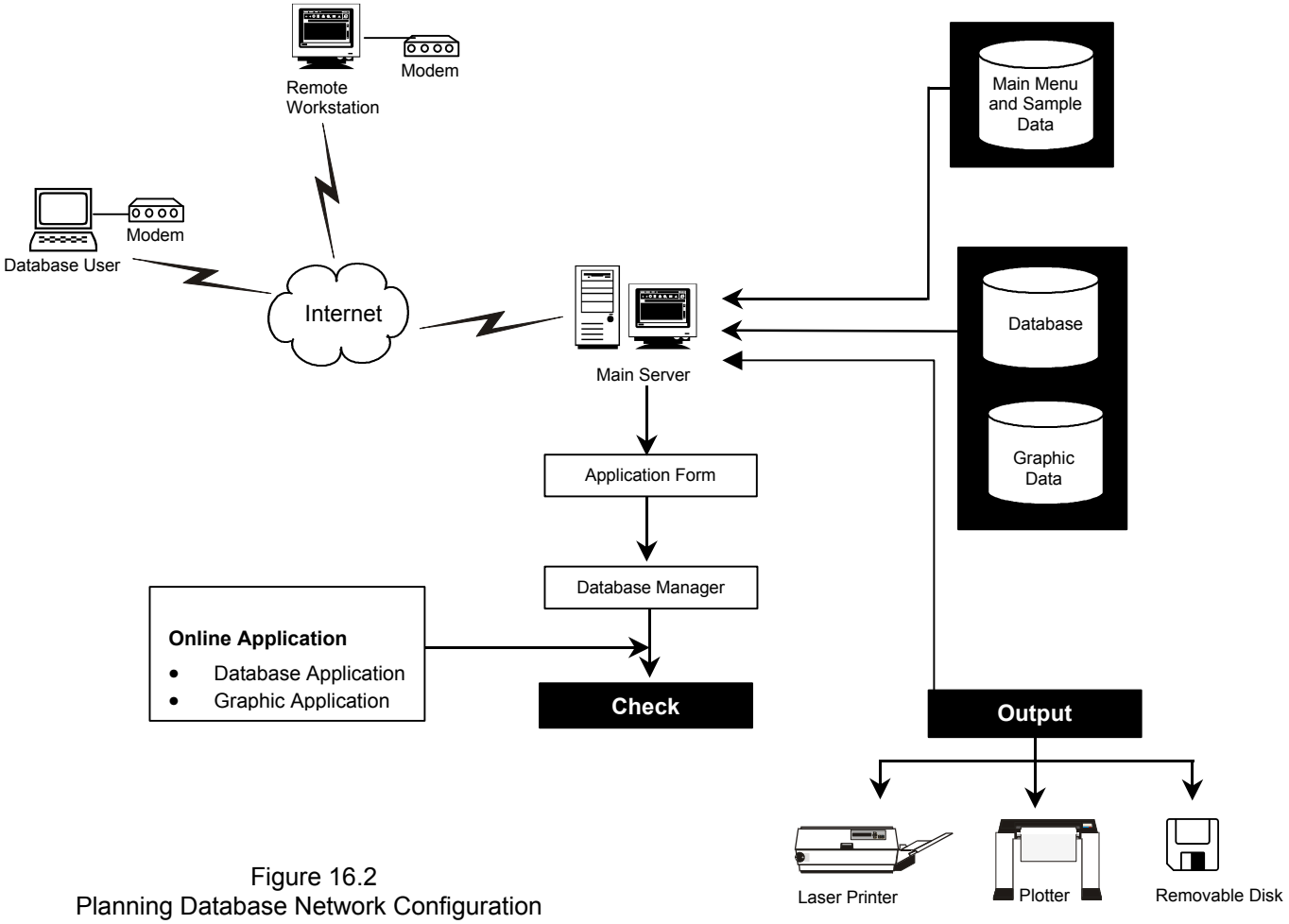
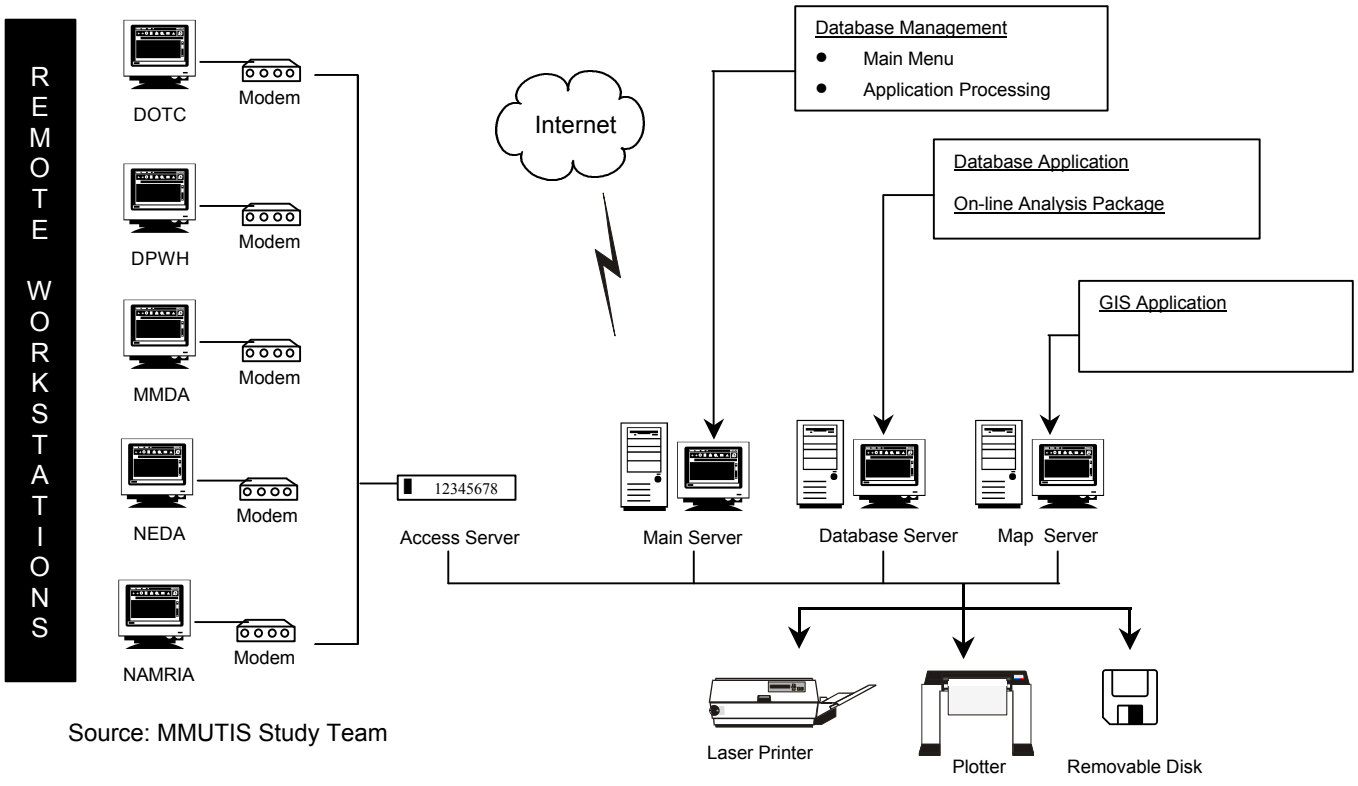


Figure 16.2
Planning Database Network Configuration



Source: MMUTIS Study Team

Coverage of Database

The MMUTIS database consists of major results of field and interview surveys conducted for the study and related data, such as population, land use, road inventory, etc. (refer to Appendix II-15), obtained from other sources. The data are classified into seven categories as listed below:

1) Socio-economic data
   a) Population and household
   b) Employment by workplace
   c) Workers by residence
   d) School attendance
   e) Income level
   f) Car ownership

2) Land-use data
   a) Land area by type of use
   b) Land-use map

3) Transport demand
   a) OD matrices
   b) Other demand data

4) Road and traffic data
   a) Road network
   b) Road inventory
   c) Traffic volume count
   d) Travel speed

5) Public transportation data
   a) Bus/Jeepney route map and operational characteristics
   b) Terminal location map and data
   c) Passenger/driver/operator interview survey data

6) Other transport related data
   a) Port/airport traffic
   b) Water transport-related data
   c) Parking data
   d) Truck survey data
   e) Traffic accident data
   f) Willingness-to-pay survey data

7) Environmental data
   a) Air pollution data
   b) Noise level

Data Category

The data can be categorized from the viewpoint of data processing. The first category is a group of unprocessed data such as traffic count data and the HIS

master file. These raw data will be useful for a user who has particular interest in analysis.

The second category is a group of processed data such as various kinds of OD matrices and a computerized transport network for simulation work. A lot of tables, maps, charts, and graphs are included in the MMUTIS database for general use. Both categories are related to the current simulation. Therefore, these data can be used by any party as a fact if no specific accuracy is required.

The third category is a group of forecast data such as socio-economic parameters, OD matrices and road network. All of them are scenario-specific, i.e., they were projected based on a number of assumptions according to the selected scenario for urban and transport development. They are not facts, and, therefore, require careful handling by database users. When these data are open to external users, database managers must take necessary measures to avoid misunderstanding and misuse. Out of the primary data, the MMUTIS extracted the core data essential for the MMUTIS database and made historical comparison of transportation demand, as shown in Table 16.1. Tables 16.2 and 16.3 summarize the primary and secondary, and tertiary data, respectively.

1) Interrelation of MMUTIS Database with GIS

   Most of the data included in the MMUTIS database can be plotted on a map using STRADA or GIS. Although the MMUTIS used MapInfo for GIS, graphic data are transferable between STRADA and GIS. Figure 16.3 shows schematically the interrelation between MMUTIS database and GIS.

2) Actual Utilization of MMUTIS Database by UP Students

   During the course of the Study, the MMUTIS has been frequently requested by UP students to provide them data necessary for their study and research. Table 16.4 lists the master's degree graduates as of December 1998 who used the MMUTIS database for their thesis.

Table 16.1
MMUTIS Database (Core Data)

Data Category	Data	Year	Update Source
Core Data	1) HIS	1983/96	-
	2) Cordonline data	1983/96	-
	3) Screenline Data	1983/96	-
	4) Land-use Map	1986	NAMRIA
	5) Administrative Boundary Map	1996	LGUs
	6) Population Census	1980/90/95	NSO

Table 16.2
MMUTIS Database
(Primary and Secondary Data including Core Data)

Data Category	Primary Data (Original Data)	Secondary Data (Processed Data)	Update Source
Socio-economic	• Population/household • Zone Map • HIS Master File	• Population data • Employment • School attendance • Income • Car ownership	NSO
Land use	• Land-use Map (GIS)	• Land-use data	NAMRIA
Transport Demand	• HIS Master File	• OD trip tables • Demand data	
Road and Road Traffic	• Road Inventory • Traffic Count • Travel speed	• Road network • Road facilities • Road traffic • Intersection traffic	DPWH
Public Transport	• Rail transit data • Bus/Jeepney data • Public Transport Terminal data • Passenger/driver/ operator interview survey data	• Rail facilities operation • Bus/Jeepney routes and operation characteristics • Terminal Location	DOTC
Other Transport Related	• Port/airport traffic data • Water transport (related data) • Parking data • Truck survey data • Traffic accident data • Willingness-to-pay survey data		
Environment	• Air pollution data • Noise level data		EMB-DENR

Table 16.3
MMUTIS Database (Tertiary Data)

Data Category	Year
• Socioeconomic parameters (population, employment, income, etc.)	2015
• Road network data	2005, 2015
• OD matrices – person-trip basis (by trip purpose for public and private mode)	2005, 2015

Note: All data of this category are scenario-specific.

Figure 16.3
Interrelation between MMUTIS Database and GIS

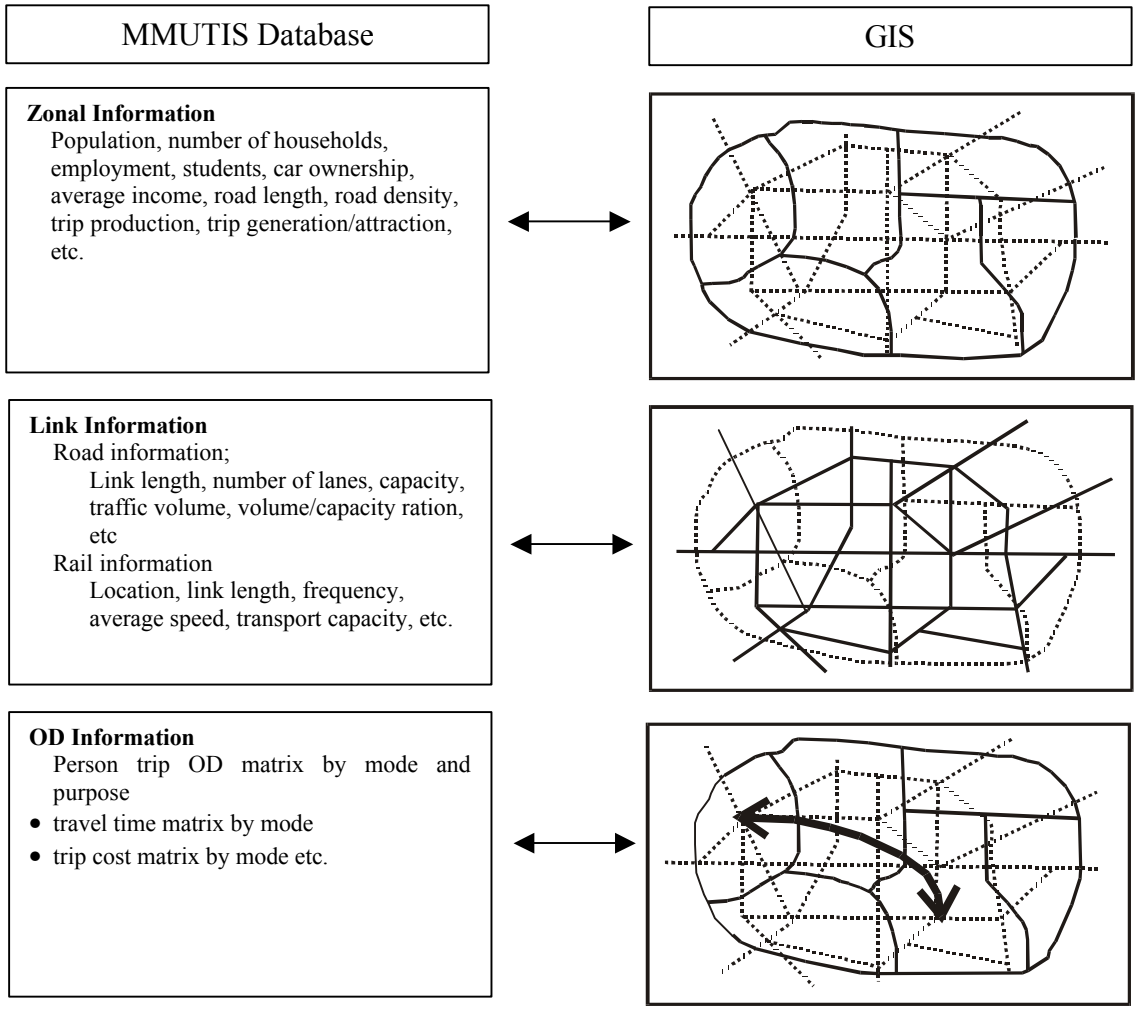


Table 16.4
List of Graduates who used MMUTIS Data for their Theses

No.	Degree	Date Graduated	Title of Thesis	MMUTIS Database Used
1	M.S.C.E	Oct. 1997	Weekend and Holiday Trips in Metro Manila	HIS master file (Form 6)
2	M.A.U.R.P	Apr. 1998	Willingness-to-pay Attitude of Car Users on Toll Charges	Willingness-to-pay Survey Result
3	M.A.U.R.P	Apr. 1998	Work Trip Distribution in Large-scale CBD	HIS master file (Forms 1, 2, 3)
4	M.S.C.E	Apr. 1998	Modeling Car Ownership and Use in Metro Manila	HIS master file (Forms 1, 2, 3)
5	M.A.U.R.P	Apr. 1998	An Analysis of Travel Activity Patterns in Metro Manila	HIS master file (Forms 1, 2, 3)

16.3 Database Management

Key Issues

Form of Database Service: The MMUTIS database itself is an aggregation of various data files of different types. To facilitate access by database users, the host agency should open an Internet home page which will include:

1) Background and objective of database
2) Database structure and file types
3) Data item index
4) Sample data files
5) Procedure to obtain necessary information
6) Rate of charge, etc.

The users can then request the host agency of the database to process the data into necessary forms. The request and the processed data could be sent through the Internet, if necessary.

Host Agency: The host agency of the database is requested to install a well-equipped computer (workstation) with back-up devices connected to the Internet, a digitizer, plotter, scanner, printer(s), and terminal microcomputer(s).

The host agency is also required to provide personnel for the operation of the database (probably one transport planner/database manager and two operators, not on full-time basis). The person in charge should be able to process the data according to the user's request by using specific software depending on the target data files.

Through past MMUTIS seminars and meetings, a consensus was made that the host agency should be the UP NCTS.

Extent of Disclosure: The following is the "Draft Guidelines for the Use of MMUTIS Reports and Database" once discussed in the MMUTIS regular meeting:

DRAFT GUIDELINES FOR THE USE OF MMUTIS REPORTS AND DATABASE

MMUTIS Reports and Database

1. Only MMUTIS reports and survey data cleared for dissemination to concerned government agencies may be used by other agencies, private firms and individuals (e.g., NCTS masteral students).

Official Request

2. Other users need to request officially to any of the member agencies of the MMUTIS Steering Committee, indicating the purpose of the undertaking and the list of requested information.
3. For individual researchers, such as NCTS masteral students, the request should include the endorsement of the student's adviser or the school.
4. For private firms working on government projects, the request should be endorsed by the concerned government agency participating in the project.

Monitoring Report to MMUTIS

5. MMUTIS member agencies which directly provided any report and data to interested parties should furnish the MMUTIS Project Office copies of the written request and the list of reports or data provided to other users.

Full Acknowledgement

6. Users of MMUTIS reports and database should provide full acknowledgement to MMUTIS, such as in sources of information for tables, figures and direct quotations, on any information cited in reports and technical papers prepared by these users.

Independent Views

7. Users of MMUTIS database should be informed that conclusions and recommendations contained in MMUTIS reports and papers are the views of the Study Team and do not reflect the official position of MMUTIS member agencies.

At present, these guidelines are followed. However, the following problems arose:

1) A number of data requests have come from NCTS students, the private sector and government agencies. Requests were varied, and the data processing work had to be done by MMUTIS team members. If entire data files cannot be provided as they are, it becomes always necessary to assess user's request first and then process data in a form suitable to the user's objectives. In addition to the data processing work to be done by the host agency, there could be a discrepancy between user's request and the host agency's judgement (e.g., when a user requests detailed data and the host agency provides only summarized data).

2) The MMUTIS has conducted a demand forecast based on selected development scenarios. The forecast data including socio-economic indicators and OD matrices are included in the MMUTIS database. However, these forecast data become meaningless if the development scenario on which the forecast is based is neglected. Forecast data should not be used independently; it is not only useless but dangerous, sometimes. Taking this into account, the extent of disclosure should be narrowed to primary and secondary data.

Sustainability of Database: Any database deteriorates soon if it is not maintained nor updated. In the MMUTIS database, there are some data files that require huge manpower and financial resources to be updated. It is not the host agency's responsibility to do this. However, for other data files, like traffic volume, bus/jeepney routes, population, and so on, the host agency must update or add data in cooperation with other agencies.

In addition to the maintenance and updating of the database, the host agency must process data according to user's specification using their hardware, software and manpower.

Hence, there is a need for funds to support the activities of the host agency. If government agencies do not fully support the host agency financially, the required funds should be sourced from fees collected from database users. Although this requires further discussion, the charge for database utilization would be composed of the following:

1) Basic Charge

- to cover the host agency's activities to maintain and update the database
- fixed rate by type of request (MMUTIS member agency, other government agency, government-endorsed private organization, academe, etc.) and by type of data files

2) Data Processing Charge

- differs depending on the volume of data processing work by host agency

Database Subcommittee: In the first Steering Committee of the MMUTIS, it was agreed upon that a Database Subcommittee under the Steering Committee, consisting of representatives of the MMUTIS member agencies, would be set up. In its first meeting, the Database Subcommittee would be required to determine the guidelines for database use including the extent of disclosure and charging rate.

In subsequent meetings, the major role of the subcommittee would be to assess requests from database users and determine the appropriate fees and other conditions.

National Center for Transportation Studies (NCTS)

Role of the NCTS: The National Center for Transportation Studies (NCTS) is a leading institution in human resource development in the field of transportation.

As a regular unit of the University of the Philippines System, it is actively involved in research and development activities covering transportation engineering, urban transportation planning, traffic management, environmental and safety studies, as well as regional development studies.

The TRANSPLAN, a proposal for a center of excellence in transportation studies which is the strategic plan for 1995-2008 was approved 14 October 1994 by the Joint Committee chaired by the Chancellor of UP Diliman. The plan calls for the following:

1) As part of its regular activities, the Center plans to create a database management system containing transportation and infrastructure-related data and information on the entire country (in the short term) and on Asian countries (in the medium term). Also in the short term, the linkage with other information centers worldwide will be established. The system will be designed as a repository of basic data to support research activities and to facilitate the exchange of information among researchers in Asian countries and, ultimately, worldwide.

2) The TRANSPLAN also specifies that the NCTS shall offer transportation-related computer seminars on topics such as statistical analysis and transportation planning.

Existing Facilities and Equipment: So far, the Government of Japan through the JICA has provided the Center with one mainframe computer, four workstations and a host of personal computers.

Specialized applications for computer-aided design (CAD) and GIS have been provided. The Center has already installed software for programming and application software for statistical analysis, transportation planning, operations research, and systems simulation. These are managed and maintained in the computer room.

The Center is taking steps to upgrade the existing network to provide efficient and cost-effective client-server functions. The future local area network shall consider the following objectives, including Internet services:

1) Improvement in information transfer and processing
2) Resource sharing
3) Improvement in productivity in research and training programs
4) Utilization of hardware/software and optimization of resources.
5) Promotion of exchanges in internal and external research activities
6) Information dissemination and networking in the global community

Transportation Research and Information Network

The creation of the Transportation and Information Network (TRAIN) is geared toward instituting a central repository for transportation research and information in the Philippines. It is envisioned to assist and inform policy-makers and transport professionals, scientific and academic researchers, the transport industry, and the general public regarding the state of transportation research and information in the country.

The project will involve the processing of network membership applications. Membership will be open to all professionals and researchers in the field of transportation and other related fields. In the initial phase, however, members shall come from the following institutions:

1) NCTS
2) School of Urban and Regional Planning, University of the Philippines
3) Major universities
4) DOTC
5) DPWH
6) MMDA
7) NEDA
8) LTO
9) LTFRB

The project will require initial equipment acquisition and installation, connection with the Internet through a reliable Internet service provider (ISP), such as PHNet, computer programming and content creation, and training of a number of staff on administering the network and Internet services.

The TRAIN shall maintain qualified and component staff that will operate and maintain the network's activities like maintenance of computer networks and equipment, design and implementation of database management systems, as well as maintenance and updating of the database.

To sustain the network, some funds will have to be sourced. The overall cost of running the network will have to be shouldered by data users. Earnings, sponsorships and endorsements from concerned government agencies can build the fund.

Further possible cost recovery schemes are being explored.

17 TECHNOLOGY TRANSFER

17.1 MMUTIS Seminar-workshops and Other Presentations

MMUTIS Seminar-workshops

During the course of the Study, the MMUTIS held a series of seminar-workshops listed in Table 17.1, with the following objectives:

1) To obtain useful information for the MMUTIS from resource persons invited to present.

2) To disseminate the views, findings and planning results of the MMUTIS.

3) To have in-depth discussions and, if possible, reach a consensus.

4) To familiarize participants with the planning methodology.

The latter three objectives are closely related to technology transfer which is one of the study's major objectives. As the MMUTIS became a by-word among transport professionals, the number of participants increased.

Table 17.1
MMUTIS Seminar-workshops

No.	Date	Theme	No. of Participants
1	October 11, 1996	MMUTIS Work Program	39
2	December 6, 1996	Public Transportation	51
3	January 24, 1997	Transport and Land-use Database Management	79
4	March 14, 1997	Transport and Land-use Characteristics	72
5	April 10, 1997	Special MMUTIS Presentation to Vietnamese Delegation in Public Transport Planning Division	49
6	May 8, 1997	MMUTIS Transport Database	81
7	June 20, 1997	Urban Development	70
8	July 16, 1997	Urban Transport Development	86
9	August 29, 1997	Methodology of Transport Demand Forecast	25
10	September 24, 1997	Traffic Improvement Measures	45
11	November 10, 1997	Transport Sector Financing	67
12	December 3, 1997	Urban Transportation Management	120
13	March 12-13, 1998	Urban Development & Planning	150
14	Sept. 15, 1998	Strategic Management of Urban Transportation	250
15	Nov. 19, 1998	Urban Rail Summit (DOTC-TSSP)	95
16	Dec. 9, 1998	Transport Master Plan and Supporting Policies	69

Other Presentations

The MMUTIS also held regular meetings in principle once a week to discuss technical and administrative matters arising from the daily work of the Study Team. A total of 103 meetings were held in three years. In some of these meetings, government agencies and private sector representatives were asked to present on issues. The objectives of these presentations were the same as those of the MMUTIS seminar-workshops. Table 17.2 lists the presentations conducted during regular MMUTIS meetings.

17.2 Training on STRADA and MMUTIS Transport Models

Training Program

Table 17.3 shows the training course program conducted in December 1998 pertaining to STRADA and MMUTIS transport models. In the training, focus was placed not only on how to use these models but also on how to accurately interpret outputs for planning purposes. Approximately 20 persons from different agencies, including the DOTC, DPWH, MMDA, and NCTS, participated in the course.

Training Evaluation

The training course was completed in December 11, 1998. Afterward, an evaluation was conducted by both the participants and the lecturer to gauge the participants' understanding of the models and for the lecturer to assess the

Table 17.4 shows the profile of participants. Six were from the NCTS and the remaining 14 from other agencies. Six participants were once trained in transport planning.

Table 17.5 presents the evaluation results of the training course by the participants. Most of their answers were favorable, giving either "good" or "fair" answer to most of the questions. However, the percentage of "poor" was high for "explanation" (i.e., English proficiency of Japanese lecturers) and "model equations" (i.e., mathematics). The major comments from the participants include:

1) STRADA should be distributed to the participants during or after the training course.

2) Training schedule was too tight. It should be longer and held more often.

3) Japanese experts should train Filipino assistants. They can help the lecturer, or even conduct the training course themselves.

4) Attention should be paid to the difference in the technical background of the participants.

5) STRADA can be more user-friendly if the "Help" menu is available in every step.

6) A Magnabyte-type overhead projector would help the lecture greatly.

7) For better understanding of the methodology, a complete set of examples should be given starting from trip generation to traffic assignment.

8) An advanced training course should be held for those who use STRADA thoroughly. It will help users if the NCTS can be consulted readily in case STRADA and the models do not give expected outputs or when errors occur.

9) Future training on STRADA should use the final MMUTIS data used by the consultant and should involve practical exercises such as economic evaluation of road projects.

Table 17.2
Presentations during Regular Meetings of the MMUTIS

Date	Topics	Presentor
Nov. 18, 1996	Overall Plans & Programs of the DPWH for CY 1995-2000	Dir. Elisa Joson (DPWH-URPO)
Dec. 9, 1996	Industrial Electronics Systems	Mr. Masayoshi Suzuki (NEC)
Dec. 17, 1996	Metro Manila Physical Framework Plan	AGM Alex Cabanilla (MMDA)
Jan. 13, 1997	NAIA Access Roadway Study	Mr. Ronnie Navarro (SCHEMA)
Jan. 27, 1997	Clark Rapid Railway System	Mr. Steve Cases (North Rail)
	Fort Bonifacio Master Plan	Dr. Art Corpuz (BCDA)
Mar. 24, 1997	Pasig River Ferry	Mr. Ed Manuel (Starcraft Ferry)
Mar. 31, 1997	Metro Manila Rail Network Development Program	Ms. Vangie Razon (LRTA)
Apr. 7, 1997	Boulevard 2000	Mr. Bernardo Viray & Ms. Angelita Arcilla (PEA)
April 11, 1997	Cavite Provincial Development Plan	Mr. Dante Reyes (Cavite-PPDO)
May 21, 1997	NAIA Master Plan	Mr. Danilo Pagsanjan
	Integrated Transport Planning (USAID)	Mr. John Ernst (IIEC)
May 26, 1997	MMUTIS GIS	Mr. Omar Mendoza (Cybersoft)
June 9, 1997	MCX Rail Project & Ayala Center Plans and Dev. Programs	Dr. Art Corpuz (Ayala Center Inc.)
June 23, 1997	MMURTRIP Project Preparation Stage I Update on USAID ITP Project Commuter Rail Lines	Mr. Geoffe Key, Mr. John Ernst & Mr. Rafael Mosura (PNR)
July 7, 1997	Modernization: A Philippines LTO 2000 Vision	Mr. Rene Tababa
Aug. 7, 1997	North Rail Traffic Study	Mr. John Thomas & Mr. James Lather
Aug. 18, 1997	Manila Skyway I & II	Mr. Allan Knox & Mr. Dante Bautista
Sept. 15, 1997	USTDA-assisted Manila Airport LRT Project Study	Mr. John Priede
Sept. 22, 1997	C-5 Busway System (PHILTRACK)	Mr. Francis Yuseco
Sept. 29, 1997	Pasig River Environmental Management and Upgrading Project	Mr. Keith Perry
Oct. 20, 1997	NAIA Terminal 3 Project & Traffic Study	Mr. Nabor Gaviola & Mr. Teofilo Asuncion
Dec. 12, 1997	Manila Harbor (R10-C3) Fly Way	Mr. Thomas Daniel
Feb. 9, 1998	LRT 1 Extension by (SNC-LAVALIN)	Mr. Grant Miyasaki & Mr. Mel Samson
Apr. 20, 1998	NAMRIA Browser System Transport Infra. Mapping	Mr. Ruel Belen Mr. Stadel Jurgen
June 8, 1998	MMUTRIP Stage 1 Study	Mr. Geoffe Key & Mr. Seng Felias
June 15, 1998	NAMRIA'S Proposal on GIS-based Infra Browser System for Metro Manila	Mr. Jurgen Stadel & Ms. Wilma Capistrano
June 22, 1998	EXPO 2000	Mr. Kebers Jean Luc
July 21, 1998	Autoscope Wide Area Video Vehicle Detection System	Engr. Scott Israelson
Nov. 17, 1998	Advanced Urban Transit System, KOBE Steel Ltd.	Mr. Shinichi Hara Mr. Eturo Nakamura

Table 17.3
Training Programs on STRADA and MMUTIS Transport Models

Date/Time		Subject
Dec. 2 (Wed.)	9:00 – 9:15	Opening Speech (NCTS)
	9:15 – 9:30	Course Orientation
	9:30 – 10:30	Traffic Demand Model for Master Plan Study
	10:30 – 10:45	Coffee Break
	10:45 – 12:00	Outline of STRADA
Dec. 3 (Thur.)	9:00 – 10:30	Model Building Procedure for OD Tables
	10:30 – 10:45	Coffee Break
	10:45 – 12:00	Model Building Exercise of OD Tables (1)
Dec. 4 (Fri.)	9:00 – 12:00	Model Building Exercise of OD Tables (2)
Dec. 7 (Mon.)	9:00 – 10:30	Methodology of Traffic Assignment and Traffic Analysis
	10:30 – 10:15	Coffee Break
	10:15 – 12:00	Exercise of Traffic Assignment Analysis (1)
Dec. 8 (Tue.)	9:00 – 12:00	Exercise of Traffic Assignment Analysis (2)
Dec. 10 (Thur.)	9:00 – 10:00	Methodology of Transit Assignment Analysis
	10:00 – 10:15	Coffee Break
	10:15 – 12:00	Exercise of Transit Assignment Analysis
Dec. 11 (Fri.)	9:00 – 10:30	NCTS as a Management Center of Transport Models and Database
	10:30 – 11:45	Evaluation
	11:45 – 12:00	Closing Remarks

Table 17.4
Profile of Participants in the Training Course

Academic Background	Formal Training	Agency		
		NCTS	Others	Total
BS	Yes	1	2	3
	No	4	10	14
MA	Yes	1	2	3
	No	0	0	0
Total	Yes	2	4	6
	No	4	10	14
	Total	6	14	20

Table 17.5
Assessment of Training Course by the Participants

Item	Total			NCTS			Others			BS			MA		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
Opinion on Lecture															
1. Level of Lecture	6	14	0	4	2	0	2	12	0	4	13	0	2	1	0
Rate (%)	30.0	70.0	0.0	66.7	33.3	0.0	14.3	85.7	0.0	23.5	76.5	0.0	66.7	33.3	0.0
2. Explanation	4	11	4	0	3	2	4	8	2	3	9	4	1	2	0
Rate (%)	21.1	57.9	21.1	0.0	60.0	40.0	28.6	57.1	14.3	18.8	56.3	25.0	33.3	66.7	0.0
3. Handout	14	6	0	3	3	0	11	3	0	11	6	0	3	0	0
Rate (%)	70.0	30.0	0.0	50.0	50.0	0.0	78.6	21.4	0.0	64.7	35.3	0.0	100.0	0.0	0.0
4. Transparencies	16	4	0	5	1	0	11	3	0	13	4	0	3	0	0
Rate (%)	80.0	20.0	0.0	83.3	16.7	0.0	78.6	21.4	0.0	76.5	23.5	0.0	100.0	0.0	0.0
5. English of Lecturer	4	14	2	2	4	0	2	10	2	2	13	2	2	1	0
Rate (%)	20.0	70.0	10.0	33.3	66.7	0.0	14.3	71.4	14.3	11.8	76.5	11.8	66.7	33.3	0.0
Level of Understanding															
1. MMUTIS Framework	8	12	0	4	2	0	4	10	0	6	11	0	2	1	0
Rate (%)	40.0	60.0	0.0	66.7	33.3	0.0	28.6	71.4	0.0	35.3	64.7	0.0	66.7	33.3	0.0
2. Demand Forecast	5	14	1	1	5	0	4	9	1	3	13	1	2	1	0
Rate (%)	25.0	70.0	5.0	16.7	83.3	0.0	28.6	64.3	7.1	17.6	76.5	5.9	66.7	33.3	0.0
3. Model Equations	5	11	4	1	2	3	4	9	1	2	11	4	3	0	0
Rate (%)	25.0	55.0	20.0	16.7	33.3	50.0	28.6	64.3	7.1	11.8	64.7	23.5	100.0	0.0	0.0
4. Model Building	4	14	2	1	4	1	3	10	1	1	14	2	3	0	0
Rate (%)	20.0	70.0	10.0	16.7	66.7	16.7	21.4	71.4	7.1	5.9	82.4	11.8	100.0	0.0	0.0
5. Model Parameters	6	13	1	1	5	0	5	8	1	3	13	1	3	0	0
Rate (%)	30.0	65.0	5.0	16.7	83.3	0.0	35.7	57.1	7.1	17.6	76.5	5.9	100.0	0.0	0.0
6. Mode Output	4	15	1	2	4	0	2	11	1	1	15	1	3	0	0
Rate (%)	20.0	75.0	5.0	33.3	66.7	0.0	14.3	78.6	7.1	5.9	88.2	5.9	100.0	0.0	0.0
7. MMUTIS Models	5	14	1	1	5	0	4	9	1	3	13	1	2	1	0
Rate (%)	25.0	70.0	5.0	16.7	83.3	0.0	28.6	64.3	7.1	17.6	76.5	5.9	66.7	33.3	0.0
8. How to Use STRADA	2	18	0	0	6	0	2	12	0	1	16	0	1	2	0
Rate (%)	10.0	90.0	0.0	0.0	100.0	0.0	14.3	85.7	0.0	5.9	94.1	0.0	33.3	66.7	0.0
Opinion on STRADA															
1. Integrity	10	9	0	4	2	0	6	7	0	9	8	0	1	1	0
Rate (%)	52.6	47.4	0.0	66.7	33.3	0.0	46.2	53.8	0.0	52.9	47.1	0.0	50.0	50.0	0.0
2. User Interface	9	10	1	2	4	0	7	6	1	7	9	1	2	1	0
Rate (%)	45.0	50.0	5.0	33.3	66.7	0.0	50.0	42.9	7.1	41.2	52.9	5.9	66.7	33.3	0.0
3. Graphics	15	5	0	6	0	0	9	5	0	13	4	0	2	1	0
Rate (%)	75.0	25.0	0.0	100.0	0.0	0.0	64.3	35.7	0.0	76.5	23.5	0.0	66.7	33.3	0.0
4. Model Options	8	11	1	3	3	0	5	8	1	7	9	1	1	2	0
Rate (%)	40.0	55.0	5.0	50.0	50.0	0.0	35.7	57.1	7.1	41.2	52.9	5.9	33.3	66.7	0.0
5. Applicability to Work	12	8	0	2	4	0	10	4	0	9	8	0	3	0	0
Rate (%)	60.0	40.0	0.0	33.3	66.7	0.0	71.4	28.6	0.0	52.9	47.1	0.0	100.0	0.0	0.0
Item	Yes	No		Yes	No		Yes	No		Yes	No		Yes	No	
6. Private Use	3	16		1	5		2	11		3	14		0	2	0
Rate (%)	15.8	84.2		16.7	83.3		15.4	84.6		17.6	82.4		0.0	100.0	0.0