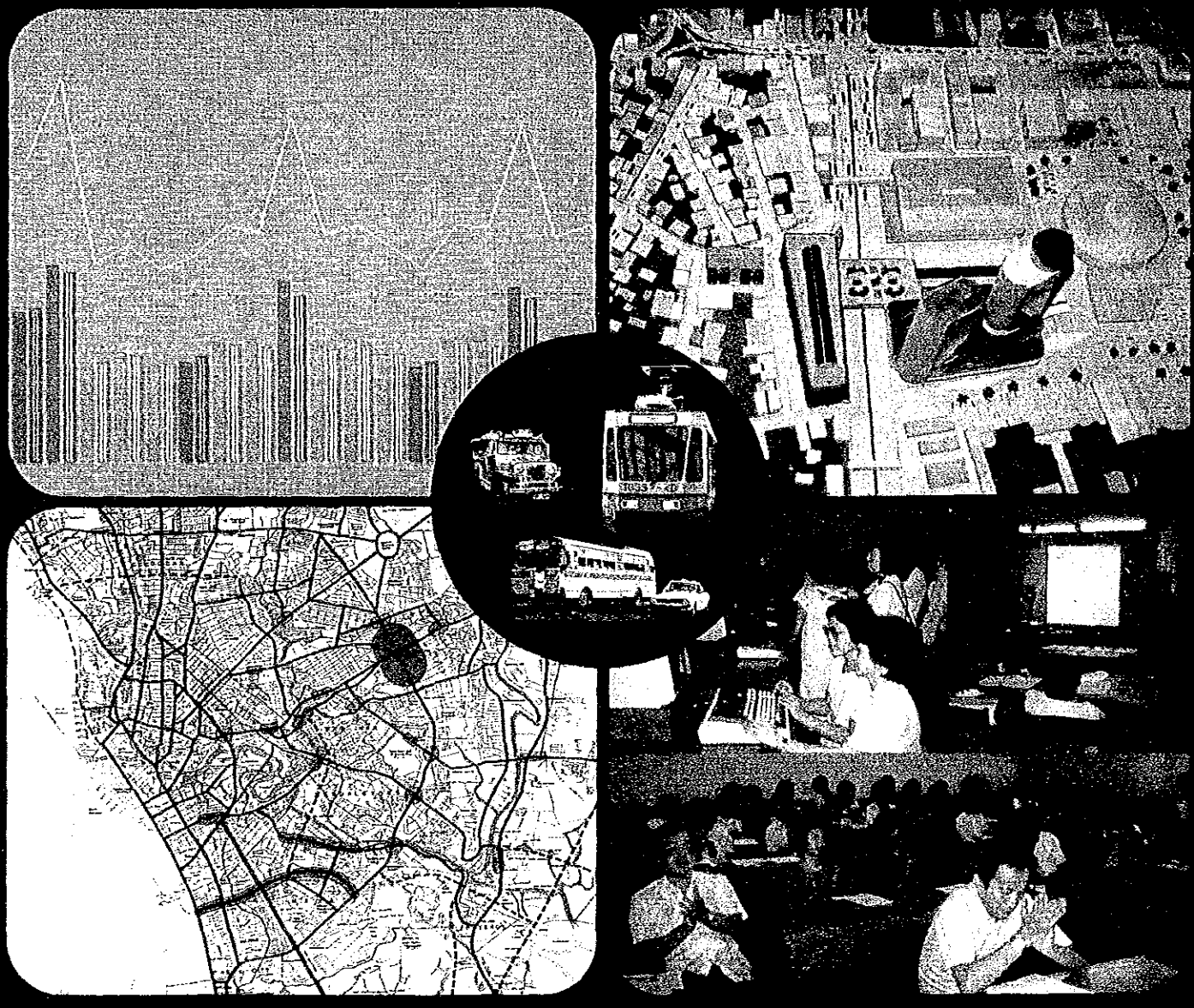
社会開発協力部報告書

REPUBLIC OF THE PHILIPPINES No. 51

JUMSUT

The Metro Manila Transportation Planning Study Phase II Final Report

MAIN TEXT



SEPTEMBER 1985

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of the Government of the Republic of the Philippines, the Japanese Government decided to conduct a study on the Metro Manila Transportation Planning (JUMSUT) Phase II and entrusted the Study to the Japan International Cooperation Agency.

The J.I.C.A. sent to the Republic of the Philippines a study team headed by Mr. Shizuo Iwata, ALMEC Corporation, from June 1984 to March 1985.

The team exchanged views with the officials concerned of the Government of the Republic of the Philippines and conducted a field survey in Metro Manila.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the team.

September, 1985

Keisuke Arita
President
Japan International Cooperation Agency

Mr. Keisuke Arita
President
Japan International Cooperation Agency
Tokyo, Japan

September 1985

Dear Sir:

LETTER OF TRANSMITTAL

We are pleased to formally submit herewith the final report on "The Metro Manila Transportation Planning Study (JUMSUT) Phase II". This study report comprising an Executive Summary, a Main Text, and nine (9) Technical Reports embodies the results of the study undertaken by ALMEC Corporation during the period from June 1984 to September 1985.

The main objective of the study was to formulate proposals for the further improvement of the public transportation route structures and for the development of selected mode interchange areas, both from the short-term and mid-term planning periods. Complementary to this objective, a series of seminars were conducted for effective transfer of technology.

We hope that this study would be of valuable assistance to the Government of the Republic of the Philippines not only for the present transportation improvement of Metro Manila but also for the future development of its transportation schemes.

We wish to express our appreciation and sincere gratitude to the officials of your Agency, Advisory Committee, the Embassy of Japan to the Republic of the Philippines, as well as to the officials and individuals of the agencies concerned of the Government of the Republic of the Philippines, particularly the Ministry of Transportation and Communications for the assistance and cooperation extended to the Study Team.

Very truly yours,

Shizuo Iwata
Managing Director
ALMEC Corporation
Project Manager
Metro Manila Transportation
Planning Study (Phase II)

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6.0 MODE INTERCHANGE AREA PLANNING

GLOSSARY

ADT	Average Daily Traffic
BCGS	Bureau of Coast and Geodetic Survey
BLT	Bureau of Land Transportation
BOT	Board of Transportation
CBD	Central Business District
CCP	Cultural Center of the Philippines
CHPG	Constabulary Highway Patrol Group
EDSA	Epifanio de los Santos Avenue
FEU	Far Eastern University
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
HIS	Home Interview Survey
HOV	High Occupancy Vehicle
JICA	Japan International Cooperation Agency
JUMSUT	JICA Update of Metro Manila Study on Urban Transportation (The Metro Manila Transportation Planning Study)
LOV	Low Occupancy Vehicle
LRT	Light Rail Transit
LTPD	Land Transportation Planning Division
MECS	Ministry of Education, Culture and Sports
MIA	Mode Interchange Area
MIS	Management Information System
MMC	Metro Manila Commission
MMTEAM	Metro Manila Traffic Engineering and Management Project
MMUTIP	Metro Manila Urban Transport Improvement Project
MMUTSTRAP	Metro Manila Urban Transportation Strategy Planning Project
MOTC	Ministry of Transportation and Communications
MPWH	Ministry of Public Works and Highways
NCR	National Capital Region
NCSO	National Census and Statistics Office
NEAP	Network Assignment Program
NEDA	National Economic and Development Authority
NHA	National Housing Authority
NS	North to South Screenline
OBA	Old Bilibid Area
OD	Origin-Destination
PC/INP	Philippine Constabulary/Integrated National Police
PDC	Progressive Development Corporation
PNR	Philippine National Railways
PT	Public Transport
PU	Public Utility
PUB	Public Utility Vehicle
PUJ	Public Utility Jeepney
PUV	Public utility Vehicle
ROE	Return on Equity
ROW	Right-of-Way
TCC	Traffic Control Center
TCT	Traffic Citation Ticket
TOC	Traffic Operations Center
TEAM	Traffic Engineering and Management
TRANSEC	Transportation Secretariat
TTC	Transport Training Center
UP	University of the Philippines
URPO	Urban Roads Project Office

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1.0 INTRODUCTION

1.0 INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

The Metro Manila Urban Transportation Planning Study (otherwise known as JUMSUT) Phase II was started June 1984 based on the recommendations made in Phase I which commenced in October 1982 and ended in March1984. The objectives of the Phase I study were on the strengthening of the transportation data base and planning procedures, the short-term route improvement of public transportation along the LRT, and a preliminary assessment of the public transportation terminals or turning points in the metropolitan area.

As a sequel, JUMSUT Phase II seeks to further the improvement of public transportation by focusing on two parameters – routes and mode interchange areas. Taking short-term and mid-term viewpoints, the study's specific objectives are:

a) To conduct supplemental transport surveys and to forecast 1990 public transportation demand, including a limited HIS in areas peripheral to Metro Manila, and screenline/cordonline surveys to update traffic demand data.

b) To formulate public transportation route improvement plans comprising

   1) Detailed short-term route improvement proposals for the eastern part of Metro Manila;

   2) Broad route restructuring schemes for the entire Metro Manila over the mid-term horizon.

c) To formulate development plans and assess the feasibility of five selected mode interchange areas in Cubao, Recto, Divisoria, Novaliches, and C-3/Quezon Avenue.

d) To conduct seminars as a mechanism for technology transfer, among others.

1.2 STUDY AREA AND FRAMEWORK

While the study area encompasses the Metro Manila region, the planning work revolves around specific topical areas, such as:

– 1984 Supplemental HIS for the towns within a 30-kilometer radius and at the periphery of Metro Manila, such as: Obando, Meycauayan, Marilao, Bocaue, Sta. Maria, and San Jose del Monte in the north; Montalban, San Mateo, Antipolo, Cainta, Taytay, Angono, and Binangonan in the east; and Bacoor, Kawit, Cavite, Noveleta, Rosario, Imus, Dasmariñas, San Pedro, Biñan, Carmona, and Cabuyao in the south.

- For the short-term public transportation route improvement component, the eastern part of Metro Manila defined generally by Quezon Avenue, Buendia and C-2.

- The mid-term public transportation route planning component covers the whole Metro Manila.

- The mode interchange area planning component is limited to Cubao, Recto, Divisoria, Novaliches, and C-3/Quezon Avenue.

In terms of planning activities, JUMSUT Phase II consists of three principal undertakings, namely:

- Public transportation route improvement study divided into short-term and mid-term planning initiatives;

- Mode interchange area planning;

- Technology transfer in the form of seminars and on-the-job training.

The methodology, scope and interrelationships between study components are illustrated in Figure 1.1, while the location of the Study Areas is shown in Figure 1.2.

1.3 REPORT COMPOSITION

The final reports of JUMSUT Phase II are contained in the following volumes:

a) An Executive Summary

b) A Main Text

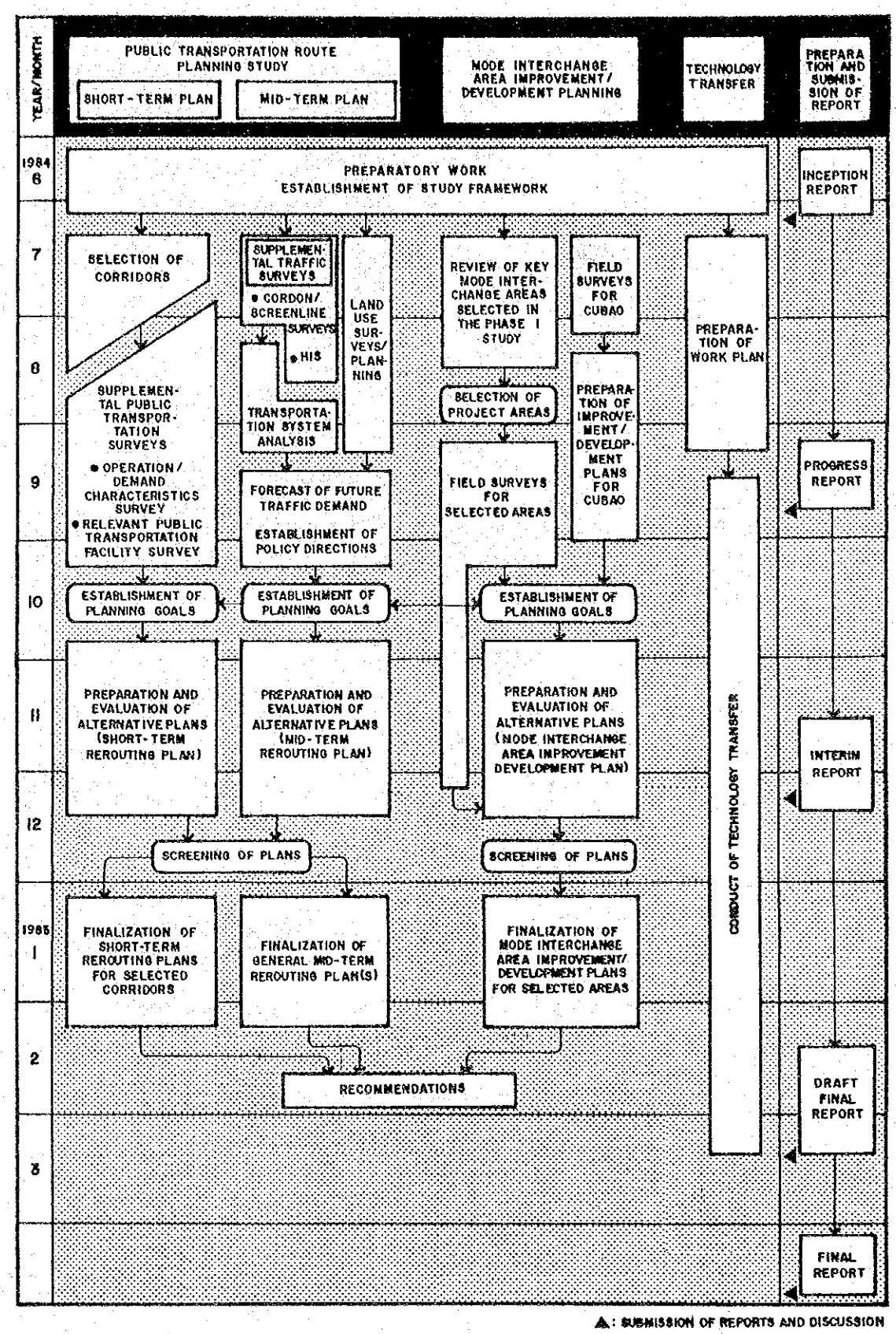
c) Technical Reports in 9 separate covers:

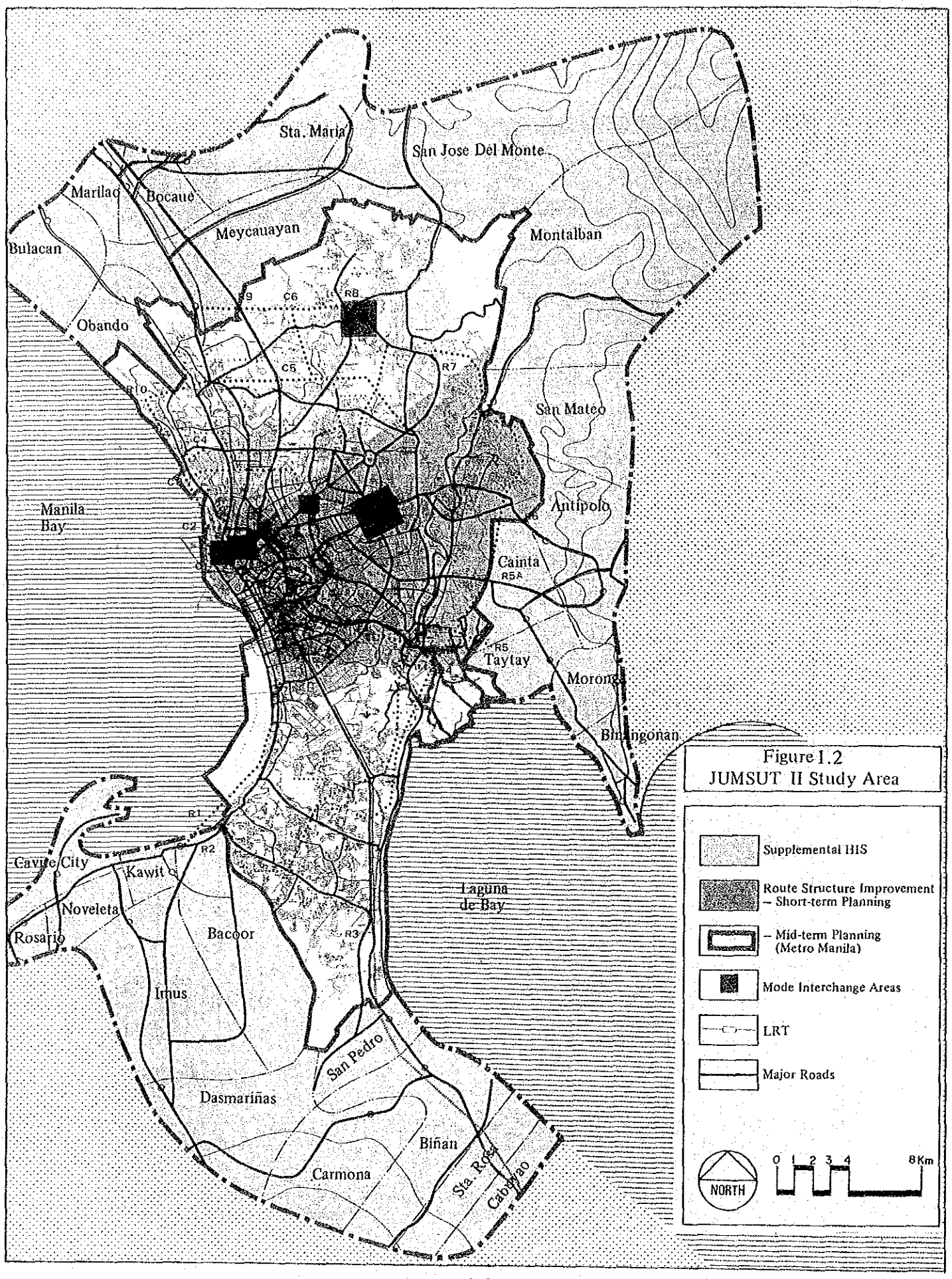
1) Supplemental Surveys and Analysis
2) Transportation Demand Analysis
3) Public Transportation Route Structure Improvement Study
4) Cubao Mode Interchange Area Study
5) Recto Mode Interchange Area Study
6) Divisoria Mode Interchange Area Study
7) Novaliches Mode Interchange Area Study
8) C-3/Quezon Avenue Mode Interchange Area Study
9) Users' Reference in Microcomputer Seminar for Transportation Planning

1.4 PREVIOUS STUDIES

Several studies have been undertaken in the past concerning Metro Manila's transportation system. The more recent ones are: Metro Manila Traffic Engineering and Management Project (MMTEAM II), Metro Manila Urban Transportation Strategy Planning Project (MMUTSTRAP) B1 and B2 and Topical Studies done by the Ministry of Transportation and Communications (MOTC). These are briefly discussed hereafter

Figure 1.1
Overall Study Framework and Flow




Sta. Maria
San Jose Del Monte
Marilao
Bocaue
Meycauayan
Montalban
Bulacan
Obando
C6
R8
C5
R7
R10
San Mateo
C4
C3
Manila
Bay
C2
Antipolo
Cainta
R5A
R5
Taytay
Morong
Binangonan
R1
R2
Cavite City
Kawit
Laguna
de Bay
Noveleta
Rosario
Bacoor
R3
Imus
San Pedro
Dasmariñas
Biñan
Carmona
Sta. Rosa
Cabuyao
Figure 1.2
JUMSUT II Study Area
Supplemental HIS
Route Structure Improvement
– Short-term Planning
– Mid-term Planning
(Metro Manila)
Mode Interchange Areas
LRT
Major Roads
NORTH
0 1 2 3 4 8Km

a) MMTEAM II

MMTEAM II is concerned with the study and installation of traffic signals at about 170 locations in the area between C-2 and C-4. The target period for the complete implementation of these signalization is in the year 1987. Its major effect on public transport will likely be in better control of schedules and higher trips. The Project is funded by OECF.

b) MMUTSTRAP B1

This project, with ADAB assistance, recommended several institutional and policy proposals and has prepared feasibility studies for five major public transport terminals, four traffic sectors, two traffic corridors and three traffic management sub-areas. This study touched on a range of institutional, technical and engineering aspects, such as:

i) road classification

ii) traffic management and control, e.g., signalization, intersection improvements, street lights, pedestrian facilities, circulation, parking, etc.

iii) transport regulations and operations

iv) freight movement and trucking operations

v) enforcement and traffic administration

vi) terminal development

c) MMUTSTRAP B2

MMUTSTRAP B2 is currently being undertaken under MPWH with IBRD-funding. Its main purpose is the preparation of investment packages for primary and secondary road projects in Metro Manila, which were initially identified in MMUTSTRAP Parts A and B1. It has the responsibility of preparing feasibility studies and preliminary designs for priority roads and for important links not previously studied.

d) JUMSUT Phase I

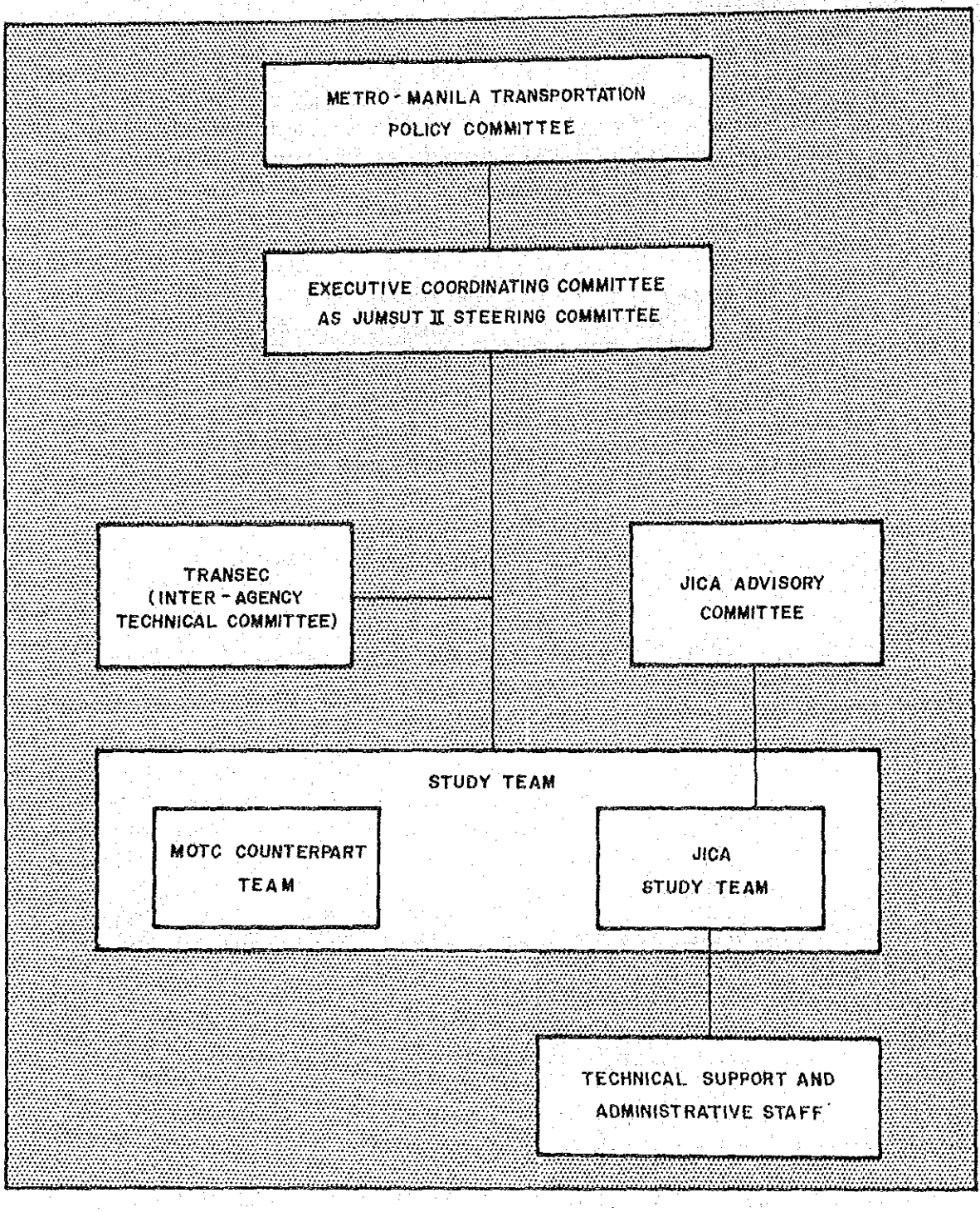
The predecessor to this study, JUMSUT I undertook several surveys and made recommendations in Metro Manila with concentration on road-based public transport rerouting vis-a-vis the LRT along Taft and Rizal Avenue.

What differentiates JUMSUT Phase II from the preceding planning studies are its outputs of supplemental HIS, expanded and updated OD Tables, a detailed forecast for 1990 covering land use and transport, public transport route designs in the short and medium term, and prefeasibility of five mode interchange areas.

1.5 STUDY TEAM ORGANIZATION

The Study was conducted under the project organization shown in Figure 1.3 and by the members listed hereafter during the study period, direct and indirect assistance and cooperation were extended by various officials and personnels from different agencies and organizations as listed in Appendix 1.1.

Figure 1.3
Project Organization Chart



Metro Manila Transportation Policy Committee:

Minister Jose P. Dans, Jr. – MOTC
Minister Jesus S. Hipolito – MPWH
Vice Gov. Ismael A. Mathay – MMC
Brig. Gen. Fidel V. Ramos – PC Chief/INP D.G.

Executive Coordinating Committee:

Chairman :	Dep. Min. J. P. Lavares, Jr.	– MOTC
Members :	Asst. Sec. J. R. Valdecañas	– MOTC
	Asst. Sec. T. T. Encarnacion	– MPWH
	Comm. N. von Einsiedel	– MMC
	Gen. P. A. Laroya	– CHPG

Japanese Advisory Committee:

Chairman :	Dr. T. Kurokawa	
Members :	Dr. M. Asano	Mr. M. Kanno
	Mr. K. Takeda	Mr. S. Saso
	Mr. K. Satoi	Mr. K. Takeda

TRANSEC (Inter-Agency Technical Committee):

Mr. G.Z. Galano	– MPWH (URPO)	Mr. S. R. Corteza	– BOT
Mr. E. D. Tayao	– MPWH (NCR)	Mr. C. T. Guarin	– BLT
Mr. V. C. Rojas	– MPWH (TEAM)	Maj. L. R. Villaroel	– CHPG
Ms. L. V. de Villa	– MMC (OCP)	Mr. E. T. Rosete	– MOTC
Ms. Ma. T. R. Ignacio	– MMC (TOC)	Ms. L. B. Castillo	– MOTC
Mr. O. T. Tolosa	– BOT		

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Public Transport/ Terminal Planner	: A. R. Manresa	Transport Analyst	: K. Imamura
Terminal Planner	: R. P. Soro, Jr.	Transport Analyst	: T. Kidokoro
Transport Planner	: J. R. Bondoc	Traffic Management	: K. Iwata
Transport Planner	: C. S. Buhisan	Terminal Planner	: S. Furusawa
Systems Analyst	: M. F. Alejandro	Terminal Planner	: Y. Kanno
Terminal Planner (MMC)	: J. P. Placido	Terminal Planner	: M. Kotoh
Public Transport Planner (BOT)	: A. O. Sesperes	Systems Engineer	: N. Okamura
Public Transport Planner (BLT)	: L. Q. Diego	Management Specialist	: M. Tomioka
Public Transport Planner (CHPG)	: A. G. de la Cruz	HIS Analyst	: K. Nakajima
Consultant	: D. M. Dent	Transport Planner	: R. Santiago
Consultant	: T. Ida	Architect/Cost Estimator	: G. Manahan
		Systems Analyst	: M. Tuazon

Technical Staff:
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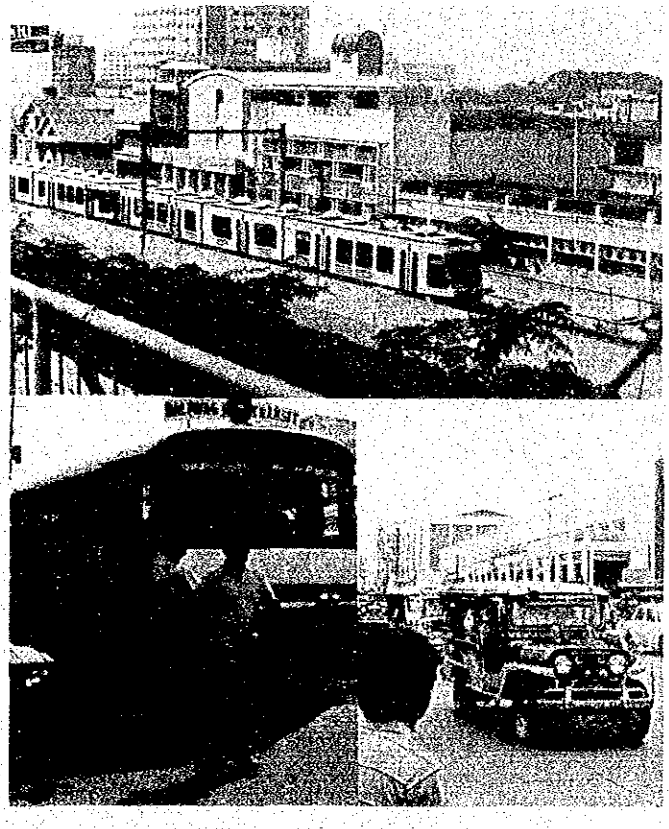
S.M. Rebano (Project Coordination)
R.S. Navarro (Terminal Planning)
D.B. Salazar (Terminal Planning)
P.A. Mabunga (Terminal Planning)
R.R. Vitasa (Landuse Analysis)

2.0 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS



2.0 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

2.1 ROUTE IMPROVEMENTS

2.1.1 Planning Considerations

The recommendations are arranged for short-term and mid-term implementation, where the first category implies immediate executability without the requisite of capital outlays.

While both bus and jeepney are covered, most of the proposals concern the latter mode for the simple reason that they predominate in the areas/corridors under review. Besides, the routes in need of improvements happen to be jeepney territory. The route modifications and redesigns are motivated by the following considerations:

- Alleviation of traffic congestion by means of suitable turning circuits and improved terminals or turning points;
- Efficiency of public transport service through expansion of existing service areas and upgrading of fixed facilities in relation to the revised routes;
- Facility in traffic management and control of public transport routes by simplification, combination, integration, and/or length reduction;
- Optimum utilization of limited road spaces via change in the modal split and vehicle mix and opening up new routes in new roads;
- Improvement of the overall route structure in consonance with such changes as new roads, new modes (e.g., LRT), land use developments, and regulatory initiatives.

2.1.2 Short-term Proposals

While the study area encompassed the entire Metro Manila because of the indivisibility of the network, the central-eastern sector of the metropolis was the main focus.

All existing studies and routes were examined as springboard for analysis. The problems were then identified in terms of physical location and type, supported by field surveys. The planning approach can be visualized in Table 5.1.

The problem areas are of three categories, viz.:

a) **Multi-dimensional,** where the magnitude of the transport problem is large and complex as to require a multi-pronged solution such as in the following:

- Marikina Town Proper
- N. Domingo
- Sta. Mesa
- Pasig Town Proper
- EDSA/Shaw
- Kalentong
- Guadalupe
- J. P. Rizal
- Paco
- Buendia

b) **Capacity-constraint areas**, where traffic congestion is due mainly to road inadequacy and short-term remedies are limited. For example, in the following areas:

- España
- Nagtahan/R. Magsaysay
- Rosario Junction
- EDSA/Ortigas

c) **Minor problem areas**, where problems are less severe and solutions simple, such as:

- Ortigas/Santolan
- D. M. Marcos/T. Sora
- Quezon/Roosevelt
- E. Rodriguez/Banaue
- EDSA/Kamias
- Aurora/Anonas
- La Salle in Ortigas
- Broadway Centrum

The detailed recommendations are presented in Chapter 5 of this report and discussed in a companion technical report. The route proposals are described in detail and supported by corresponding route maps. Although they vary from one area to another, their common denominator is implementability and decongestion.

2.1.3 Mid-term Route Improvements

These are primarily in response to anticipated demand by 1990 and likely changes in the road network and urban space. Transport demand is forecasted to go up by 37% from 1980 to 1990, or by 17% from 1984 to 1990. This deceleration is due to the prolonged effects of the present economic difficulties with consequent slowdown in the historical growth trend for private cars. As a result, greater reliance on the public transport system is expected.

Strengthening of the higher occupancy modes (e.g.,.LRT, PNR, Buses) is therefore recommended. As a general rule, the level of jeepney operations should remain at present levels rather than be allowed to grow to accommodate increments in demand by 1990.

Buses should be expanded in several existing congested corridors where roads are relatively wide or where unused sidestreets are available. These corridors include Shaw Boulevard, E. Rodriguez, Aurora Boulevard, España, C-2, Buendia, and McArthur Highway.

Since completion of committed projects would be insufficient to relieve traffic congestion, additional investments in "hardware" appear warranted. Among these are construction of R-1, completion of C-3, extension of LRT Line 1, and start of LRT Line 2.

The intermodal complementation, especially between buses and jeepneys, should be enhanced. Among the measures that can be taken along these directions are:

- controlling the jeepney route distance to 15 kilometers with corresponding restructuring of bus routes

- opening up of more jeepney routes in poorly served areas with feeder connections to bus or LRT, but, with minimum or no expansion of jeepney population

- effective administration and policing of franchises in every route.

Application of Disaggregate Behavior Model strongly suggests that the most effective tool to achieve complementation is through fare differentiation.

2.2 MODE INTERCHANGE AREAS

2.2.1 Concept Plan

As the demand for and number of public transport fleet increases so will their terminals and turning points become checkpoints in the road network of Metro Manila. This is so because the initial advantage of on-street terminals is then superseded by its disadvantages. At saturation levels, use of streets for non-moving activities becomes intolerable and uneconomical.

JUMSUT II studied five selected terminal areas comprehensively and produced a package of recommendations that will relieve bottlenecks and lead to the improvement of public transport services, not to mention passenger conveniences. This study also concluded that treatment of these terminal areas should go beyond the physical dimension and into the broader concept of mode interchange centers where vehicles, passengers and socio-economic activities converge, occur, and interact to create a living urban space.

Specific site recommendations have been made for each of the five selected mode interchange areas including concrete suggestions for their realization in time and space. Table 2.1 gives a brief comparison of the five MIAs.

2.2.2 Recommendations for the Five MIAs

a) Cubao

The Araneta Center should incorporate terminal spaces at ground level in their future plans for Cubao in lieu of or in addition to car parks. Government should encourage this type of development on both sides of EDSA by means of tax incentives and land/building controls. Other recommendations in the short to medium term periods are the following:

- Rerouting of jeepneys to six different directions, principally to relieve the congested Aurora-EDSA intersection

- Better queueing of buses along the EDSA service roads through a combination of dispatching control and more loading bays

- Improving the internal circulation system within the Araneta Center
- Provision of additional pedestrian facilities in the area, both within and without the Center
- Introduction of revised and improved traffic management measures along Aurora
- Expanding the capacity of the external access to Cubao through one-way couples for Ermin Garcia and New York and for P. Tuazon and Banahaw, a new bridge at Dilimán Creek to link Aurora to Kamias, and extension of G. Araneta street to 7th Avenue.

b) Recto

The short to medium term recommendations are geared towards existing traffic problems and the opening of the north section of the LRT while the long-term proposals are in relation to the overall transport problems of Quiapo and redevelopment of Old Bilibid. Thus, the following:

- Rerouting of northbound and southbound jeepneys
- Controlling utilization of A. Mendoza service road to deter inner lane loadings/unloadings and waiting
- Effective utilization of D. Jose roads near the LRT station through repaving, markings, and loading bays
- Construction of the pedestrian skyways across Old Bilibid (as proposed by MMC)
- Allocation of about 14,600 square meters for terminal space on the northern half of the Old Bilibid site and its early opening, in phases, for public transport use
- Extension of Doroteo Jose to A. Mendoza and of Evangelista across C. M. Recto into the Old Bilibid area.

c) Divisoria

Planning actions are very few without a conscious policy decision on the urban role of Divisoria vis-a-vis Manila now and in the future. Even short-term measures have doubtful efficacy considering the failures of past attempts. Some modest steps that may produce immediate impacts are:

- Rerouting of jeepneys converging at Divisoria, particularly their turning points
- Limiting the use of C. M. Recto to vehicles with minor civil works such as barriers, markings, etc.

- Redefinition of the role and function of many side streets to pick up more of the traffic

- Improvement of pedestrian facilities.

Interim use of Del Pan as on-street terminal should be considered in the next five years. Over the long-term, the two options are the construction of a fly-over to evade the surface activities infront of the market or the re-development of Tutuban Station into an integrated public transport terminal. The first option may need only P2.3 million and a corresponding rerouting of jeepneys away from Juan Luna; however, it may not succeed in persuading jeepneys and buses to abandon their predatory behavior in C. M. Recto. The same uncertainty exists for the Tutuban Station which will require P35.9 million for development into an integrated terminal. Construction of the fly-over (cost = P100.3 million) means accepting the Divisoria situation and formalizing a pedestrian mall and terminal function on C. M. Recto.

d) Novaliches

One of the fastest growing suburban centers in Metro Manila, Novaliches needs planning actions now to guide its future developments. The most viable approach is for MMC to initiate a land consolidation program north of and around the existing Novaliches Market with a view to urban restructuring and the provision of transport interchange facilities.

On a less hopeful footing is the development of three separate but smaller sites for transport terminals with a combined space requirement of 4,840 square meters and investment of P12.9 million.

In addition to the foregoing plans, the construction of a bypass road is recommended. To minimize cost, the alignment should utilize as much of the existing subdivision roads as possible (about P 39 million may be required). Early completion of sections of C-6 is also recommended.

Immediate steps that can be taken are in the matter of traffic management at and around the Quirino-Gen. Luis intersection, some minor jeepney reroutings, and control and management of the public transport operations which are generally uncontrolled now.

e) C-3/Quezon

In anticipation of the rapid commercialization of this important junction once C-3 is completed, early planning and acquisition of a site for public transport interchange is recommended. Government should acquire the land in conjunction with the road and grade separation construction, or at least dictate (through land use and building controls) the development of the property northwest of the intersection.

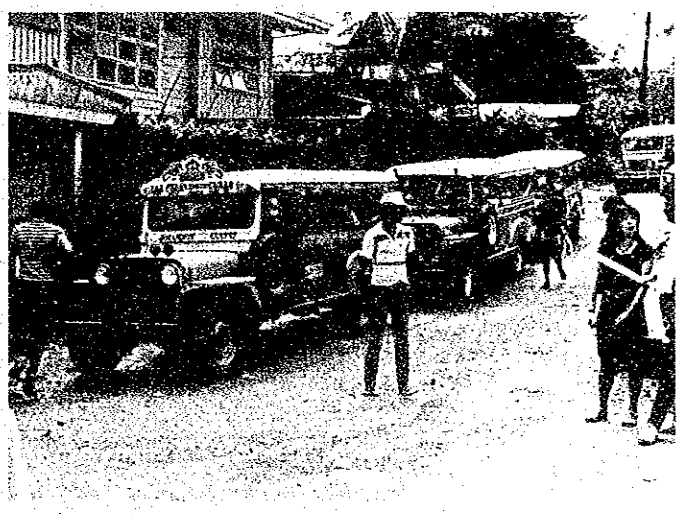
2.2.3 Viability of the Mode Interchange Areas

In almost all the mode interchange areas investigated by JUMSUT Phase II, the financial viability is unattractive when taken independent of commercial developments. But because of their economic merits (which preclude the misuse of roads for purposes other than vehicle flow), these MIAs should be promoted, encouraged, or even directly induced by government via a combination of fiscal incentives, administrative controls, and land purchase. In all cases, the operation and management of these terminals should be lodged with the private sector.

Table 2-1
The Five Mode Interchange Areas at a Glance

PARAMETERS	CUBAO	RECTO	DIVISORIA	NOVALICHES	C 3/ QUEZON
Area Characteristics	Private-sector led & planned development; non-trad commercial center amidst independent residential growths	Public-sector led urban redevelopment amidst a traditional area; Adjoins an LRT station & several institutional traffic generators	Haphazard traditional business & commercial area w/ heavy retail & wholesale trading activities; surrounded by low-income households near busy ports	Suburban town center in the throes of urban explosion w/out clear directions. Mainly catering to middle-income residential private subdivisions	Not yet a mode interchange area but anticipated to be; a future busy cross-roads among high-income neighborhoods
Problem Statement	Intensification of commercial activities ahead of effort at transport developments w/ consequent congestion from lack of external access & unruly PT behavior	Lack of adequate space to accommodate public transport in the Quiapo area & only Old Bilibid site offers relief plus facilities to pedestrians	Misuse of main roads for market & trading related activities resulting in severe congestion, worsened by absence of transport terminals & pedestrian facilities	Misaligned intersection in the heart of Town Proper where most activities occur & transport converge; no alternative routes & no off street terminals	Congestion foreseen similar to Cubao if no prior action is introduced due to potential transfers & commercialization to be unleashed by completion of C-3
Rerouting Proposals	Delete overlapping of jeepney routes at Aurora-EDSA intersection; use of Arayat & Center Avenue for on-street terminals	Rerouting of North-South bound jeepneys to use Oroquieta & D. Jose	Rerouting to less-used Del Pan & disperse turning points to avoid concentration at CM Recto; use other sidestreets	Restructure bus-jeepney-tricycle routes for better complementation & service to subdivisions	Open up C-3 to High Capacity Vehicles only to preserve future options akin to EDSA.
Traffic Management	Paired one-way flow for Banahaw-P. Tuazon and New York-E. Garcia TM treatments on Aurora & add'l bus-bays for EDSA	Limitations on the use of A Mendoza service road for smooth flow of traffic; open CM Recto median to connect Evangelista to Oroquieta.	TM treatments not promising due to accepted anarchy in relation to the market; pedestrian control may alleviate problems	Geometric improvements at the L-shape intersection plus traffic signal & enforcement	Implementation of traffic signalization & geometric improvement at the same time as C-3 opening
Road Proposals	Widen P. Tuazon, build bridge at Diliman Creek	Extend D. Jose & Evangelista to the Old Bilibid area	New road link extending Moriones up to Rizal Avenue	New secondary road to serve as bypass; early construction of C-6	Review proposed grade-separation as to traffic eng'g
Terminal Development	Earmark 15500 sq.m. at the Araneta complex and 15400 sq.m. at the Arayat-Pinatubo; terminal req'ts piggybacked on commercial endeavours.	Allocate 14,600 sq.m. at the northern side of Old Bilibid site for PT use; develop ahead of phase with MMC planned urban redevelopment	Temporary use of Del Pan; construction of a 800-m flyover on Recto Ave. to evade market-based activities & use roadspace below for PU use	Develop 3 small but separate sites with total area= 4,840 sq.m. On the long run, pursue land consolidation to restructure urban center	Acquire 2,000 sq.m. at the same time as the road construction to preserve gov't option for future terminal use
Financial Variables	Not financially viable if operated independently; 1st site will cost P16m while 2nd site needs P32m	Not viable financially; will require P28m for facilities; Int'l funding possible for terminal to seed MMC program	Del Pan may cost P2m Cost of flyover=P100m. Redevelopment cost of PNR-Tutuban= P91m	Minimal investments for the 3 sites at a sum of P13m; By-pass road estimated to cost P39m	Facilities for terminal will cost about P1.8m
Economic Variables	1st year benefits very high at P86m	Not quantified but believe to be substantial	Flyover would create savings of P182m/yr.	Savings not quantified but believe to exceed cost	Predicted savings will exceed cost of allowing congestion
Management Variables	Private sector under gov't encouragement via tax and regulatory measures; MMC as the main promoter; use jeepney associations	The same entity as the developer of the Old Bilibid Site; terminal itself should be run by PU associations	Fly-over solution is up to MPWH to evaluate & implement; terminal operations to be under PU associations	MMC to take the lead in inducing proposed developments, with possibility of land consolidation; let transport operators	Land acquisition by MPWH; terminal development under private investor thru MMC supervision; actual running by bus

3.0 PUBLIC TRANSPORTATION SURVEYS



3.0 PUBLIC TRANSPORTATION SURVEYS

3.1 INTRODUCTION

The purpose of the supplemental transportation surveys is to generate the data relevant for the planning of public transportation routes.

These surveys consisted of:

a) 1984 Supplemental HIS

b) 1984 Traffic Counts along Screenlines and Cordonlines

c) Other Supplemental Public Transportation Surveys conducted when and where necessary for analysis and planning.

Since the last type of surveys are too numerous and their coverage connected with specific topics touched in other sections, only the first two surveys are described in this chapter.

3.2 SUPPLEMENTAL HIS FOR METRO MANILA ENVIRONS

3.2.1 Survey Outline

A supplement to the 1980 HIS (MMUTIP) and 1983 JUMSUT I Supplemental HIS, this survey covers the socio-economic and trip characteristics of residents in the areas adjoining Metro Manila which contribute, by and large, to the metropolitan activity. In particular, the survey area is within the 30-kilometer radius of Metro Manila, and includes several towns in the provinces of Bulacan, Laguna, Rizal and Cavite. Finer zoning system was worked out for the survey area, while the same zoning system was maintained for Metro Manila and the rest of the country; 214 zones including 12 zones of reclaimed area for Metro Manila, 19 zones for 4 adjoining provinces and 35 zones for the rest of the country wherein 19 zones of adjoining provinces were subdivided into 24 zones.

The same sampling design as the two previous HIS was used. Except for the inclusion of a NEDA clearance notation on the questionnaire, the same form as that of 1983 HIS was used. The survey procedure and data processing were likewise similar, hence comparable in content and results though not exactly in time. Sample size was limited to 2,000 households, although the actual number of samples interviewed is 2,031. Using the two-stage sampling method, samples were collected in proportion to the number of households by zone after sample barangays were selected, considering their accessibility to transport routes and spatial distribution.

3.2.2 Profile of Residents in the Adjoining Areas of Manila

A. Socio-economic Profile

Population Growth:

As per the NCSO report, the annual growth rate of the combined population in all four provinces jumped from 3.9% in the first half of the decade (1970-1975) to 4.3% during the second half (1975-1980).

This growth trend is quite opposite to Metro Manila whose population also increased but at a decreasing rate – from 4.6% in the first half of the decade to 3.6% in the second half.

Employment:

As to be expected, the four provinces have bigger percentage shares of the primary and secondary sectors compared to Metro Manila, but its urban character is nonetheless apparent with 55.0% of its working population employed in the tertiary sector (see Table 3.1).

Table 3.1
Employment by Industry Sector (%)

Industry Sector	Supplemental HIS Survey					Metro Manila[1/]
	Bulacan	Rizal	Laguna	Cavite	Total	
Primary	6.9%	4.2%	6.9%	8.0%	6.5%	0.5%
Secondary	39.1	44.7	41.3	30.1	38.5	29.1
Tertiary	54.0	51.2	51.7	61.9	55.0	70.4
TOTAL (%)	100.0	100.0	100.0	100.0	100.0	100.0
(Net in 000)	118	117	84	122	443	1,786

Source: HIS analysis

[1/] derived from 1980 HIS

Day-to-Nighttime Population:

Based on the total population count, regardless of residence, Metro Manila has more attraction during the day with a day-to-night ratio of 1.04 as against the peripheral areas' 0.85 ratio. This means that the employment places for the residents of Metro Manila are centered more within its boundary; while those in the peripheral areas are elsewhere to a greater degree than inside.

Household Characteristics:

Household in both study areas exhibit similar characteristics – such as household size (which is between 5.4 to 5.6 persons) and household distribution by income level (which has the same tapering pattern as income increases).

Under similar conditions, the households of Metro Manila have higher average income of P1,152 for 1980 and P1,601 for 1983, about 30-31% more than those in the areas adjoining to it. Among the areas surveyed, Laguna appears to be wealthier with an average household income of P1,486/month in 1983 (see Table 3.2)

Table 3.2
Average Household Income

	1980 Money Values[1/]	1983 Money Values[2/]	1984 HIS Results
Metro Manila	P 1,152	P 1,601	–
Survey Areas	P 885	P 1,225	P 1,954
– Bulacan	826	1,129	1,875
– Rizal	861	1,208	1,846
– Laguna	1,058	1,486	2,270
– Cavite	902	1,266	1,934

Source: JUMSUT II Surveys

1/ Money value for Metro Manila were derived from 1980 HIS and those for adjacent areas were deflated using NEDA Consumer Price Index (1980 = 100)

2/ Value for Metro Manila were derived from 1983 HIS and those for adjacent areas were deflated using NEDA Consumer Price Index (1983 = 100)

Vehicle Ownership:

The 1983 BLT statistical report showed the extent of vehicle concentration in Metro Manila. Metropolitan Manila has 77.5 vehicles per thousand population as against 29.0 in the peripheral areas, or approximately 3 times the density.

Car ownership data derived from HIS reveal that there are more households (13.2% of total) owning cars in Metro Manila than in the four adjoining provinces, where only 8.3% of the households own cars.

B. Trip Characteristics

Number of Trips:

The total number of trips determined by the 1984 HIS for the adjoining areas is 1,222,231 trips. This is 11.5% of Metro Manila's.

Trip Mode:

The public mode of transport is more popular in the adjoining provinces where 88.8% of the total number of trips (as against Metro Manila's 74.4%) are on non-private mode. This may be partly attributed to the lower levels of car-ownership relative to that in Metro Manila.

Without doubt, the jeepney is the most popular mode of public transport, accounting for 48.6% of total trips in the adjoining areas. Metro Manila's figure is 54.5% of total trips made on jeepneys alone. The tricycle, however, ranks second in popularity in the provinces whilst in the metropolitan area, it is the bus.

In the case of private modes, the car/jeep is the most popular for any trip purpose in both the adjoining areas and in Metro Manila – although the frequency of usage is higher in the latter.

Trip Purpose:

In terms of trip purpose, "To Home" trips account for nearly half (47.9%) of total trips in both Metro Manila and the adjoining provinces. In the latter, however, trips to school rank second highest and work trips, the third. In the case of Metro Manila, work trips rank second while trips to school are third highest.

Table 3.3
Number of Daily Trips by Purpose and Mode, 1984

Trip Purpose	Adjoining Areas			Metro Manila		
	Public Mode	Private Mode	Total	Public Mode	Private Mode	Total
To Work	183,776	29,167	212,943	1,441,144	488,382	1,929,526
To School	214,649	19,292	233,941	1,397,262	331,178	1,728,440
Private	144,872	21,125	165,997	1,040,311	391,966	1,432,277
Business	17,577	6,049	23,626	211,673	234,210	445,883
To Home	524,344	61,380	585,724	3,820,392	1,276,501	5,096,893
TOTAL	1,085,218	137,013	1,222,231	7,910,782	2,722,327	10,633,019

Source: 1984 HIS for Adjoining areas and 1980 HIS for Metro Manila[1]

1/ The trips in 1980 HIS for Metro Manila has been calibrated with the 1984 Screen/Cordonline results.

Hourly Distribution of Trips:

The adjoining areas' hourly distribution of trips for 24 hours reflects two peak hours, namely: 6:00-8:00 a.m. and 4:00-6:00 p.m. The same peak hours were also observed in the metropolitan area.

OD Trip Pattern:

The direction of trip movements for the surveyed areas was determined based on the 7-zone system. Four major types of trip flow emerged; namely, trips between Metro Manila and each survey area, trips between two survey areas, trips made within each survey area, and trips between the external areas and the survey areas (see Figure 3.1).

The OD (origin/destination) trip pattern indicates that the volume of trips made within Cavite and Laguna (71% of total) is significantly more than those made between these areas and Metro Manila (29%). The same is seen for Bulacan and Rizal but not to a considerable extent as the southern areas. Trips made between the survey areas registered a uniform volume of 1,300 trips.

In terms of the study area's trip interaction with Metro Manila, a large trip volume is noted between the metropolitan and the southern areas. This is partly due to considerable land developments in the southern portion of Metro Manila which attracts and generates more trips. Likewise, the population of these areas (Laguna and Cavite combined) are larger than the northern and eastern areas.

3.3 SCREENLINE AND CORDONLINE SURVEYS

3.3.1 Outline of Surveys

The data obtained from these surveys are intended for the development of 1984 OD Tables by calibrating the updated 1980 OD Tables with the results of this survey. Two types of traffic surveys were conducted along 29 screenline and 13 cordonline stations from July 16 to August 6, 1984 (exclusive of Saturdays and Sundays):

a) **Traffic Count Survey** – conducted hourly for 16 hours, from 6 a.m. to 10 p.m., with the exception of the Quezon Bridge Station where a 24-hour survey was undertaken to compare the 1980 and 1984 ratios of 24-hour and 16-hour volumes.

b) **Vehicle Occupancy Survey** – number of on-board passengers and seating capacity of sample vehicles chosen at random were observed and recorded by hour and by vehicle type.

The imaginary cordonline bounded Metro Manila; while screenlines were placed along Pasig River for the north-south direction and San Juan River and PNR for the east-west direction. Except for eight new stations, principally the same survey stations were used as the 1980 MMUTIP surveys to facilitate direct comparison of changes in traffic volume and flow (see Figure 3.2).

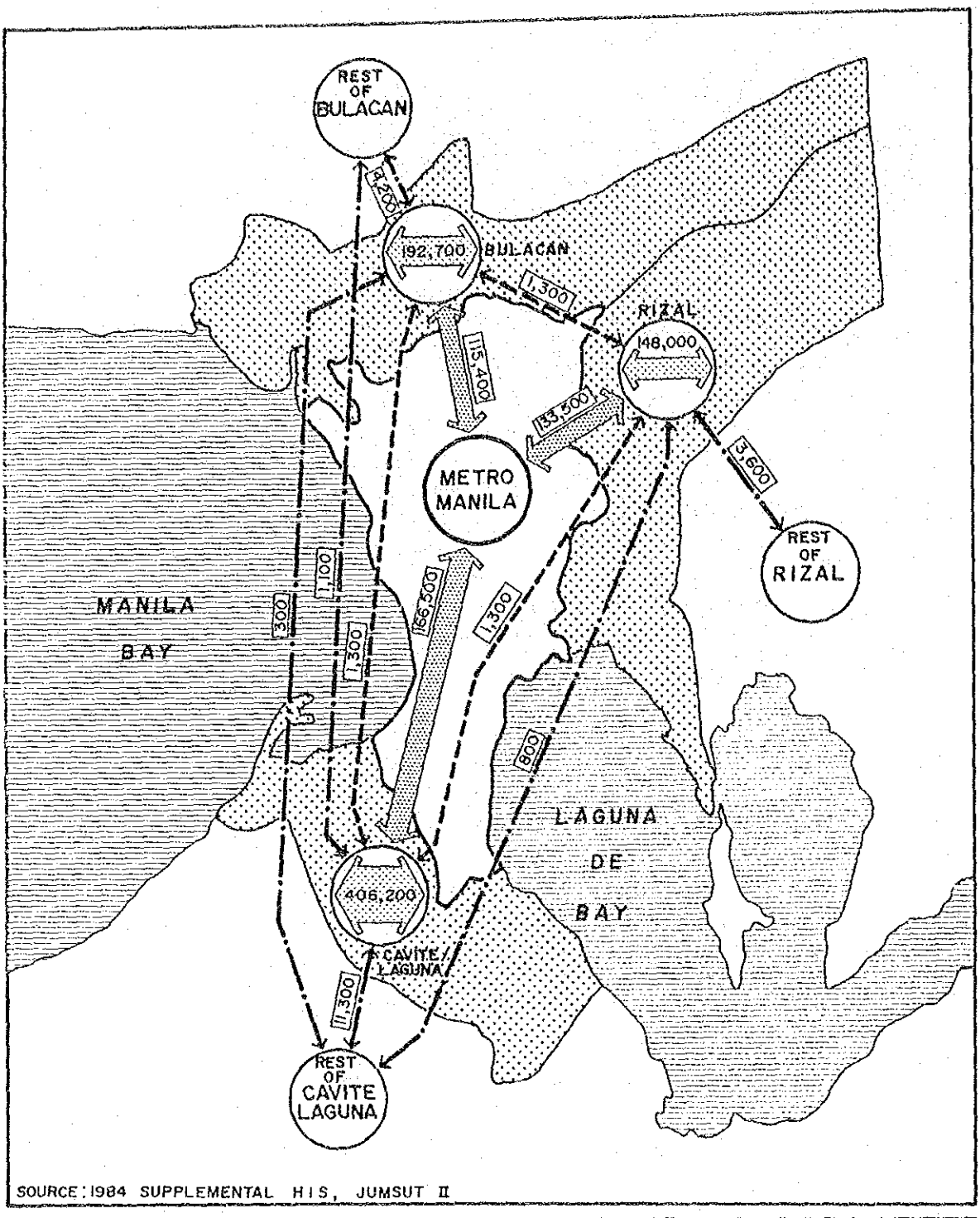
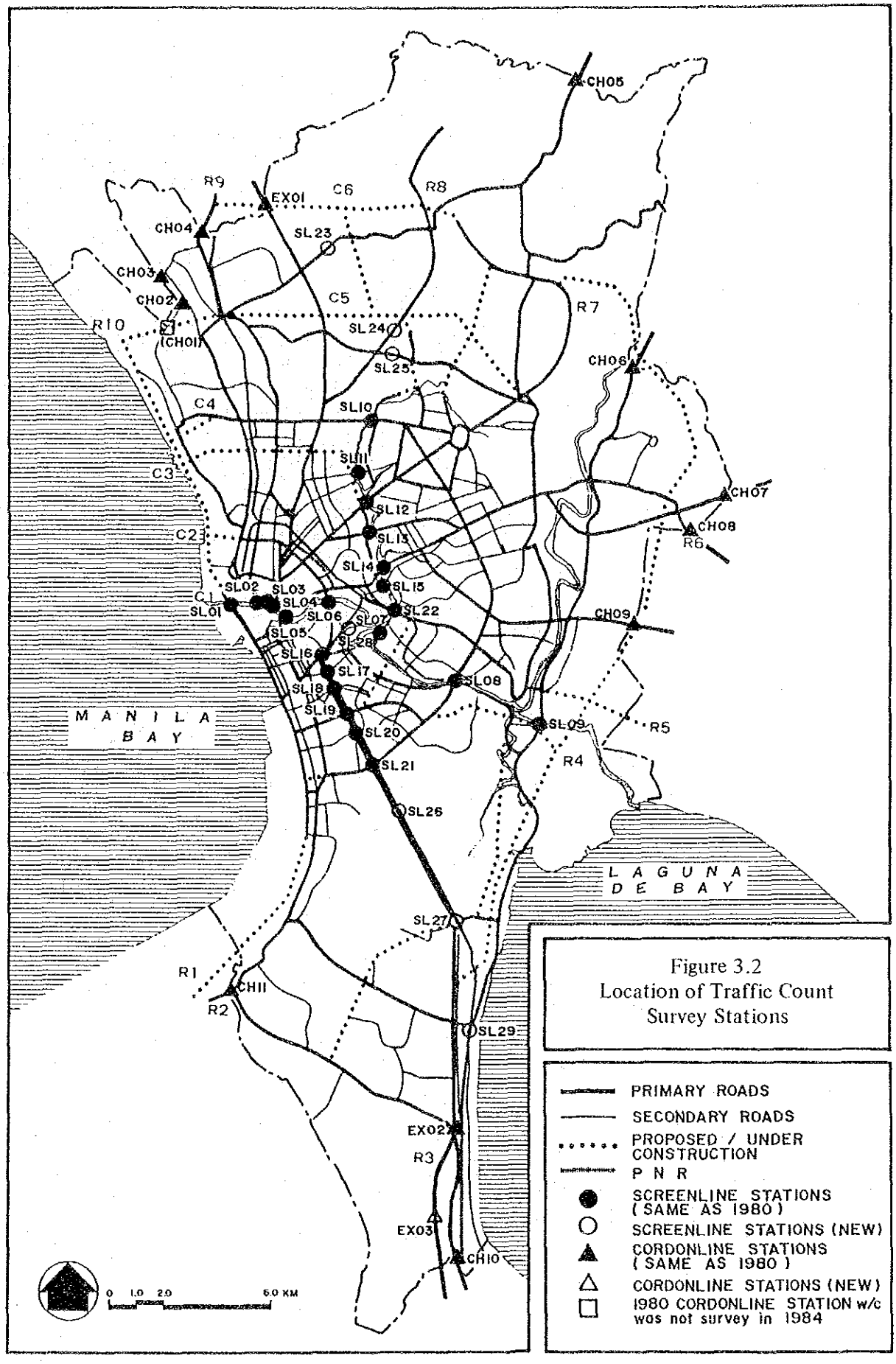


Figure 3.1
Person Trip Flow By Residents of the Adjoining Areas of Metro Manila


CH05
R9
EX01
C6
R8
CH04
SL23
CH03
CH02
C5
R7
R10
CH01
SL24
SL25
CH06
C4
SL10
SL11
C3
CH07
SL12
CH08
C23
SL13
R6
SL14
SL02
SL03
SL15
C1
SL04
SL22
CH09
SL01
SL06
SL07
SL05
SL28
SL16
SL17
SL08
SL18
SL19
MANILA BAY
SL09
R5
SL20
R4
SL21
SL26
LAGUNA DE BAY
SL27
R1
CH11
R2
SL29
EX02
R3
EX03
CH10
0 1.0 2.0 6.0 KM
Figure 3.2
Location of Traffic Count Survey Stations
PRIMARY ROADS
SECONDARY ROADS
PROPOSED / UNDER CONSTRUCTION
P N R
SCREENLINE STATIONS (SAME AS 1980)
SCREENLINE STATIONS (NEW)
CORDONLINE STATIONS (SAME AS 1980)
CORDONLINE STATIONS (NEW)
1980 CORDONLINE STATION w/c was not survey in 1984

3.3.2 Changes in Traffic Demand

The recent changes in the traffic situation can be analyzed based on a comparison of the results of the 1984 screenline and cordonline surveys with those of 1980. The general conclusions are two-fold:

- decrease in vehicular traffic volume, but
- increase in passenger traffic volume

The results of the survey shown in Table 3.5 through Table 3.10 are presented by section, which defines the survey station's location (see Table 3.4).

Table 3.4
List of Survey Stations by Sections

Location[1/]	Code	Survey Station
EW. Screen (West)	SL01	Del Pan Bridge
	SL02	Jones Bridge
	SL03	McArthur Bridge
	SL04	Quezon Bridge
	SL05	Ayala Bridge
	SL06	Nagtahan Bridge
EW. Screen (East)	SL07	Panaderos
	SL08	Guadalupe
	SL09	Bambang Bridge
NS. Screen (North)	SL10	EDSA near Roosevelt
	SL11	Del Monte
	SL12	Quezon Avenue
	SL13	E. Rodriguez
	SL14	Aurora Boulevard
	SL15	N. Domingo
	SL22	Shaw Boulevard
	SL23	Bagbaguin Road[2/]
	SL24	Quirino Highway[2/]
	SL25	Tandang Sora[2/]
NS. Screen (South)	SL16	P. Gil – P. Quirino
	SL17	San Andres
	SL18	Vito Cruz
	SL19	Buendia
	SL20	Pasay Road
	SL21	EDSA SSH
	SL26	Nichols[2/]
	SL27	Bicutan[2/]
	SL28	Dr. M.L. Carreon[2/]
	SL29	Bagumbayan[2/]
North Cordon	EX01	Malinta-Meycauayan
	CH01	Malabon-Obando
	CH02	Panghulo Road
	CH03	Gen. Vililla
	CH04	McArthur Highway
	CH05	Quirino Highway
East Cordon	CH06	Marikina/San Mateo
	CH07	Manila-Cogeo
	CH08	Antipolo Road
South Cordon	EX02	Alabang-Carmona
	EX03	Susana Heights[2/]
	CH10	San Pedro
	CH11	Bacoor

1/ Refer to Figure 3.2.
2/ New Stations added for JUMSUT II Survey

A summary of the findings follows hereafter.

Vehicular Traffic Demand

The changes on screenlines are as follows (see Table 3.5):

- The volume of public vehicles decreased (3-10%) on all sections; while those of private vehicles decreased slightly (1-6%) on all sections, with the exception of EW.WEST screenline.

- A significant decrease is observed in the volume of public vehicles on EW.WEST – from about 88 thousand in 1980 down to 79 thousand in 1984 or a decrease of 10%. This may be attributed to the LRT construction along Taft/Rizal Avenue.

The changes on cordonlines are as follows:

- The volume of public vehicles decreased significantly (15%) on cordonline north, while it is almost the same in other sections.

- The volume of private vehicles increased exclusive of cordonline EAST. A significant increase is observed in cordonline SOUTH – from 55 thousand in 1980 to 70 thousand in 1984. This is attributed to the decentralization of population to the south and north.

Table 3.5
Changes in Traffic Demand Between 1980 and 1984
of Public and Private Modes: Number of Vehicles/24 Hours

	Section	1984 JUMSUT 2 (000)			1980 MMUTIP (000)			1984/1980 RATIO		
		Public[2/]	Private	Total	Public[2/]	Private	Total	Public[3/]	Private	Total
SCREENLINE[1/]	EW. WEST	79	206	285	88	211	299	0.90	0.98	0.95
	EW. EAST	32	147	179	33	142	175	0.97	1.04	1.02
	Sub-total	111	353	464	121	353	474	0.92	1.00	0.98
	NS. NORTH	83	198	281	86	210	296	0.97	0.94	0.95
	NS. SOUTH	45	221	266	50	224	274	0.90	0.99	0.97
	Sub-total	128	419	547	136	434	570	0.94	0.97	0.96
	TOTAL	239	772	1,011	257	787	1,044	0.93	0.98	0.97
CORDONLINE	NORTH	26	40	66	31	37	68	0.84	1.08	0.97
	EAST	19	23	42	18	25	43	1.06	0.92	0.98
	SOUTH	25	45	70	25	30	55	1.00	1.50	1.27
	TOTAL	70	108	178	74	92	166	0.95	1.17	1.07

1/ Exclusive of the eight (8) new stations surveyed in 1984
2/ Includes jeepneys, buses and tricycles

Changes in bus and jeepney traffic volume are as follows (see Table 3.6):

- The volume of jeepneys decreased on all sections by 3-26%. Notable decreases are observed in EW.EAST – from about 17 thousand in 1980 to 13 thousand in 1984, and cordonline NORTH – from 23 thousand to 17 thousand.

- The volume of buses decreased on screenlines as a whole, while it remained the same on cordonlines.

Table 3.6
Changes in Traffic Demand Between 1980 and 1984
of Buses and Jeepneys: Number of Vehicles/24 Hours

	Section	1984 JUMSUT 2 (000)			1980 MMUTIP (000)			1984/1980 Ratio		
		Bus	Jpy.	Total	Bus	Jpy.	Total	Bus	Jpy.	Total
SCREENLINE[1/]	EW.WEST	7	73	80	8	80	88	0.88	0.91	0.91
	EW.EAST	9	13	22	9	17	26	1.00	0.76	0.85
	Sub-total	16	86	102	17	97	114	0.94	0.89	0.89
	NS.NORTH	13	69	82	13	72	85	1.00	0.96	0.96
	NS.SOUTH	10	35	45	14	36	50	0.71	0.97	0.90
	Sub-total	23	104	127	27	108	135	0.85	0.96	0.94
	TOTAL	39	190	229	44	205	249	0.89	0.93	0.92
CORDONLINE	NORTH	4	17	21	5	23	28	0.80	0.74	0.75
	EAST	2	14	16	2	15	17	1.00	0.93	0.94
	SOUTH	6	18	24	5	20	25	1.20	0.90	0.96
	TOTAL	12	49	61	12	58	70	1.00	0.84	0.87

1/ Exclusive of the eight (8) new stations surveyed in 1984.

Passenger Traffic Volume

With the exception of EW.WEST screenline where reduction may be attributed to the detour of passengers from the LRT corridor to EDSA due to the LRT construction, all other sections went up. On cordonlines, the passenger volume also increased, with the exclusion of cordonline EAST. A notable increase in the passenger volume of private vehicles, is observed in cordonline SOUTH (27%), (see Table 3.7).

The general increase in passenger traffic volume may be attributed to the increased population growth rate of Metro Manila, which is 3.0-4.0% per annum.

Table 3.7
Changes in Traffic Demand Between 1980 and 1984
of Public and Private Modes: Number of Passengers/24 Hours

	Section	1984 JUMSUT 2 (000)			1980 MMUTIP (000)			1984/1980 RATIO		
		Public1/	Private	Total	Public1/	Private	Total	Public1/	Private	Total
SCREENLINE2/	EW.WEST	1,054	441	1,495	1,016	361	1,377	1.04	1.22	1.09
	EW.EAST	664	326	990	559	262	821	1.19	1.24	1.21
	Sub-total	1,718	767	2,485	1,575	623	2,198	1.09	1.23	1.13
	NS.NORTH	1,260	429	1,689	1,241	453	1,694	1.02	0.95	1.00
	NS. SOUTH	752	434	1,186	783	463	1,246	0.96	0.94	0.95
	Sub-total	2,012	863	2,875	2,024	916	2,940	0.99	0.94	0.98
	TOTAL	3,730	1,630	5,360	3,599	1,539	5,138	1.04	1.06	1.04
CORDONLINE	NORTH	343	98	441	320	97	417	1.07	1.01	1.06
	EAST	196	59	255	208	66	274	0.94	0.89	0.93
	SOUTH	373	114	487	345	90	435	1.08	1.27	1.12
	TOTAL	912	271	1,183	873	253	1,126	1.04	1.07	1.05

1/ Did not include passengers of tricycles, motorcycles and others.

2/ Exclusive of eight (8) new stations.

The highlights of the changes in bus/jeepney passenger traffic demand are as follows (see Table 3.8).

- The total number of bus/jeepney passenger increased (4-19%) on all sections, with the exception of NS screenline south (bus: 457 thousand to 441 thousand; jeepney: 326 thousand to 311 thousand).

- The number of bus passengers increased significantly (5-48%) on all sections, with the exception anew of NS screenline south and cordonline east.

- On the other hand, the number of jeepney passengers decreased both on screenlines (205 thousand to 190 thousand) and cordonlines (58 thousand to 49 thousand).

- In 1984, the number of jeepney passengers accounted for 54% on screenlines and 51% on cordonlines; not very different from 1980 except for the slight reduction in the difference between bus and jeepney.

Table 3.8
Changes in Traffic Demand Between 1980 and 1984
of Buses and Jeepneys; Number of Passengers/24 Hours 1/

	Section	1984 JUMSUT 2 (000)			1980 MMUTIP (000)			1984/1980 Ratio		
		Bus	Jpy.	Total	Bus	Jpy.	Total	Bus	Jpy.	Total
SCREENLINE 1/	EW. WEST	254	803	1,054	238	778	1,016	1.07	1.03	1.04
	EW. EAST	541	123	664	365	194	559	1.48	0.63	1.19
	Sub-total	795	926	1,718	603	972	1,575	1.32	0.95	1.09
	NS. NORTH	497	763	1,260	438	803	1,241	1.13	0.95	1.02
	NS. SOUTH	441	311	752	457	326	783	0.96	0.95	0.96
	Sub-total	938	1,074	2,012	895	1,129	2,024	1.05	0.95	0.99
	TOTAL	1,733	2,000	3,730	1,498	2,101	3,599	1.16	0.95	1.04
CORDONLINE	NORTH	183	160	343	140	180	320	1.31	0.89	1.07
	EAST	50	145	196	56	152	208	0.89	0.95	0.94
	SOUTH	209	164	373	186	160	346	1.12	1.03	1.08
	TOTAL	442	469	912	382	492	874	1.16	0.95	1.04

1/ Exclusive of the eight (8) new stations surveyed in 1984.

Hourly Fluctuation of Vehicular and Passenger Traffic Volume

The 1984 and 1980 hourly fluctuations of vehicular traffic volume generally exhibit varying highs and lows both for public and private modes (see Figure 3.3). Nonetheless, morning and evening peak hours for 1984 and 1980 public modes is the same for screenline EAST (8:00-9:00 a.m., 5:00-6:00 p.m.) and screenline NORTH (7:00-8:00 a.m., 5:00-6:00 p.m.).

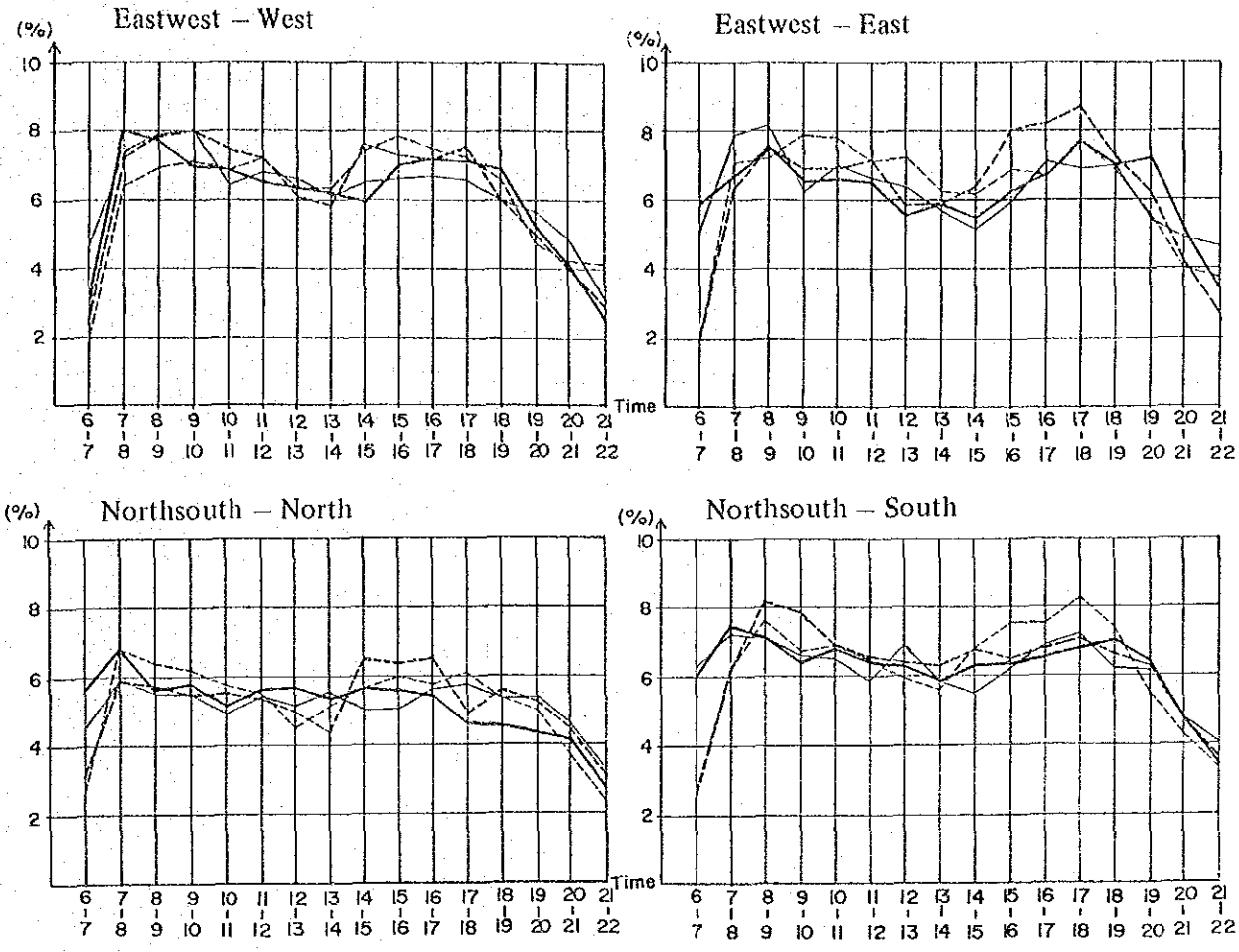
The same is true for passenger traffic volume. However, the 1980 and 1984 morning peak hours for public passengers of EW screenline range from 7:00-9:00 a.m. Similarly, at NS screenline, public passengers morning peak hour both for 1980 and 1984 is at 7:00-8:00 (see Figure 3.3).

Vehicle Composition

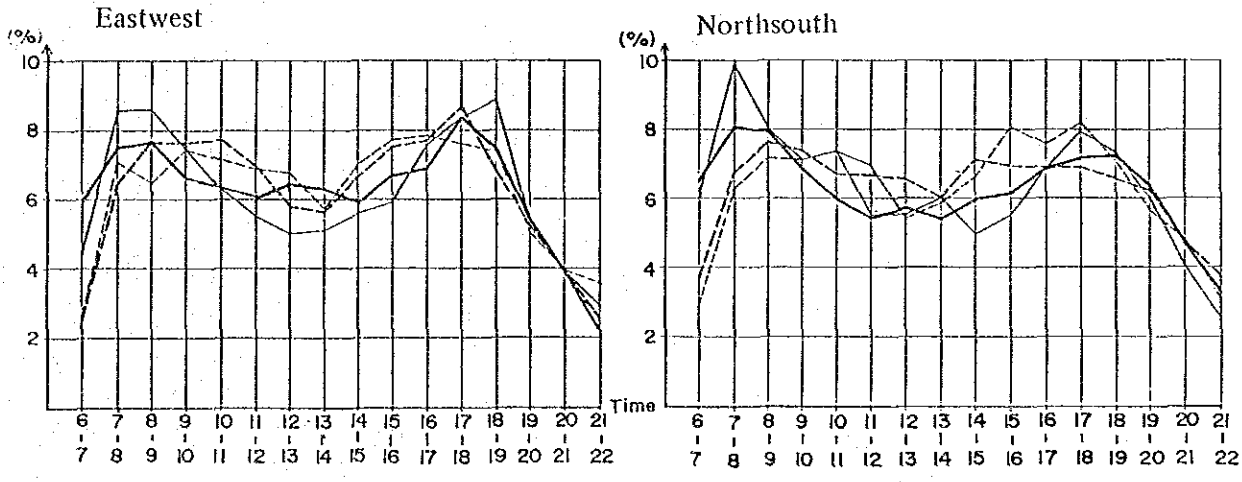
On screenlines, both 1980 and 1984 data showed that car/taxi accounted for more than 50% of vehicular traffic volume, followed by jeepney. On cordonlines, the percentage of jeepney was slightly higher than that of car/taxi in 1980. The number of jeepneys on cordonlines, however, decreased significantly by 1984. Consequently, the percentage of jeepney dipped lower than of car/taxi in 1984 (see Table 3.9).

It is noted that the number of tricycles increased significantly (51% on screenlines and 103% on cordonlines), emphasizing their role as feeders to other modes. Truck and other modes also increased. The volume of car/taxi decreased slightly on screenlines, although it increased on cordonlines as a whole.

A. Vehicular Traffic



B. Passenger Traffic



1984 PUBLIC
1984 PRIVATE
1980 PUBLIC
1980 PRIVATE

1/ Exclusive of tricycles, motorcycles and others.

Figure 3.3
Traffic Hourly Fluctuation
for 1984 and 1980 by Mode

Table 3.9
Changes in Vehicle Composition Between 1980 and 1984

		1984 JUMSUT 2(%)					1980 MMUTIP (%)					1984/1980 Ratio				
	Section	Jpy.	Bus	Tri-cycle	Car/ Taxi	Truck/ Others	Jpy.	Bus	Tri-cycle	Car/ Taxi	Truck/ Others	Jpy.	Bus	Tri-cycle	Car/ Taxi	Truck/ Others
SCREENLINE 1/	EW. WEST	25.5	2.3	0.0	64.1	18.1	26.7	2.7	0.0	55.9	14.6	0.90	0.80	1.25	0.92	1.18
	EW. EAST	7.4	5.3	5.3	64.4	17.6	9.8	5.3	3.8	65.0	16.7	0.78	1.01	1.43	1.02	1.13
	Subtotal	18.5	3.4	2.1	58.1	17.9	20.5	3.7	1.4	59.1	15.1	0.89	0.92	1.43	0.96	1.16
	NS. SOUTH	24.6	4.6	0.4	51.8	18.6	24.5	4.4	0.1	54.5	16.5	0.96	1.00	2.66	0.91	1.07
	NS. SOUTH	13.2	3.6	0.1	67.3	15.8	13.1	5.0	0.1	66.7	15.1	0.97	0.71	1.91	0.98	1.01
	Subtotal	19.0	4.1	0.3	59.3	17.2	19.0	4.7	0.1	60.3	15.9	0.96	0.85	2.45	0.95	1.05
	TOTAL	18.8	3.8	1.1	58.8	17.5	19.7	4.2	0.7	59.8	15.5	0.93	0.88	1.51	0.95	1.10
CORDONLINE	NORTH	26.4	6.7	6.4	35.0	25.5	34.6	6.7	4.0	31.3	23.3	0.74	0.97	1.55	1.09	1.06
	EAST	34.5	3.5	6.8	29.2	26.0	35.7	4.8	2.1	32.6	24.8	0.93	0.71	3.18	0.86	1.01
	SOUTH	25.8	8.6	1.2	41.6	22.7	36.0	9.5	0.5	34.2	19.8	0.92	1.16	3.13	1.56	1.47
	TOTAL	28.0	6.7	4.4	36.3	24.5	35.4	7.1	2.3	32.6	22.5	0.85	1.01	2.03	1.19	1.17

1/Exclusive of the eight (8) new stations surveyed in 1984.

Average Load Factor

Generally, the 1984 and 1980 rate of average load factors of jeepneys and buses registered an increase both on screenlines and cordonlines. The average load factor of car/taxi decreased at 8-5% (see Table 3.10).

Table 3.10
Load Factor Comparison Between 1980 and 1984

		1984 JUMSUT-2			1980 MMUTIP			1984/1980 Ratio		
	Section	Jpy.	Bus	Car/ Taxi	Jpy.	Bus	Car/ Taxi	Jpy.	Bus	Car/ Taxi
SCREENLINE 1/	EW. WEST	68.8	66.5	43.5	62.5	44.3	46.1	1.10	1.50	0.94
	EW. EAST	53.8	64.1	43.2	80.6	75.8	48.5	0.67	0.85	0.89
	Subtotal	66.9	64.2	44.2	65.7	60.9	47.1	1.02	1.05	0.94
	NS. NORTH	66.9	65.4	70.9	65.0	54.8	46.9	1.03	1.19	0.90
	NS. SOUTH	56.9	69.2	81.1	53.1	54.7	44.1	1.07	1.27	0.92
	Subtotal	63.8	66.2	41.1	61.1	54.8	45.4	1.04	1.21	0.91
	TOTAL	64.4	65.6	42.5	63.2	57.2	46.2	1.02	1.15	0.92
CORDONLINE	NORTH	58.8	70.1	46.3	55.2	51.5	53.3	1.07	1.36	0.87
	EAST	65.6	61.7	49.7	70.5	53.7	54.9	0.93	1.15	0.91
	SOUTH	58.8	59.4	48.0	57.4	63.8	60.6	1.02	0.93	0.79
	TOTAL	60.6	63.9	47.7	60.0	57.2	56.2	1.01	1.12	0.85

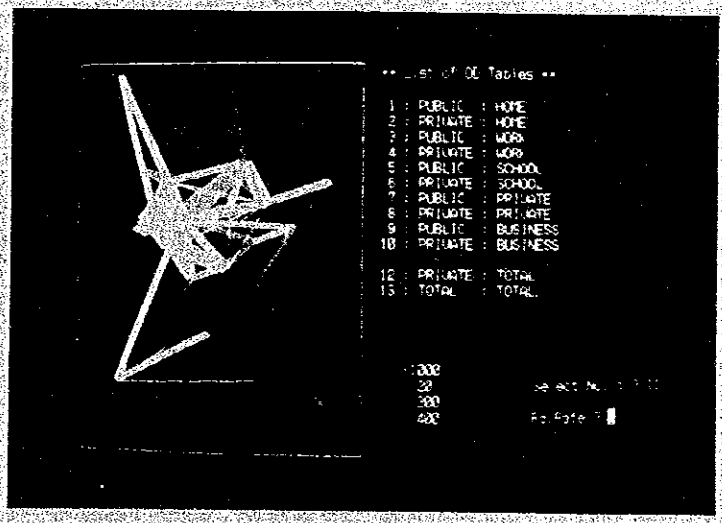
Source: JUMSUT I

1/ Exclusive of the Eight (8) new stations surveyed in 1984.

Note: Capacity

Jeepney	: 16
Minibus	: 47
Standard bus	: 59
Provincial Bus	: 64
Car	: 5
Taxi	: 4

4.0 TRANSPORTATION DEMAND FORECASTING



4.0 TRANSPORTATION DEMAND FORECASTING

4.1 METHODOLOGY

4.1.1 Analytical Framework

The section expounds on the transportation demand analysis and forecasting component of the study. It updates the existing 1980 OD tables into 1984 OD tables and produces future trip demand and distribution for 1990. As shown in Figure 4.1, the subtasks are:

a) Expansion of 1980 OD tables – The 1980 OD tables developed in JUMSUT I have been expanded with the inclusion of the results of the 1984 Supplemental HIS conducted for the areas adjoining Metro Manila.

b) Development of 1984 OD tables – The 1984 OD tables are developed by calibrating the expanded 1980 OD tables with the results of 1984 screenline/cordonline surveys.

c) Estimate of 1990 Land Use Parameters – The 1990 land use parameters required in developing 1990 OD tables are first estimated from existing land use data and analysis of likely developments; then finalized in coordination with MMC.

d) Forecast of 1990 OD tables – The 1990 OD tables are then generated using the refined forecasting models developed in JUMSUT I with inputs derived from (a) and (c).

4.1.2 Coverage and Limitation

The physical boundary of the Study Area goes beyond the Metro Manila region to include the following adjoining areas/municipalities:

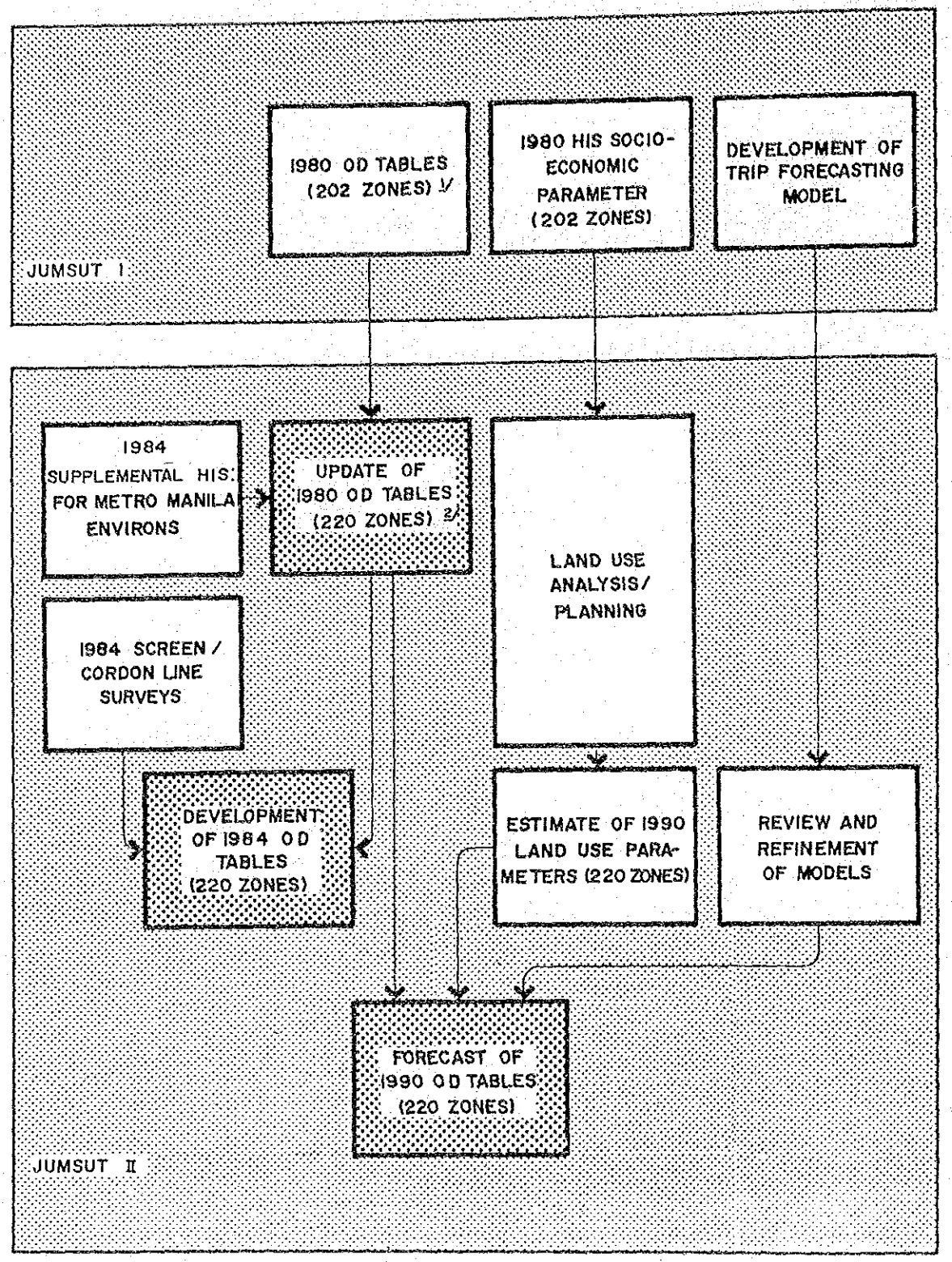
Bulacan Province	:	Bulacan, Obando, Marilao, Meycauayan, Bocaue, San Jose del Monte, and Sta. Maria
Rizal Province	:	Montalban, San Mateo, Antipolo, Cainta, Taytay, Angono, and Binangonan
Laguna Province	:	San Pedro, Biñan, Sta. Rosa, and Cabuyao
Cavite Province	:	Bacoor, Kawit, Cavite, Novelcta, Rosario, Carmona, Imus, and Dasmariñas

The 1990 forecast suffers from the following limitations:

a) sample size of the 1984 supplemental HIS is only 2,000 households, or about 1% of the population.

b) land use information relied only on what is available from other government agencies, hence may not be the most up-to-date information nor uniformly reliable.

Figure 4.1
Framework of Transportation Demand
Analysis and Forecasting



1/ 202 Zones cover Metro Manila only

2/ 220 Zones cover additional 18 Zones of adjoining areas of Metro Manila

4.2 LAND USE ANALYSIS

4.2.1 Analytical Approach

This task provides the base for forecasting the 1990 socio-economic parameters through a review and analysis of:

- Interrelationship of the 1980 zonal socio-economic parameters with the actual land uses by zones
- Land use characteristics in quantitative terms.

The three major sources of existing land use data were:

a) 1980 socio-economic data by zone, which were derived from the 1980 HIS and include such data items as:

   - Population
   - Number of households
   - Employment by sector (by residence and by workplace)
   - Number of students (by residence and by school address)
   - Car-owning rate
   - Average household income

b) 1975 and 1980 population data by barangay, taken from 1975 and 1980 population census of NCSO/NEDA,

c) 1980 existing land use map for Metro Manila, synthesized from three visuals, viz.:

   i) 1977 land use map of MMC (scale of 1:10,000; Marikina and San Juan not covered)

   ii) 1978-80 aerial photos (CCP, 1:5,000)

   iii) 1979-82 aerial photos (BCGS, 1:32,000)

4.2.2 The Preparation of 1980 Land Use Map and Associated Data

The 1980 land use map was assembled out of the preceding data. After the map was completed, sub-areas were measured using a planimeter and grouped in accordance with the MMC land use classification shown in Table 4.1. To have a better gauge of available areas for possible development, parks and open spaces were disaggregated further.

Land use characteristics by municipality in Metro Manila are presented in Appendices 4.1 and 4.2. They can be summarized as follows:

a) On the whole, open space accounts for the largest portion of land use (47.8%) in Metro Manila, followed by residential use (37.3%). The total open spaces may be further brokendown into: vacant area (29.4%), agricultural area (23.6%), and mountain and hills (32.3%).

b) With the exception of Pasay City, where the Manila International Airport and Nichols Air Base are located, the predominant land use within Circumferential Road-4 (EDSA) is residential, where open space constitutes only about 10%.

c) High density residential areas can be found in the cities of Manila and Pasay, while low density residential areas are more prevalent in the municipalities of Makati and San Juan.

Significant commercial/business concentration is seen in Makati and the City of Manila.

d) Predominant land use outside EDSA is open space, of which mountains/hills occupy a large share, followed by vacant area and agricultural area. Residential areas are normally of low density and take up 30 to 40% of the total area. Although subdivision developments are significant, vacant lots are still considerable.

e) Industrial developments are significant in Valenzuela, Marikina and Pasig, particularly along Quirino Highway and McArthur Highway in the north and along South Superhighway and Pasig River in the south.

Table 4.1
Land Use Classification

Classification		Description
Residential 1	:	Low intensity residential
Residential 2	:	Medium intensity residential
Residential 3	:	High intensity residential
Commercial 1	:	Low intensity commercial
Commercial 2	:	Medium intensity commercial
Commercial 3	:	High intensity commercial
Industrial 1	:	Low intensity industrial
Industrial 2	:	Medium intensity industrial
Industrial 3	:	High intensity industrial
Institutional 1	:	Low intensity institutional
Institutional 2	:	Medium intensity institutional
Institutional 3	:	High intensity institutional
Utilities		
Airport		
Agricultural Area		
Fish Ponds		
Reclamation Area		
Park/Open Space 1/		

Source: MMC

1/ MMC's classification of parks/open spaces has been modified for JUMSUT II study purpose. They originally are composed of parks/cemeteries, trackfields/race tracks/zoos/golf clubs, mountains/hills (forest), water surfaces and vacant areas.

4.3 FORECAST OF SOCIO-ECONOMIC PARAMETERS

4.3.1 Establishing Existing Structure

The socio-economic structure for Metro Manila is constructed from the work of different agencies and outputs of various studies. NEDA provides basic national and regional socio-economic indicators (such as gross domestic product (GDP), or gross regional domestic product (GRDP), population, employment, and household income), while school attendance is provided by MECS. MMC analyzes data available from these sources, and then draws the appropriate socio-economic structure applicable for the urban region.

However, as has been observed in the past, different studies conducted for Metro Manila use different figures (as evidenced by Appendix 4.3). This can be explained by the absence of a common forecast–which, if allowed to continue, will lead to uneven investments.

Realizing that the JUMSUT II work on land use could fill up the gap, a series of discussions were held with MMC to agree on a forecasting methodology and the indicative estimates for the following:

a) GDP/GRDP
b) Population
c) School Attendance
e) Household Income
f) Car Ownership Level

The following collaborative arrangements and estimates were adopted in relation to the forecast of 1990 parameters:

a) GRDP will be determined by MMC, in coordination with NEDA.

b) Population from the NCSO forecasts, Series 2.

c) Employment will be determined by MMC, in coordination with NEDA.

d) School Attendance following the MECS forecasts.

e) Missing socio-economic parameters (such as household income and car ownership level) will be supplied by JUMSUT II and validated by MMC.

The results are summarized in Table 4.2.

Table 4.2
Metro Manila Socio-economic Framework

Item	1980	1990	Average Annual Growth Rate (%)
1. Population			
1) Number	5,925,844	7,974,000	3.0
2) No. of Households	1,103,563	1,812,273	5.1
3) Ave. H.H. Size	5.4	4.4	—
2. Employment			
1) Primary	122,621	122,621	—
2) Secondary	627,000	746,000	1.8
3) Tertiary	1,346,812	1,511,000	1.2
TOTAL	2,096,433	2,379,621	1.3
3. School Attendance			
1) Primary	791,761	1,030,200	2.7
2) Secondary & above	933,349	1,129,900	1.9
TOTAL	1,725,110	2,160,000	2.3
4. Income Level			
1) Ave. HH Income (P/month)	1,152	781	– 3.8
5. Real GDP (P million)			
1) Metro Manila (P million)	29,987	33,402	1.1
2) Ave. per Capita Income (P/year)	5,060	4,189	– 1.9

Source: MMC

4.3.2 Methodology

The requirements of transport planning call for the further breakdown of relevant socio-economic parameters of Metro Manila into traffic zones. Thus, the following heuristics:

A. 1990 Population

1) As a result of the current economic situation, the historical trend of population growth is likely to continue, if not go down.

2) The committed projects, as summarized in Table 4.3, will be completed on schedule. Therefore, their impact on population can be initially assumed.

3) A population growth model by zone is hypothesized from the relationship of population density, population growth rate and average household income (residential type). Their significant relationships are visualized in Figure 4.2. Each zone can be classified into one of five groups according to the average household income level. For each group, population growth patterns are estimated based on the actual growth rate between 1975 and 1980, and 1980 population density of each zone. This concept is further explained in Figure 4.3 where population growth in a zone that belongs to a particular income group could continue until it reaches saturation point or stabilized level.

4) Zero growth is assumed for the zones which registered negative growth rates between 1975 and 1980.

Table 4.3
Summary of Committed Development Projects

Project Name	Target Development		Location of Project: City/Municipality	Zone No.	Allocated Population	
	Area (ha)	Population			1985	1990
Dagat-Dagatan	410	200,000	Caloocan City	137	1,240	39,340
				138	920	29,360
				Sub-total	2,160	68,700
			Malabon	156	2,740	87,000
			Navotas	162	22,200	22,200
			Total Dagat-Dagatan		27,100	177,900
Pasig Project	40.2	37,000	Pasig	173	1,030	37,000
TOTAL	450.2	237,000			28,130	214,900

B. **Employment**

1) **Employment by residence** are estimated to grow in a similar proportion to population. Accordingly, 1990 employment by residence can be obtained by multiplying the 1990 population with the 1980 ratio of employment to population.

2) **Employment by workplace** are estimated as follows:

i) Primary Sector Employment – assumed static 1980 levels, or no expected increase.