C. 1990 Traffic Demand on Existing Road Network

The demand/supply gaps by corridor are shown in Figure 2.15 in terms of volume/capacity ratio, assuming there is no change in the existing road network.

Around the CBD, the road capacity becomes tighter than the existing situation. Especially in the northern, eastern and southern corridors in radial direction, traffic demand will be so strong that traffic overflow could virtually paralyze the transportation system. Even outside C-4, the major roads will be reaching saturation levels in the radial directions.

D. 1990 Traffic Demand on the 1990 Planned Road Network

Figure 2.16 presents the demand/supply gaps for the 1990 planned road network. Figure 2.17 hypothesizes a situation where C-3 is completed in addition to the 1990 planned road network.

When compared to the "Do Nothing" case of Figure 2.15, remarkable improvements can be seen in:

- northern corridor inside C-4 due to the completion of R-10
- southern corridor outside EDSA due to the completion of R-1
- circumferential direction along C-3 due to the partial completion of C-3 and the completion of Makati - Mandaluyong road.

When C-3 is completed up to Makati, the capacity across the Pasig will be further improved.

However, there will still remain some congested corridors in the eastern and southern corridors.

2.3.2 Critical Corridors

Based on the analysis explained in the preceding section, a number of roads will be decongested by 1990 as a result of the completion of some committed road projects, notably the roads along the LRT Line No.1 (Baclaran - Arroceros - Monumento) in the northern and southern corridors (see Section 4.8). Nonetheless, a number of roads will remain critical even after 1990 and these are:

a) Northern Corridor
   - McArthur Highway
   - Quirino Highway

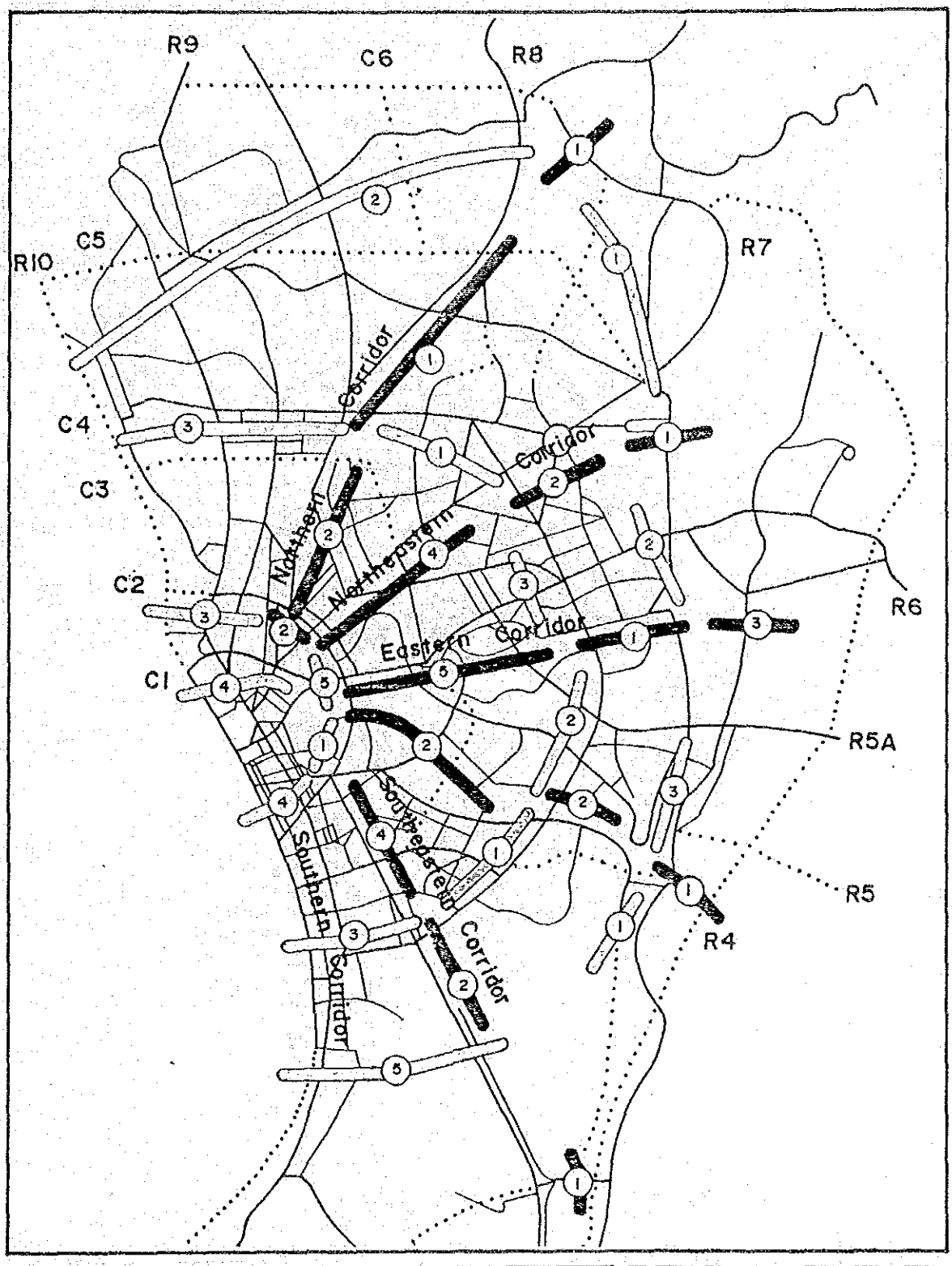
b) Northeastern Corridor
   - España
   - E. Rodriguez
   - C-2

c)	Eastern Corridor	- Kamias - Legarda/R. Magsaysay - Aurora Boulevard - C-2 - Ortigas - Santolan Road - Shaw Boulevard - EDSA
d)	Southeastern Corridor	- C-2 - P. Gil/J.P. Rizal - Buendia Avenue - Pasay Road
e)	Southern Corridor	- Buendia Avenue

Most of the roads in the northeastern and southern corridors have numerous sidestreets, although they are not supposed to be used by through-traffic. They can, however, be regarded as a realistic solution for the financial and capacity problem. The availability of sidestreets will be discussed in Section 4.3.

As a conclusion, the most critical corridors have been determined to be the eastern, northeastern, and southeastern corridors and a part of northern and southern corridors based on the network analysis. R. Magsaysay/Legarda is not only congested at present but also has the strongest potential demand in the future. It has no available sidestreets, and the construction of C-3 will further impose an additional load on it. Since this road is considered to be extremely important for Metro Manila (due to the saturation of this road, the total vehicle-kilometers on Metro Manila roads will increase in 1990 by about one million vehicle-kilometers or one (1) percent), appropriate countermeasures must be pursued.

Against this backdrop, short-term public transportation improvement plans are hereby proposed mainly for the northeastern, eastern, and southeastern corridors. Mid-term and long-term proposals are also dealt with for selected areas (See Chapter 6).



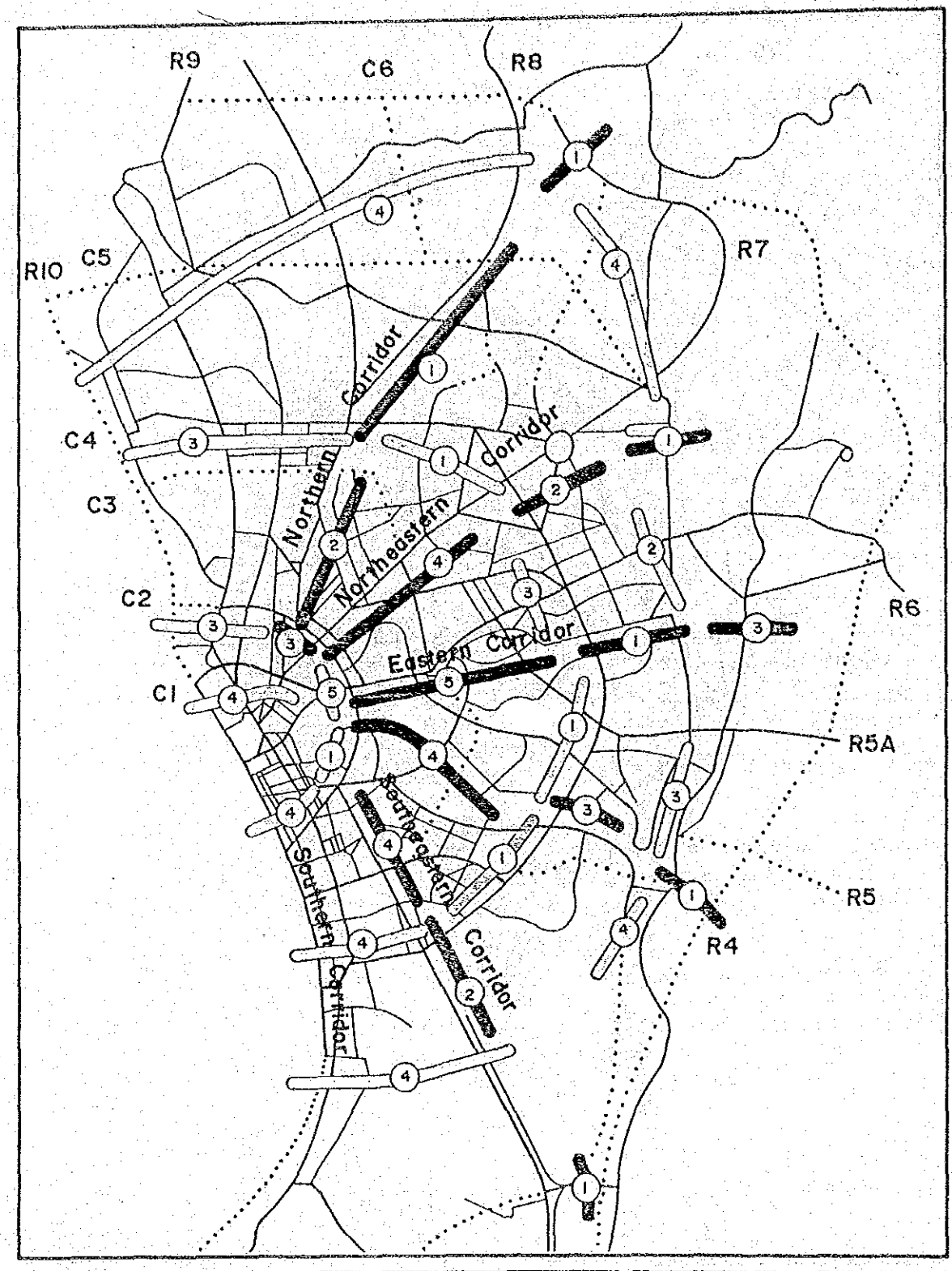
LEGEND :

DEGREE	VOLUME/CAPACITY RATIO
①	~ 0.75
②	0.76 ~ 1.00
③	1.01 ~ 1.25
④	1.26 ~ 1.50
⑤	1.51 ~

SOURCE : JUMSUT II

Figure 2.15
1990 Traffic Demand
on Existing
Road Network

JUMSUT II



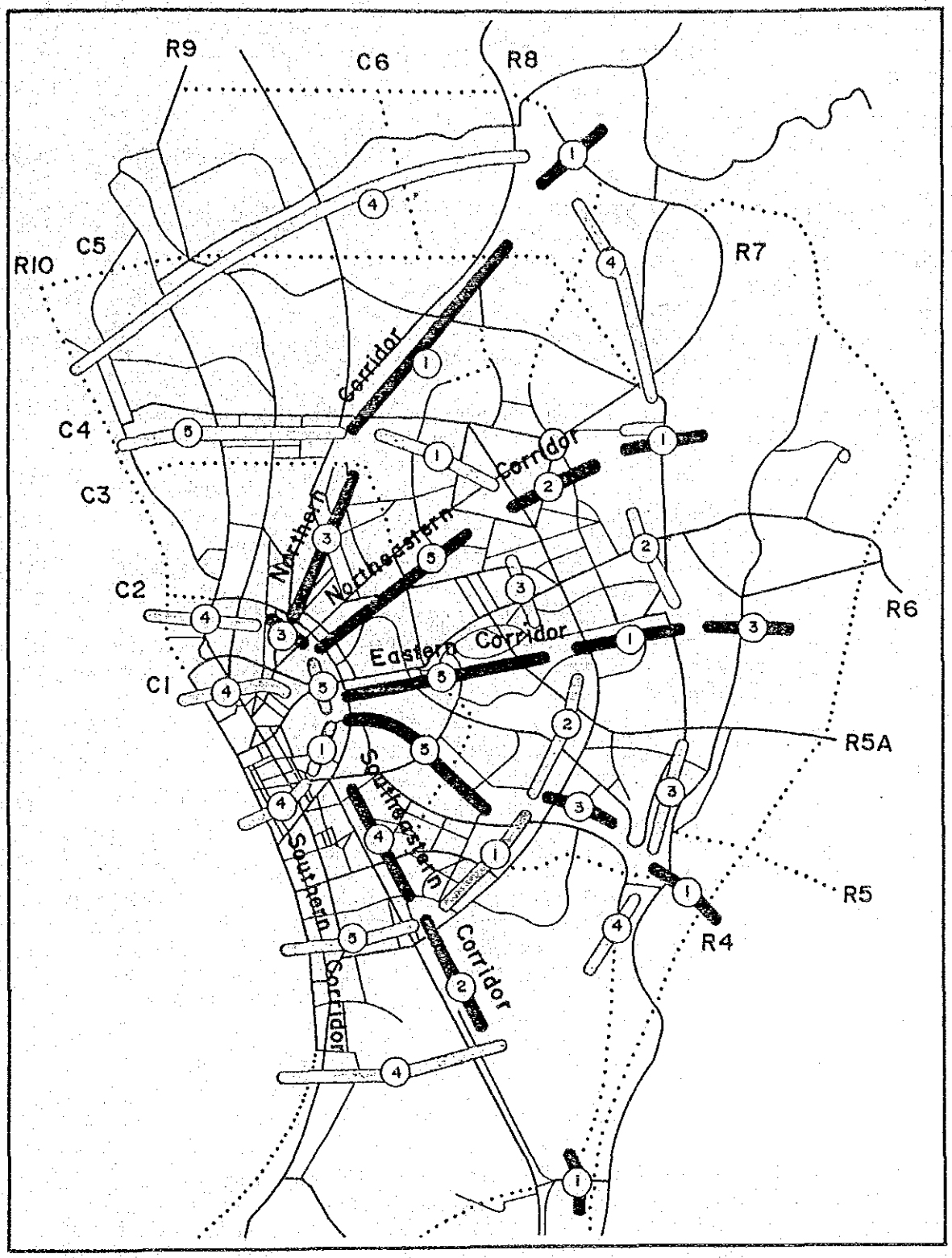
LEGEND :

DEGREE	VOLUME / CAPACITY RATIO
①	~ 0.75
②	0.76 ~ 1.00
③	1.01 ~ 1.25
④	1.26 ~ 1.50
⑤	1.51 ~

SOURCE : JUMSUT II

Figure 2.16
1990 Traffic Demand on the 1990 Planned Road Network

JUMSUT II



LEGEND :

DEGREE	VOLUME / CAPACITY RATIO
①	~ 0.75
②	0.76 ~ 1.00
③	1.01 ~ 1.25
④	1.26 ~ 1.50
⑤	1.51 ~

SOURCE : JUMSUT II

Figure 2.17
1990 Traffic Demand on the 1990 Planned Road Network + C-3

JUMSUT II

3.0 PREVIOUS STUDIES AND PROPOSALS

3.1 PRECEDENTS

Several studies have already been undertaken on various aspects of Metro Manila's transportation system. The more recent proposals and plans are contained in such studies as Metro Manila Traffic Engineering and Management Project (MMTEAM II), Metro Manila Urban Transportation Strategy Planning Project (MMUTSTRAP Parts B1 and B2) and other small-scale studies done internally by the Ministry of Transportation and Communications (MOTC) planning staff.

These studies were considered by JUMSUT II and where appropriate, their recommendations incorporated in the plans. A brief statement on the thrust of each project is discussed in the succeeding sections.

3.2 MMTEAM II

MMTEAM II is focused on the engineering and installation of traffic signals in about 170 locations between C-2 and C-4, as shown in Appendix 3.1. The original target period for the completion of the signalization is 1986, but latest information indicate a 1988 time table.

3.3 MMUTSTRAP B1

This project, under MOTC, generated several institutional and policy recommendations, including the preparation of feasibility studies for five major public transport terminals, and traffic management proposals for four traffic sectors, two traffic corridors and three traffic management sub-areas. Its approach is mainly from a traffic engineering standpoint.

The project's salient recommendations are summarized in Appendix 3.2.

3.4 MMUTSTRAP B2

Part B2 of MMUTSTRAP is currently being undertaken by the Ministry of Public Works and Highways (MPWH) with the assistance from the World Bank. Its main purpose is the preparation of investment packages for primary and secondary road projects in Metro Manila. Covered in Part B2 are the road projects shown in Appendix 3.3.

In addition, this project has the responsibility of investigating further the preliminary list of secondary roads, recommended in Part A and assessing feasibility and preliminary designs for new links deemed to be important.

3.5 MOTC INTERNAL STUDIES

A number of plans for the improvement of Metro Manila's transportation system have been drawn up by the MOTC planning staff. The notable ones relative to this study are as follows:

a) LRT Rerouting Scheme for jeepneys which was undertaken based on JUMSUT I.

b) Rerouting study of public transport conveyances along Espana and Cubao.

c) Route segregation for provincial and Metro Manila jeepneys.

d) The limitation of all jeepney route lengths to 15 kilometers within Metro Manila and 30 kilometers for inter-city routes.

3.6 CONSOLIDATION OF PENDING PROPOSALS

All pending proposals relevant to the areas under JUMSUT II were consolidated. These are presented in Table 3.1.

Table 3.1
Summary of Proposals for the Rerouting Planning Study

Name of Major Roads	Identified Problems	Recommended Countermeasures
1. D.M. Marcos Avenue		
a) All	• PUVs loading/unloading	• 25 PU stops will be required
b) D.M. Marcos	• PUVs loading/unloading	• Seal shoulders with waiting shelters on the approaches to D.M. Marcos • Seal shoulder on departure side • Provide sealed partways for pedestrians
2. Katipunan/Tandang Sora		
a) Aurora Blvd./ UP	• PUVs loading/unloading	• Passenger shelters with sealed sidewalk • Major widening would be required
b) Between UP/ D.M. Marcos Ave.	• Narrow carriageway • PUV loading/unloading • Traffic mix	• Major widening would be required
3. Kamias/Kamuning		
a) EDSA to 11th Jamboree	• PUVs loading/unloading • Curbside parking	• Seal 3m shoulders and install passenger shelters • Enforce 'No Parking' restriction on both sides-up to 100m. from EDSA in peak times
b) 11th Jamboree to T. Morato	• Narrow carriageway • PUV loading/unloading	• Widen the carriageway • Provide passenger shelters
c) Kalayaan/Anonas	• PUV loading/unloading	• Seal the shoulder and provide passenger shelters
4. East Avenue		
a) All	• Safety of pedestrian; traffic flow	• Construct central median • Remove existing marked pedestrian crossing • Re-mark 6 lanes after construction of the median
5. Marikina		
a) J.P. Rizal, A. Tuazon b) J.P. Rizal/ M. Roxas	• No signposting to indicate one-way, which forces those unfamiliar with the traffic to go into residential streets	• Signposting • Channelize at J.P. Rizal/ M. Roxas
c) Commercial Center	• Broken pavement, missing catch basin covers, and street furniture in spite of a reasonable reservation for sidewalks	• Repair and rehabilitate

(Cont. Table 3.1)

Name of Major Roads	Identified Problems	Recommended Countermeasures
d) Marikina Market	• Severe congestion on W. C. Paz due to the mixture of private vehicles with PUJs, tricycles and service vehicles • Congestion on Shoe Avenue/W.C. Paz due to poor surface condition and conflicting car and PUJ movements	• Prohibit entry of vehicles to Zapatero, Venciong (Lakandula) and the streets between them from 6:00 a.m. to 7:00 p.m. • Widen sidewalk to 4.0 m. on northside of W.C. Paz (Shoe Ave.-E. Jacinto) and ban parking • Provide sealed pavement in tricycle waiting area adjacent to school • Remove and replace parking signs from E. Jacinto to A. Luna • Make A. Luna one-way north • Construct rotonda at W.C. Paz/Shoe Avenue
6. Sta. Mesa		
a) Sta. Mesa (Private Market, Stop and Shop)	• The road is in a poor state of repair and poorly drained. Vendors occupy the sidewalk • Parking	• Remove the vendors • Enforce parking bans • Repair broken surface and provide adequate drainage
b) Pamilihang Sentral ng Sta. Mesa (Stop and Shop)	• Conditions for pedestrians are generally reasonable although some congestion is evident as a result of the stopping pattern of PUJs and PUBs	• Provide pedestrian barrier fences and pedestrian crossing • Define PUJ stops • Repair street lights
7. N. Domingo		
a) N. Domingo/ Banaue b) N. Domingo/ P. Tuazon	• Traffic congestion caused by poor alignment and drainage and presence of stalls on sidewalk • PUVs loading/unloading into and out of P. Tuazon	• Remove undesirable parking and sidewalk stalls • Improve the turning point radii at P. Tuazon • Provide curb and gutter to formalize the road space required for PU stops, pedestrians and through vehicles
c) Section between Ortigas and Pinaglabanan	• Curbside parking • Narrow carriageway (9m)	• Introduce "No Parking" restrictions on alternate sides of the road on alternate days on a trial basis, in narrow sections between San Juan River and Pinaglabanan
8. Shaw Boulevard		
a) Mandaluyong	• No significant lane marking	• Mark 4 lanes

(Cont. Table 3.1)

Name of Major Roads	Identified Problems	Recommended Countermeasures
b) All	• PU loading/unloading	• Mark PU stops and prohibit parking at the stops • Provide passenger shelter on sidewalk at all PUJ and PUB stops
c) Crossing	• Queueing of PUV	
9. Ortigas Avenue a) La Salle School	• Traffic congestion caused by cars picking-up/ setting down students	• Picking-up/Setting-down students by car should be banned from the Ortigas Avenue gate. Bus and PUJ pick-up can continue from the setback and curbside area • Channelize the Ortigas/ Wack-Wack intersection
b) Santolan/ Ortigas	• Traffic congestion (poor alignment, poor signal phasing)	• Construct median for 200m. on north-western approach • Widen Ortigas on northern corner to provide transition between alignments
10. Pasig	• Access from Pasig to other areas is very limited	• Channelize Pasig Blvd./ Kapasigan intersection • Improve geometry of Dr. S. Antonio/A. Luna/ Kapasigan/Dr. Maldo intersection and provide traffic signals • Signalize Dr. S. Antonio/ Pasig Blvd.
11. Shaw/EDSA a) EDSA Connections	• A lack of capacity to handle the traffic demand	• Provide additional points to join or cross EDSA. There are two possible locations: - EDSA/Boni/Pioneer intersections - Old PNR right of way Guadalupe Bridge
b) Shaw Interchange	• A lack of capacity to handle the traffic demand	• Widen the median on the western side • Widen the triangular island to separate right turns from the through-traffic • Improve lane discipline
c) Crossing jeepney terminal EDSA Central Market	• PU loading/unloading on street • Curbside lane cannot support large number of waiting jeepneys	

(Cont. Table 3.1)

Name of Major Roads	Identified Problems	Recommended Countermeasures
	• The existing terminal is well-organized but is of limited size compared to number of jeepneys. Large number of jeepney queues in adjacent streets	
12. Gen. Kalentong a) Mandaluyong Market-Aglipay	• Lack of sufficient pedestrian/PUV facilities	• Provide jeepney shelters • Sidewalk improvement/ widening • Mark centerline along Kalentong • Move jeepney stops in King Albert to a point 35 meters from Kalentong • Provide pedestrian barriers, signals and crossings.
	• Presence of unlicensed vendors on sidewalks	• Remove vendors from sidewalks and carriageway for the entire length of Kalentong
13. Pedro Gil a) Railway crossing	• Poor Surface	• Rehabilitate railway crossing
b) All	• Parking along both sides (parking is banned) • PUJ/PUB loading and unloading	• Enforce "no parking" restriction • Permit parking between 7:00 p.m. to 6:00 a.m.
c) Paco Market & Trabajo Market	• Stalls on the roadway • Haphazard parking (and double parking)	• Task force approach
d) P. Quirino/P. Gil	• Unorthodox routing	• Rerouting of vehicles
J.P. Rizal a) East of EDSA	• Narrow carriageway (2 lanes) with little or no sidewalk (traffic congestion)	• Widen to 4 lanes • PU passenger shelters at 300 m spacing
b) Jupiter/Metropolitan Avenue	• Access to Buendia	• Upgrade the intersection and revert Jupiter back to 2-way movement
c) All (esp. at intersections)	• Traffic congestion	• Make Pasig Line/Tejeron a one-way pair • Mark turning bays at intersection on J.P. Rizal between EDSA and Pasong Tamo • Mark center line of entire section of road
d) Whole J.P. Rizal Corridor	• Traffic/Pedestrian Signals	• Installation of 3 traffic signals

(Cont. Table 3.1)

Name of Major Roads	Identified Problems	Recommended Countermeasures
		• Installation of 31 traffic signals (TEAM II) • Installation of 2 pedestrian signals (TEAM II)
	• Poor Road Surface	• Upgrade the road surface on J.P. Rizal as part of on-going maintenance.
14. Buendia (Sen. G.J. Puyat)		
a) Buendia/EDSA	• Access to main commercial area	• Open and signalize the central median island on EDSA
b) Pasay Road/SSH	• Congestion at the intersection	• Open a PNR crossing on Don Bosco
c) Pasong Tamo Underpass	• Severely restricted by capacity and sight distance	• Retain existing one-way arrangements and provide adequate 'one-way', ' no-entry' and all traffic signposting
15. Guadalupe		
a) J.P. Rizal	• Insufficient capacity to handle demand	• Widen bridge on J.P. Rizal to five lanes
b) J.P. Rizal/Sgt. Yabut/EDSA ramps	• Conflicts and congestion at the intersection	• Modify and channelize the Rizal/Yabut ramp intersection • Modify western ramp/Rizal intersection to permit left turn
c) ABC EDSA frontage	• Inadequate street capacity for circulation • Dangerous parking maneuvers	• Install island on EDSA outside ABC • Move the curb line to provide a through lane for vehicles maneuvering in and out of the angle parking
	• Lack of pedestrian/ bus stop facilities	• Widen sidewalk • Remove steps of adjacent buildings • Provide passenger waiting sheds and barrier fence • Provide standard bus stop improvement

Source: MMUTSTRAP

4.0 TRANSPORTATION SYSTEM ANALYSIS

4.1 SPECIFICATION OF PROBLEMS AND POSSIBLE SOLUTIONS

4.1.1 General

Congestion remains to be the biggest traffic problem in Metro Manila at present. While generally understood, traffic congestion defies exact definition.

In addition, there are other traffic problems which may be considered as having a cause and effect relationship with congestion or which can be treated as an entirely separate problem altogether. The problems involve three entities: the driver, the passenger/pedestrian, and the traffic enforcer and/or government agency responsible.

Discipline counts a lot if improvement of driver behavior (loading/unloading , queueing, etc.) is to be achieved. The same is true for waiting passengers and pedestrians who encroach on the carriageway. Coupled with the above should be strict enforcement of rules by policemen. Poor road condition is also a contributory factor not to mention the perennial problem of sidewalk vendors.

The lack of road capacity is a mid-term or long-term problem, because it requires the allocation of capital investment. Other problems classified as short-term may be amenable to soft or managerial countermeasures. These aspects are further discussed in Chapter 6.

4.1.2 Problems and Possible Solutions

Table 4.1 shows the possible solutions by problem type. The short-term solutions as compared to those of mid-term and long-term are classified as follows:

a) Low cost
b) Within current technical capability
c) Within current management and maintenance capabilities
d) Implementation is possible, viewed from its practicability and political implications.

The possible solutions are presented by type of problem or area of improvement as follows:

a) Road Section Component
b) Intersection Component
c) Pedestrian Facility Component
d) Public Transportation Component
e) Enforcement Component
f) Vehicle Component
g) Construction Work Component

Table 4.1
Possible Solutions to Traffic Congestion
by Problem Type

Problem	Description	Possible Countermeasures	
		Short-Term	Mid-Term Long-Term
ROAD SECTION COMPONENT			
• Lack of capacity	• Congested without any significant reason and with relatively long peak hours	• rerouting or detouring of private and/or public utility vehicles to available sidestreets • introduction of one-way control	• median cutting to widen carriageway • widening of carriageway • construction of new roads
• Deterioration of road surface	• Potholes, major cracks, ruts and other surface deficiencies cause vehicle slow down, weaving and break-down	• patching • surface dressing • partial overlay • control of axle load	• overlay • repavement • reconstruction • organized periodical maintenance system
INTERSECTION COMPONENT			
• Lack of capacity	• Saturated intersections create long vehicle queues thus affecting the nearby sections and intersections	• rerouting or detouring of private and/or public utility vehicles to available sidestreets • reduction of number of phases or traffic signal by: - elimination of left-turn phase - banning left-turn movement - introduction of one-way control • "all vehicles right turn" control as long as applicable	• installation of traffic signals if not existing • expansion and strengthening of the TCC capability on the centralized and coordinated traffic signal system as well as the monitoring devices • grade separation
• Mishandling of traffic signal	• Long and unstable cycle time of traffic signals controlled manually hinders smooth traffic by creating a long vehicle queue at a time which paralyzes the operation of nearby intersections	• training of traffic policemen • monitoring of vehicle queues using equipment such as portable talkies	• introduction of automatic monitoring devices such as loop detectors to major intersections • installation of TCC controlled signal system
• Chaotic traffic movement around intersections	• Unruly driver behavior • Right turning or left-turning lane sometimes occupied by PU vehicles loading, unloading or waiting for passengers • Conflict between vehicles and pedestrians crossing or walking along the carriageway • Blocking of intersections by vehicle queues created by other intersections, signal-neglecting vehicles, etc.	• no left-turn when applicable • rerouting or change of turning circuits of PU vehicles • pedestrian barrier fence • clear lane marking • removal of malfunctioning signal • adjustment of signal phasing • stricter enforcement • removal of unnecessary obstacles and debris from intersection and sidewalk	• campaign of traffic rules • cutting, removal, extension and construction of traffic islands to assure the channelization plan • construction of PUV bays provided with waiting sheds • installation of pedestrian signal where necessary • coordinated traffic signals

(Cont. Table 4.1)

Problem	Description	Possible Countermeasures	
		Short-Term	Mid-Term Long-Term
PEDESTRIAN FACILITY COMPONENT			
• Pedestrians encroaching to carriageway	• Pedestrians on carriageway crossing, walking or waiting for PU vehicles largely hinder smooth traffic • Accident rate is higher	• pedestrian barrier fence • strict prohibition of parking on sidewalks • sealing of sidewalks • removal of debris, garbage and construction materials from sidewalks • restriction of PUV loading/unloading zones • removal or restriction of vendors on sidewalks • stricter enforcement of the above	• widening of sidewalks • construction of PUV bays provided with waiting sheds • pedestrian signal • increase of PUV supply to lessen the competition of passengers for vacant seats • construction of pedestrian overpass/underpass for high standard roads
• Inconvenient transfer for passengers	• In some large congested terminal areas, a passenger has to walk a long distance (sometimes across or along dangerous and hazardous roads) to transfer	• pedestrian barrier fence • strict prohibition of parking on sidewalks • sealing of sidewalks • removal of debris garbage and construction materials from sidewalks • rerouting of PUVs if desirable	• widening of sidewalks • pedestrian signal • construction of pedestrian overpass/underpass for high standard roads • construction of modal interchange terminals
PUBLIC TRANSPORTATION COMPONENT			
• Unruly PUV practice in loading/unloading passengers	• Fierce competition of PUVs for passengers when vacant seats are available • Loading/unloading is frequently done far from the curbside, blocking the second or further outer lanes • Dangerous weaving due to the above practice	• talks with bus consortia and jeepney associations looking for realistic solutions • proper guidance of passenger movement by pedestrian barrier fence, waiting shed and well-sealed sidewalk	• adoption of fixed salary system for PUV drivers • installation of barrier fence type median to segregate through traffic from PUV loading/unloading lane • construction of PUV bays/lanes by widening right of way
	• Intentional blocking of other buses/jeepneys • Jeepney and bus make or try to make too many stops to to pick up passengers affecting the traffic by its weaving and slowdowns	• location of watcher and dispatcher in problem areas to control PUV movement • rerouting or detouring of PUVs to available sidestreets • limitation of PUV loading/unloading zones supported by pedestrian facilities • stricter enforcement of the above	
• Rampant illegal operation	• Illegal PUV routes and vehicles without franchise nor registration make it difficult for government authorities to monitor and and control PUV operation	• legalization of "colorums" on a uniform basis • simplification of franchise issuing procedure • linkage of BLT registration records and BOT franchise records • periodical monitoring and data updating by government agencies • stricter enforcement of the above	• formulation of jeepney and/or bus associations responsible for internal control of PUV operation and looking after the welfare of its members

(Cont. Table 4.1)

Problem	Description	Possible Countermeasures	
		Short-Term	Mid-Term Long-Term
• Ossified route structure	• The current PUV route structure is distorted from what it should be partly because of traffic management and partly because of the lack of information pertaining to the demand pattern	• rerouting of PUVs	• rerouting of PUVs in conjunction with the proper modal split
ENFORCEMENT COMPONENT			
• Unclear demarcation of authority among government agencies	• Traffic law enforcement authority is shared by a number of agencies and necessary arrangement and cooperation require considerable time	• establishment and activation of inter-agency coordinating committee	• reorganization of relevant agencies
• Lack of well-trained law enforcers	• Even if necessary arrangement is done in the upper level, a thorough implementation is hardly done.	• training of law enforcers	• periodic education of law enforcers
VEHICLE COMPONENT			
• Obsolete dangerous vehicles running on the road	• The rate of accidents and breakdowns is considered very high. This not only causes traffic congestion but also threatens public safety	• strengthening of the BLT capability in vehicle inspection • campaign to vehicle users	• periodic vehicle inspection system with stricter enforcement
CONSTRUCTION WORK COMPONENT			
• Long, inefficient and dangerous construction works on roads	• At present, the MWSS construction works all over Metro Manila is the single largest cause for traffic congestion. Usually, the duration of the construction works is long and the negative effects are large. Insufficient signposts aggravate the dangerous situation.	• well organized scheduling of construction works • concentration in night time construction • proper setting of signposts	• introduction of efficient construction equipment • limitation of construction works to night time • temporary sealing of construction sites during daytime

Source: JUMSUT II

4.1.3 Identification of Problem Areas

A. Short-term Problem Areas

The findings of previous studies and the field surveys conducted in JUMSUT I were duly taken into account. The criteria followed for determining the problem areas were as follows:

1) Congestion with long vehicle queues throughout the day or, at least, during peak hours;

2) Conflicts among PUVs, private vehicles, pedestrians and commercial activities with long vehicle queues or very low vehicle speed.

The problem areas finally selected are shown in Figure 4.1 and enumerated below:

Major Problem Areas: where the magnitude of the problem is severe and a multi-dimensional approach is needed.

1) Marikina Town Proper
2) N. Domingo
3) Sta. Mesa
4) Pasig Town Proper
5) EDSA/Shaw
6) Kalentong
7) Guadalupe
8) J. P. Rizal
9) Paco
10) Buendia

Mid-term Problem Areas: where the traffic congestion occurs mainly due to lack of capacity. Though not definitive, short-term countermeasures are available.

11) España
12) Nagtahan/R. Magsaysay
13) Rosario Junction
14) EDSA/Ortigas

Minor Problem Areas: where the magnitude of the problem is of a lesser severity and the possible solutions are relatively simple.

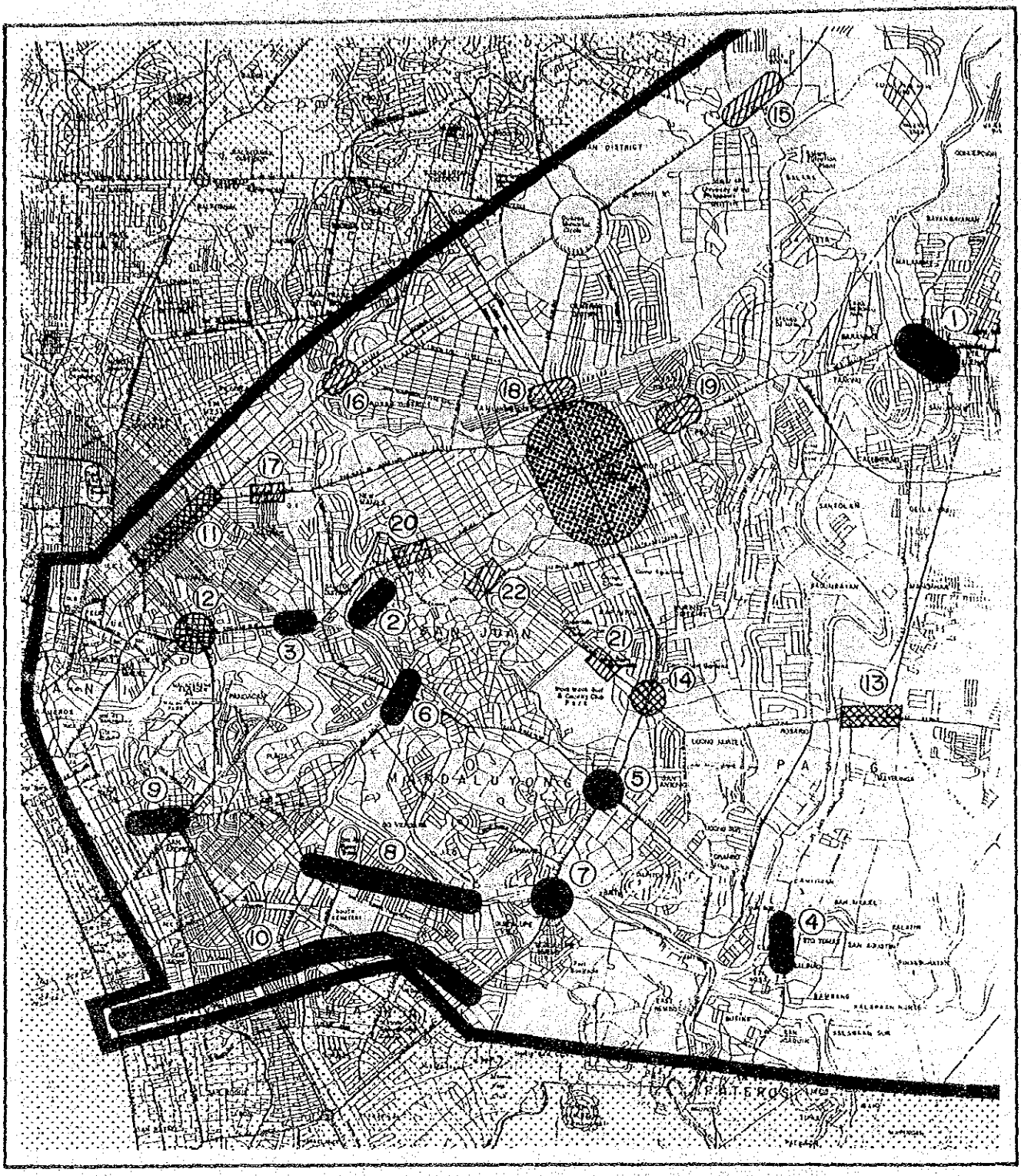
15) Ortigas/Santolan
16) D. M. Marcos/Tandang Sora
17) Quezon Ave/Roosevelt Ave.
18) E. Rodriguez
19) EDSA/Kamias
20) Aurora/Anonas
21) La Salle in Ortigas
22) Broadway Centrum

B. Mid-term Problem Areas

Based on the results of the network analysis and the existing situation presented in Section 4.5, the following areas were identified as mid-term problem areas:

Corridors/Roads:

- McArthur Highway
- Quirino Highway
- España
- E. Rodriguez
- Kamuning/Kamias



LEGEND:

- MAJOR PROBLEM AREA
- MID-TERM PROBLEM AREA
- MINOR PROBLEM AREA
- STUDY AREA CUBAO MIA

0 1 2 3 KM

Figure 4.1
Identified Problem Areas
for Short-term Planning

- R. Magsaysay
- Aurora Boulevard
- Shaw Boulevard
- Ortigas Avenue
- EDSA (Crossing-Cubao)

- Santolan Road
- Nagtahan/P.Quirino
- J. P. Rizal/P. Gil
- Buendia
- Pasay Road

Intersections:

- EDSA/Kamuning/Kamias
- EDSA/Aurora/E. Rodriguez
- EDSA/Santolan
- EDSA/Ortigas
- EDSA/Shaw
- R. Magsaysay/V. Mapa/Aurora
- R. Magsaysay/Nagtahan
- España/A. Mendoza
- P. Gil/Pres. Quirino
- South Superhighway/Buendia

However, due to the current situation where no major transportation investment other than those listed in Section 2.3.1 can be expected by 1990, feasible solutions being proposed by JUMSUT II are rather limited to the following:

1) Short-term Plans: For those areas classified as short-term problem areas, practical countermeasures are proposed that lead to mid-term and long-term proposals. Twenty road sections/intersections out of 25 mid-term problem areas listed above were touched upon with short-term schemes; these are presented in Chapter 6 and in the Cubao MIA Technical Report.

2) Mid-term Rerouting Plans: To alleviate anticipated traffic congestion, rationalization of the public transport route structure coupled with maximum use of new roads suggest specific route improvement schemes for all major corridors in the mid-term period. These are discussed in detail in Chapter 7.

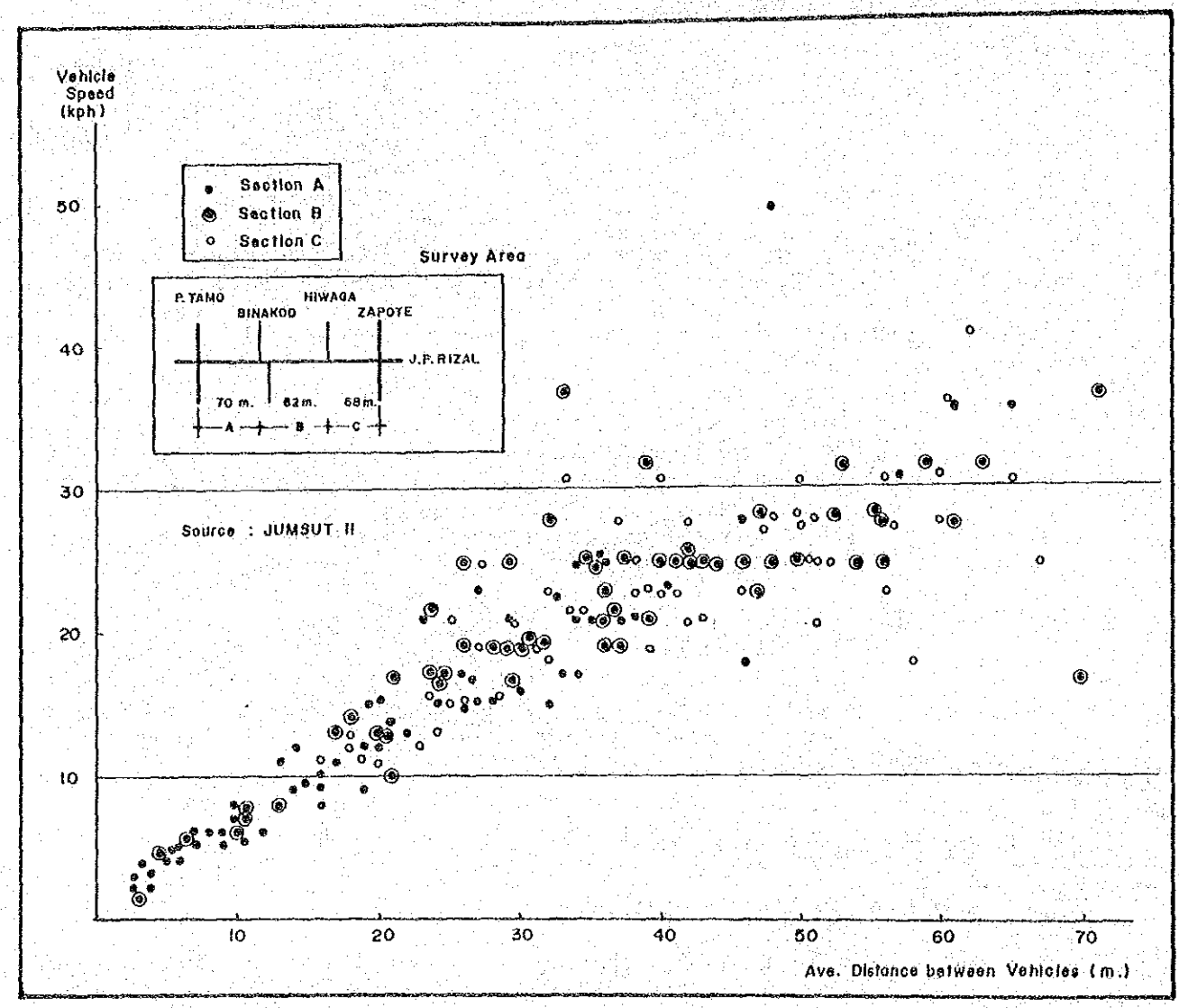
4.2 TRAFFIC AND ITS MANAGEMENT

4.2.1 Causes of Traffic Congestion

As mentioned earlier, the most visible and biggest headache of Metro Manilans is traffic congestion. However, due to the diversity and complexity of the traffic phenomena, the term "congestion" has a broad connotation. An indirect definition relates it with other problems such as traffic accidents, passenger convenience, and living environment. In the abstract, traffic congestion could be explained as a higher volume/capacity ratio.

Heavy mixture of vehicles and pedestrians and road conflict between vehicles and commercial activities are also related to congestion; so are slow moving vehicles. Figure 4.2 illustrates the direct relationship of speed with average distance between vehicles, though it is not quite linear. At slow vehicle speed, the distance between vehicles also becomes shorter or vice-versa. When the distance between vehicles is extremely short, a vehicle queue is formed.

Figure 4.2
Interrelationship Between Vehicle Speed and Average Distance Between Vehicles
(December 27, 1984, 11:00 a.m. - 7:00 p.m., at J. P. Rizal)



Other related factors associated with congestion are traffic safety, passenger convenience and urban environment. Table 4.2 lists down typical behavior which cause congestion based on a survey at a busy section of J. P. Rizal. Major findings are as follows:

Table 4.2
Reasons for Repeated Vehicle Stopping and Slowing down along a Busy Narrow Road
(January 9, 1985, 4:00-7:00 p.m., at J. P. Rizal)1/

	Car/ Jeep/Van	Jeepney	Bus	Total (Average)
No. of Samples Taken	44	55	13	112
Average Vehicle Speed (kph)	11.1	9.3	7.7	9.8
Reason for Stopping and Slowing-down (% in parenthesis)				
1) Own passenger loading/ unloading	17 (39)	35 (64)	6 (46)	58 (52)
2) Loading/unloading of other jeepneys	37 (84)	46 (84)	11 (85)	94 (84)
3) Loading/unloading of other buses	2 (5)	8 (15)	2 (15)	12 (11)
4) Loading/unloading/parking unparking of other vehicles	2 (5)	2 (4)	0 (0)	4 (4)
5) Pedestrian crossing (at intersection)	37 (84)	47 (85)	11 (85)	95 (85)
6) Pedestrian crossing (other roadways)	32 (73)	41 (75)	9 (69)	82 (73)
7) Pedestrian on carriageway (waiting for PUVs)	42 (95)	52 (95)	12 (92)	106 (95)
8) Pedestrian on carriageway (walking)	34 (77)	44 (80)	10 (77)	88 (79)
9) Other reasons (queueing, congestion, etc.)	18 (41)	23 (42)	7 (59)	48 (43)

Source: JUMSUT II

1/ Surveyed at the Pasong Tamo - Zapote section which is considered to be one of the busiest sections along J.P. Rizal.

- For jeepney and bus, loading/unloading passengers is the reason for repeated stopping or slowing down;

- The loading/unloading of passengers by jeepney and bus affects other vehicles considerably;

- Pedestrians crossing the roadway, walking along the curbside, and waiting for PUVs on the carriageway have negative effect on vehicle movement.

Although the causes of traffic congestion vary with the road sections according to the characteristics of the traffic and the section itself, a common denominator in Metro Manila is the presence of extensive PUV operation and pedestrian activites. A survey on the reasons behind frequent stopping or slowing down of jeepney and bus produced the following observations (see Table 4.3 for details).

- The wider the road, the more vehicles can overtake or be overtaken by other vehicles. By their number, PUVs may largely determine the average speed on narrow streets.

- PUVs make a stop every 70 to 200 meters. Buses sometimes make a stop more often than the jeepneys. Nevertheless, it is the jeepney which tries harder to get more passengers. The number of stopping/slowing down intended for getting passengers is more frequent for the jeepney than for the bus.

- Pedestrian activities are less descriptive on wider roads.

Table 4.3
Number of Jeepney/Bus Stopping by Reason, Number of Vehicles Overtaking Jeepney/Bus and Number of Vehicles Overtaken by Jeepney/Bus
(January 17-18 and 21-23, 1985, 4:00-7:00 p.m.)

Road	Carriage-way Width (m)	Mode	Ave. Travel Speed (kph) 1/	Number of Jeepney/Bus Stoppings by Reason (per km.)									No. of Vehs. Over-taken by Sur-veyed Jpy/Bus (/km)	No. of Vehs. that Over-took Surveyed Jpy/Bus (/km)
				Load/ Un-load	Try to Load/ Unload	Other PUVs Load/ Unload	Other Vehs. Load/ Unload/ Turn	Pedes-trian Cross	Pedes-trian on the Carriage-way	Traffic Signal/ Aids	Others	Total		
N. Domingo (V.Mapa-Pinaglabanan)	8.0-9.4	Jpy	16.0	3.2	2.2	1.9	3.1	1.3	0.9	0.8	0.1	13.5	1.3	1.6
		Bus	11.4	5.0	0.1	2.1	2.0	1.2	0.4	1.2	0.1	12.1	2.2	0.7
J.P. Rizal (P. Gil-EDSA)	9.0-9.1	Jpy	14.8	2.2	0.9	0.9	0.9	0.4	0.2	0.3	1.4	7.2	1.4	1.4
		Bus	11.4	5.9	0.4	1.0	1.5	1.0	0.5	0.3	0.7	11.3	0.3	3.7
Aurora Boulevard (V. Mapa-EDSA)	12.0	Jpy	19.6	1.7	1.0	0.9	1.0	0.3	0.1	1.2	0.2	6.4	1.3	4.8
		Bus	19.0	2.7	0.4	1.0	0.8	0.2	0.0	0.9	0.1	6.1	4.4	7.4
Shaw Boulevard (Aurora-EDSA)	20.5	Jpy	18.2	2.2	1.2	1.0	1.5	0.4	0.2	0.9	0.7	8.1	5.2	9.0
		Bus	17.2	3.1	0.4	0.6	1.4	0.2	0.0	0.9	0.7	7.3	1.9	7.6
R. Magsaysay (Nagtahan-V. Mapa)	24.0	Jpy	9.6	2.0	2.0	2.3	1.3	0.3	0.2	1.3	0.6	10.0	7.3	11.2
		Bus	15.6	1.1	0.5	0.9	0.7	0.1	0.0	1.0	0.4	4.7	5.0	11.0

Source: JUMSUT II

1/ JUMSUT I Data for evening peak hours for both directions.

Aside from those already mentioned, there are some other reasons which may not be usual but have large effects on traffic flow, viz:

- Malfunctioning of traffic signals
- Accidents and breakdowns
- Construction works

The street diggings occasioned by MWSS all over Metro Manila form the single largest cause for the traffic congestion at present.

To summarize, traffic congestion can be induced not only by a limitation of road capacity but also by a variety of non-traffic activities. While the former can be resolved only over a longer period, the latter can be dealt with immediately by means of traffic management and other administrative solutions.

4.2.2 Traffic Signal

During the period 1977 to 1981, the Traffic Engineering and Management Project (TEAM), was undertaken with IBRD funding and resulted in computer-controlled traffic signal system for about 100 intersections within C-2. In 1982, the TEAM II Project was started with funding from OECF to expand the signal system to the area between C-2 and C-4. The implementation of the signalization under TEAM II is targeted for 1985 to 1988.

The signals are coordinated and controlled by a central computer installed at the Traffic Control Center (TCC). This system is supported by a number of VHF radio equipment at the Police Districts and CCTV cameras installed at critical intersections. The coverage of the TCC is expanding. In 1982, it took over control of the traffic signals installed along Quezon Avenue by Transport Training Center (TTC). There are still some traffic signals independent of the TCC system. Most of them, however, are quite old and obsolete. One notable exception is the signalization project initiated by the Makati Municipal Government. They are planning to have a similar computerized traffic signal system with some interfacing with TCC in the near future.

The traffic signals in Metro Manila are generally characterized as follows:

a) Manual operation by traffic police at most major intersections, including those under TCC.

b) Multi-phasing

Manual Operation by Traffic Police

At major intersections, it is frequently observed that traffic policemen manually control the traffic signals. When this occurs, the signals become independent from the centralized control of the TCC. This is done on the pretext of flexible response to the ever changing traffic.

The said practice is considered to be dysfunctional in many cases. It distracts police from the more important task of intersection control management. In heavily-congested intersections where vehicle queues often extend far beyond the policemen's sight, manual intervention of traffic signals tends to worsen the situation. Table 4.4 shows the results of the traffic signal cycle time survey conducted by JUMSUT II along Buendia Avenue. The results are illustrative of the problems.

a) The cycle times of the traffic signals varied by intersection. The Pasong Tamo/Buendia intersection recorded the longest cycle time reaching more than five (5) minutes, followed by the EDSA/Buendia intersection; while other intersections showed less than three (3) minutes. Although it is natural for the cycle time to differ by intersection depending on local traffic condition, wide variation is not favourable to smooth traffic flow especially in a busy avenue as Buendia.

b) The cycle time in some intersections was extremely long. At the EDSA/Buendia intersection, for example, the maximum cycle time observed was nearly ten (10) minutes. As indicated in Figure 4.3, long cycle time means long queue of vehicles. Although the length of vehicle queue is not directly caused by the cycle time, nevertheless, extreme cycles exceeding 2.5 minutes are found to be counterproductive. The long vehicle queue leads to blockage of adjacent intersections as in the case of the EDSA/Buendia with the Paseo de Roxas intersection.

c) The phasing of traffic signal was found to be unstable and inconsistent. In the case of the EDSA/Buendia intersection, the green time for the Buendia approach fluctuated between 14 to 257 seconds. This extreme variability of course, prevents rational adjustment from vehicle drivers, and leads to unexplained congestion build-up.

It is a well-known fact that the capacity of an intersection decreases as the number of phases increases. In Metro Manila, multiphasing seems to be a usual practice. All normal intersections have four (4) phases, i.e., straight/right turn and left turn/right turn for one road, and the same for the others.

One notable feature of the left turn movement is its unusually independent phasing, even if the traffic volume is small. This may be attributed to unruly driver behavior.

Table 4.4
Results of the Vehicle Queue Length Survey
of the Buendia Approach to the EDSA/Buendia Intersection
(4:00-7:00 p.m., January 18, 1985)

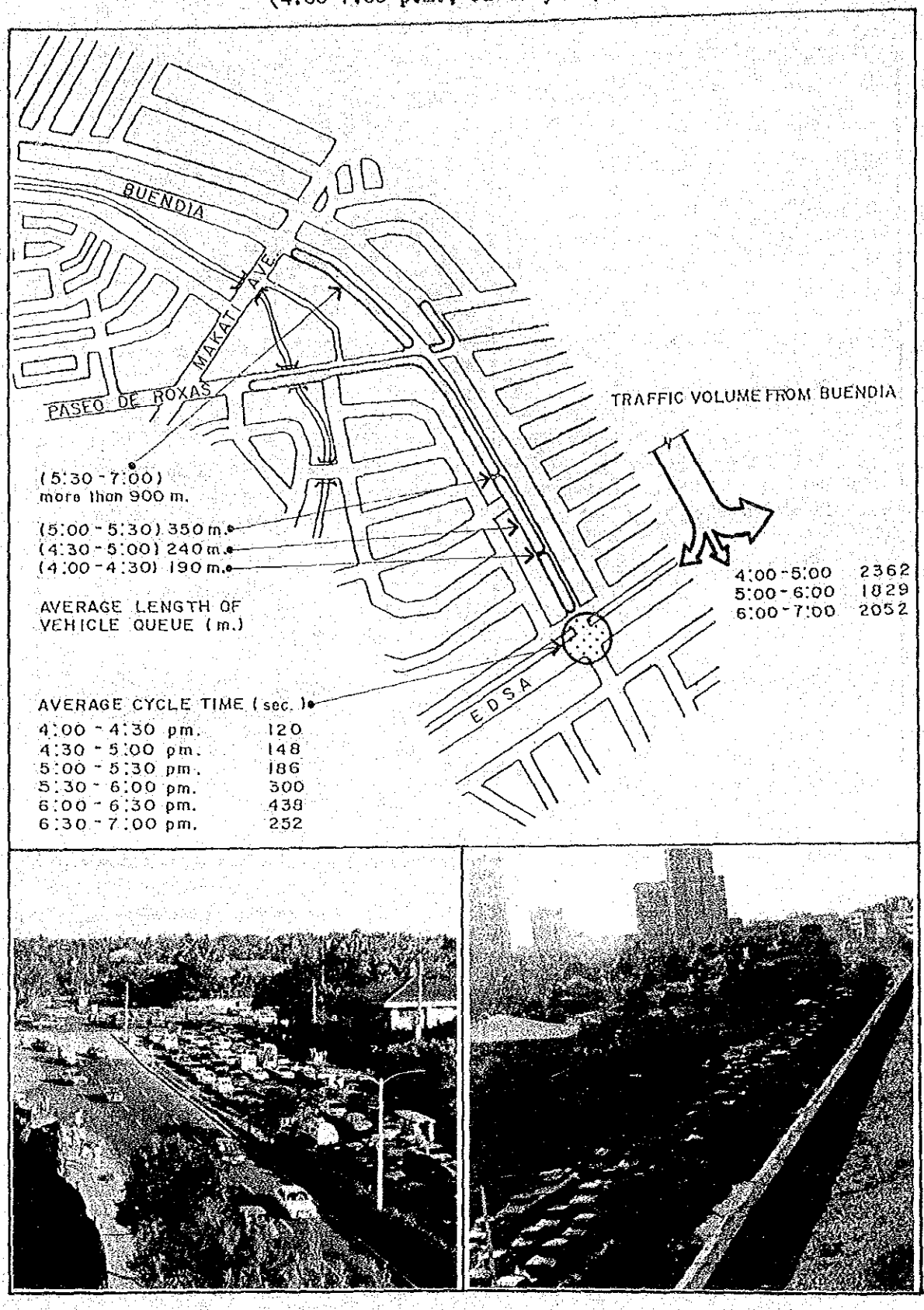
Intersection	No. of Phases	Cycle Time (seconds)			Priority Phase
		Ave.	Max.	Min.	
Manually Controlled Signals					
EDSA/Buendia	4 (3)[2/]	203	562	83	EDSA (straight/ right) or Buendia
Makati Ave./ Buendia	4	127	152	86	Makati Ave. (straight/right)
P. Tamo/Buendia	4	392	497	309	P. Tamo (South entrance)
Roxas Blvd./Buendia	4	156	217	120	not identified
Automatic Operation					
P. de Roxas/Buendia	4	91	92	90	Buendia (straight/right)
Ayala/Buendia	2	99	100	97	even
Harrison/Buendia	3	122	123	121	Buendia (straight/right)
Controlled by Police-man (not signalized)					
N. Garcia/Buendia	3	40	46	34	not identified

Source: JUMSUT II

1/ The various intersections were surveyed continuously between 4:00 p.m. and 7:00 p.m.. While the intersection of EDSA/Buendia follows a 4-phase cycle, others are on the average of three (3) cycles.

2/ The phase for the Forbes Park approach was occasional.

Figure 4.3
Change of Vehicle Queue Length of the Buendia Approach
to the EDSA/Buendia Intersection
(4:00-7:00 p.m., January 18, 1985)

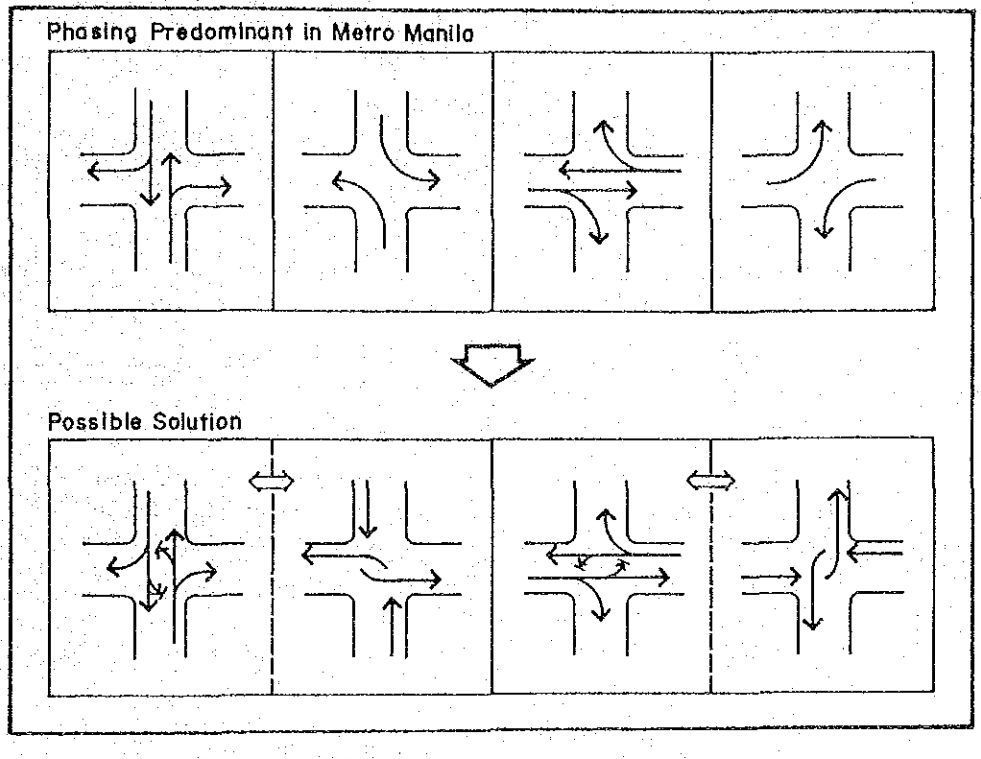


It appears reasonable to seek a reduction in the number of phases at several places by the following means:

a) Elimination of Left-turn Phase:

This is applicable only when traffic volume turning to the left is small as shown in Figure 4.4.

Figure 4.4
Reduction of Signal Phases through the Elimination of Left-turn Movement



b) Other Possible Solutions:

If an intersection is saturated and when drastic countermeasures cannot be taken, it is the easiest way to reduce the number of delays.

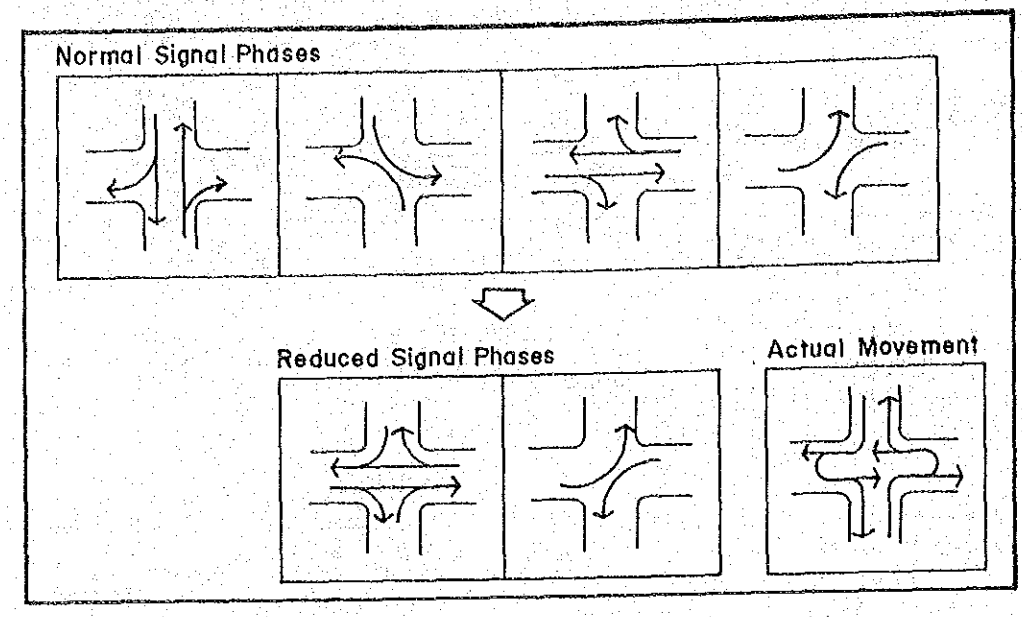
Figure 4.5 illustrates one possible countermeasure adopted in Metro Manila. This has already been proven as effective in some areas. However, due to U-turning and weaving reaction of the vehicles which are forced to turn to the right, its application becomes limited.

Other possible countermeasures are as follows:

- ban left-turn movement
- convert the road into one-way street

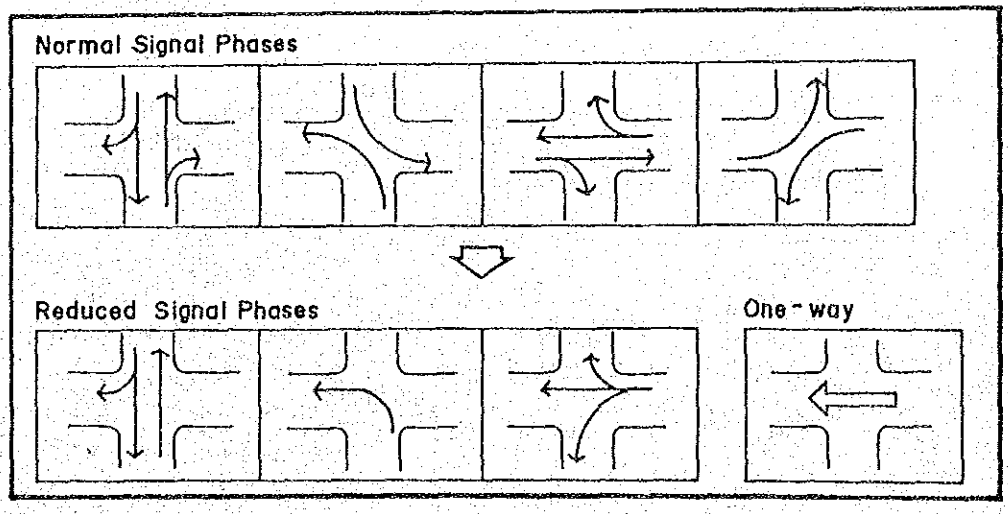
c) As long as adjacent and parallel roads can be found conversion of the roads into one-way pair is desirable.

Figure 4.5
Reduction of Signal Phases seen in Metro Manila



Banning the left-turn movement is presumably the most effective way of reducing the signal phases as long as there are suitable options nearby for left-turning. Introduction of one-way control is also effective as shown in Figure 4.6, provided a one-way pair of roads can be found.

Figure 4.6
Reduction of Signal Phases
by Introducing One-way Control



Conclusions

Manual operation of traffic signals creates a number of difficulties. The following are recommended:

a) Stop manual operation at major intersections. Complementary steps include:

   - well-trained traffic policemen
   - equipment for monitoring vehicle queues

b) Reduce cycle time of signals that are manually-controlled and if possible, visually synchronize with that of nearby intersections. Policemen should be drilled about tolerable maximum phases.

It is important to reduce the number of phases of traffic signals at saturated intersections. The following is recommended:

a) If the traffic volume turning to the left is small, elimination of the left-turn phase (still allowing left-turning) should be considered. Advanced notice or signs should be introduced.

b) If the traffic volume turning to the left is small and alternative routes can be identified, then banning left-turning is advisable.

4.2.3 Pedestrian Facilities

In Metro Manila, in many instances either pedestrian activity hinders vehicular traffic or vice-versa. This can be partly attributed to the undisciplined movement of both vehicles and pedestrians and due to deficiency of pedestrian facilities, such as:

a) Sidewalk
b) Pedestrian Crossing
c) Overpass
d) Pedestrian Signal
e) Pedestrian Barrier Fence
f) PUV Waiting Shed Loading/Unloading Zone

Possible solutions to the problems concerning pedestrian facilities are summarized in Table 4.5. These were applied to many of the identified short-term problem areas.

With regard to overpass, a mini-survey was conducted to get a feel for the reasons why pedestrians risk crossing without using the overpass. The results are shown in Table 4.6. Salient findings of the survey are:

a) Steep, narrow and crowded staircases make pedestrians reluctant to use the overpass. Especially when they carry heavy load, which is typical near markets, crossing on the roadway is more preferred. In Balintawak, this practice is even tolerated by policemen.

Table 4.5
Possible Solutions to the Problems
of Pedestrian Facilities

Pedestrian Facilities	Problem	Possible Solution
Sidewalk	• No sidewalk	• Construction/widening of sidewalk
	• Narrow sidewalk • Gaps and unsealed openings	• Pavement/repair of sidewalk, coupled w/ periodic maintenance • Provision of covers for unsightly and dangerous holes
	• Encroachments made by private activities • Unnecessary obstacles	• Control of private activities • Clearing of sidewalk through the removal of needless objects/debris that block or prove hazardous to pedestrian movements
Pedestrian Crossing	• No designated pedestrian crossings	• Provision of pedestrian crossings coupled with stricter enforcement to ensure safety and smoother traffic flow
Overpass	• Not frequently used (resulting in dangerous roadway crossing)	• Strict enforcement • Removal of vendors/beggars to ensure adequate pedestrian space
	• Lack of capacity (especially the staircase)	• Installation of the barrier fence on curbs and medians to prevent the inordinate crossings of pedestrians • Widening (mid-term/long-term)
Pedestrian Signal	• Lack of facility	• Installation of pedestrian signal (mid-term)
Pedestrian Barrier Fence	• Lack of facility	• Installation or extensions as deemed necessary
	• Vandalism	• Repair/maintenance of broken fences together with adequate patrol as a countermeasure.
	• Ignored by pedestrians	• Strict enforcement that pedestrians should not go beyond the fence
PUV Waiting Shed /Loading/Unloading Zone	• Lack of facility/ designation	• Construction/designation of adequate waiting sheds/loading and unloading zones
	• Poor location	• Relocation at convenient/suitable locations
	• Occupied by vendors or other private activities	• Clear sidewalks of vendors and other unnecessary activities so that commuters will make use of such facilities • Strict enforcement
	• Ignored by pedestrians/PUV drivers	• Installation of pedestrian barrier fence to serve as guide • Strict enforcement

Source: JUMSUT II

b) Barrier fence on the central median is effective for preventing pedestrians from crossing the roadway. However, once broken, pedestrians will dare to disregard them.

c) Limitations, if not prohibition, against vendors and protection against pickpockets are important considerations to encourage greater usage of overpass.

d) Physically handicapped pedestrians are unable to cross streets using the overpass.

Table 4.6
Number of Pedestrians Crossing and Reasons
for Not Using the Overpass
(Selected overpasses were surveyed on January 29, 1985)

Road/ Overpass	No. of Pedestrians Crossing (4:00-7:00 p.m.)			Reasons for Not Using the Overpass	Remarks
	Using Overpass	Across Carriageway	Total		
EDSA (Arayat)	16,096 (85)	2,873 (15)	18,969 (100)	1) preference for short-cut 2) reluctant to climb the staircase 3) crowded staircase 4) afraid of pickpockets 5) physically handicapped	• Barrier fence along the central median of EDSA is broken • 11 stalls on the sidewalk of Arayat
EDSA (Nepa-Q.Mart)	4,642 (68)	2,233 (32)	6,875 (100)	1) preference for short-cut 2) reluctant to climb the staircase 3) can cross safely 4) crowded staircase	• Barrier fence along the central median of EDSA is broken • 17 stalls on the overpass and 6 stalls on the western sidewalk (illegally squatting)
EDSA (Balintawak)	2,095 (38)	3,388 (62)	5,483 (100)	1) heavy goods to carry 2) tolerated by policemen 3) reluctant to climb the staircase 4) preference for short-cut 5) physically handicapped	• No barrier fence • For the convenience of pedestrians with heavy load, policemen sometimes guide them to cross EDSA
Lerma	15,653 (100)	- (-)	15,653 (100)		• Complete barrier fence along curb and median • 10 vendor stalls on the sidewalk with permits from Manila City Hall and the Barangay.

Source: JUMSUT II

Consequently, the following steps are recommended:

- Removal of vendors/beggars from congested overpasses.
- Periodic patrol by policemen to ensure vendor-free overpasses and to discourage pickpockets in congested overpasses.
- Complete installation of pedestrian barrier fence along the central median for dangerous or heavily trafficked roads.

- At the discretion of policemen, for pedestrians with heavy load and for physically handicapped persons to cross the roadway, inspite of the above.

- As a long-term solution, widening of the staircase where necessary and reduction of steep angles of the staircase so that even physically handicapped persons can climb.

4.3 BETTER USE OF SIDESTREETS

4.3.1 Current Use of Sidestreets

A sidestreet can be defined as a narrow road that is used less often than a nearby major thoroughfare. It serves either a secondary or local function and presents the following possibilities:

a) as an alternative link for public transport routes
b) as a turning circuit for PUVs
c) as a by-pass for through-traffic

The last one leads to expansion of road capacity of major thoroughfares while the first two improve PUV movements in various ways.

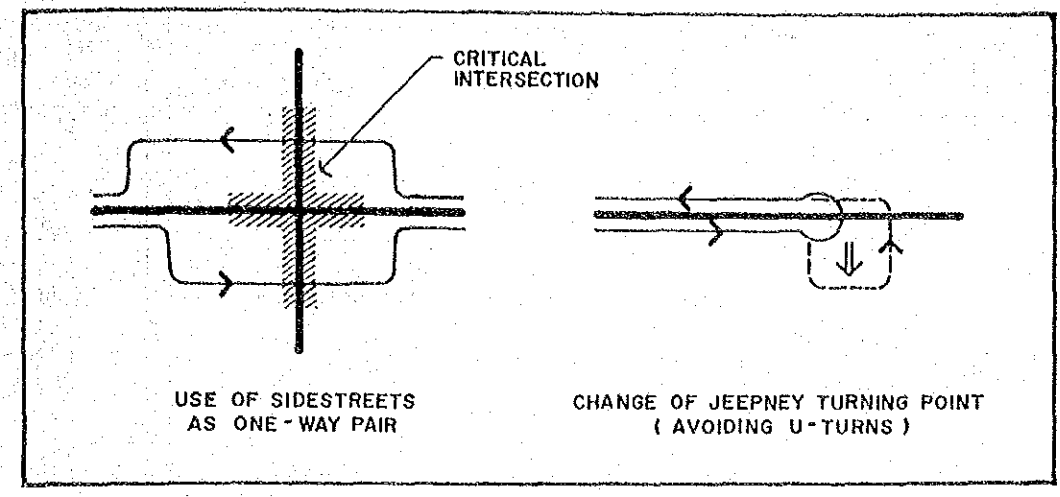
For a sidestreet to cater to through-traffic, it must have a good configuration so that it becomes an integral part of the entire road network. As a turning circuit, local conditions become the dominant criterion rather than alignment per se. Designation of sidestreets for the first role can be explored all over Metro Manila.

Although there are several sidestreets extensively used, many more are left unutilized due to various reasons:

- poor alignment (difficult access to/from major roads, short stretch, change in road width, etc.)
- poor road surface
- occupied by parked trucks
- obstacles like debris, garbage, etc.
- squatting houses, stalls, etc.
- used as a playground
- used as a market

Depending on how pressing the need is or the existing difficulties, the possibility of greater usage of sidestreets should be looked into for cost reasons. Typical examples are shown in Figure 4.7.

Figure 4.7
Typical Examples of Sidestreets Utilization



4.3.2 Availability of Sidestreets

The use of sidestreets for through-traffic deserves special attention.

Table 4.7 lists down available sidestreet by major roads. It is noted that sidestreets are relatively dense in the following areas:

- Northern Corridor along : J. A. Santos
  Rizal Avenue
- Northeastern Corridor along : España
  A. Mendoza (C-2)
  Quezon Avenue
  EDSA
- Eastern Corridor along : Aurora Boulevard
  EDSA
  S. Antonio Avenue
- Southeastern Corrridor along : J. P. Rizal
  Buendia Avenue
- Southern Corridor along : Taft Avenue
  South Superhighway
  Quirino Avenue

Figure 4.8 depicts the ratio between possible road capacity (with sidestreets) and road capacity, (major roads only) for each of the screenlines outlined in Section 2.3. The ratio illustrates the possibility of expanding road capacity via greater use of the available sidestreets. In general, numerous sidestreets are available inside C-4, except the Pasig River cross-section and some other screenlines. Outside C-4, a paucity of sidestreets is the norm.

Table 4.7
List of Available Sidestreets by Major Road

Mini 1/ Screenline	Major Roads Included	Available Sidestreets	No. of Lanes
R1	A. Mendoza	7th Avenue	(2)
		D. Tuazon Avenue	(4)
		Banawe Avenue	(2)
		Del Monte Avenue	(4)
		Mayon Avenue	(2)
		Amoranto Avenue	(2)
		Calavite	(2)
		Mariveles	(2)
		Blumentritt	(4)
		Rizal Avenue	(4)
		Solis	(2)
		Pampanga	(2)
		Earnshaw	(2)
		Hermosa	(2)
		4th Avenue	(2)
		C. Namie	(2)
R2	EDSA - Tandang Sora	Mendez Road	(2)
		Bahay Toro	(2)
		Pluto	(2)
		Don Felipe	(2)
		Victoneta Avenue	(2)
R3	Don M. Marcos Avenue	Camarin Road	(2)
		Old Sabarte	(2)
R4	Quirino Avenue, G. Araneta Avenue	Tomas Morato Avenue	(4)
		Scout Tobias	(2)
		Don A. Roces Avenue	(4)
		Scout Chuatoco	(2)
		Araneta Avenue	(4)
		Nicanor Reyes	(2)
		Dapitan	(2)
		Bayani	(2)
		Plaridel	(2)
R5	EDSA - East Avenue	Kamuning	(2)
		Kamias	(4)
		V. Luna	(2)
		Kalayaan Avenue	(2)
		Anonas Extension	(2)
		V. Luna Extension	(2)
R6	Tandang Sora	University Avenue	(4)
		Osmeña Avenue	(2)
		Roxas Avenue	(2)
R7	Nagtahan - Shaw Boulevard - Ortigas Avenue	Santol	(2)
		Old Sta. Mesa	(2)
		Valenzuela	(2)
		N. Domingo	(2)
		Blumentritt	(2)

1/ Location of the mini-screenlines are shown in Figure 2.12

(Cont. Table 4.7)

Mini 1/ Screenline	Major Roads Included	Available Sidestreets	No. of Lanes
		Pinaglabanan	(2)
		Big Horse Shoe Drive	(2)
		Valentina	(2)
		Doña J. Rodriguez	(2)
		Gov. Gilmore Avenue	(2)
		Doña M. Hemady	(2)
R8	EDSA - Ortigas Avenue	McKinley	(2)
		Eisenhower	(2)
		Annapolis	(2)
		Doña J. Vargas Avenue	(4)
		Katipunan Road	(2)
R9	A. Rodriguez	Angel Tuazon	(2)
		Chestnut	(2)
		Daang Bakal	(2)
		Bayan-Bayanan Avenue	(2)
		Liwasang Kalayaan	(2)
		Katipunan	(2)
R10	Quirino Avenue, Gen. Kalentong, C-3	Pasig Line	(2)
		Imelda Avenue	(2)
		E. Pascua	(2)
		H. Santos	(2)
		Pasong Tamo	(2)
		Reposo	(2)
		Makati Avenue	(4)
R11	EDSA	McKinley Road	(2)
R12	Dr. Sixto Antonio	M. Concepcion	(2)
R13	Buendia Avenue	Vito Cruz Extension	(2)
		Kamagong	(2)
		Pasong Tamo	(2)
		Washington	(2)
		Pasay Road	(2)
		Paseo de Roxas	(4)
		Ayala Avenue	(6)
		Makati Avenue	(4)
R14	EDSA	Service Road (Left)	(2)
		Service Road (Right)	(2)
		Private Road	(2)
		Doña Soledad	(2)
R15	Upper Bicutan	Service Road (Left)	(2)
		Service Road (Right)	(2)
		Green Heights Avenue	(2)
		President Avenue	(2)
		Aguirre Avenue	(2)
		J. Elizalde	(2)

1/ Location of the mini-screenlines are shown in Figure 2.12

(Cont. Table 4.7)

Mini Screenline	Major Roads Included	Available Sidestreets	No. of Lanes
		Tropical Avenue	(2)
		Don Manolo Boulevard	(2)
		Bb. R. Tirona	(2)
		Don Jesus Boulevard	(2)
		Marcos Alvarez Avenue	(2)
		Wawa	(2)
		San Guillermo	(2)
		Rizal Avenue	(2)
		T. Molina	(2)
C16	Roxas Boulevard, Rizal Avenue, Quezon Boulevard	Moriones	(2)
		Dagupan	(2)
		Asuncion	(2)
		Jaboneros	(2)
		Ongpin	(2)
		Dasmariñas	(2)
		Escolta	(2)
		Magallanes Drive	(2)
		Aduana	(2)
C17	R10, Juan Luna, J.A. Santos	Antonio Rivera	(2)
		Bambang	(2)
		Aragon	(2)
C18	España, Rizal Avenue	Dapitan	(2)
		Laong-Laan	(2)
		M. dela Fuente	(2)
		Vicente Cruz	(2)
		N. Reyes	(4)
		Lepanto	(2)
		Sergio Loyola	(2)
		Jacobo Fajardo	(2)
		Blumentritt	(2)
C19	R. Magsaysay Boulevard	C. Palanca	(2)
		Arlegui	(2)
		Mendiola	(4)
		Dr. J.P. Laurel, Jr.	(2)
		Concepcion Aguila	(2)
		Earnshaw	(2)
		G. Tuazon	(2)
		Loreto	(2)
C20	U.N. Avenue, Pedro Gil	Concepcion	(2)
		San Marcelino	(2)
		Romualdez	(2)
		Francisco	(2)
		Paz Mendoza Guanzon	(4)
		Quirino Avenue	(4)
		Paz	(2)
		Jesus	(2)
		Laura	(2)
		M. Carreon	(2)

1/ Location of the mini-screenlines are shown in Figure 2.12

(Cont. Table 4.7)

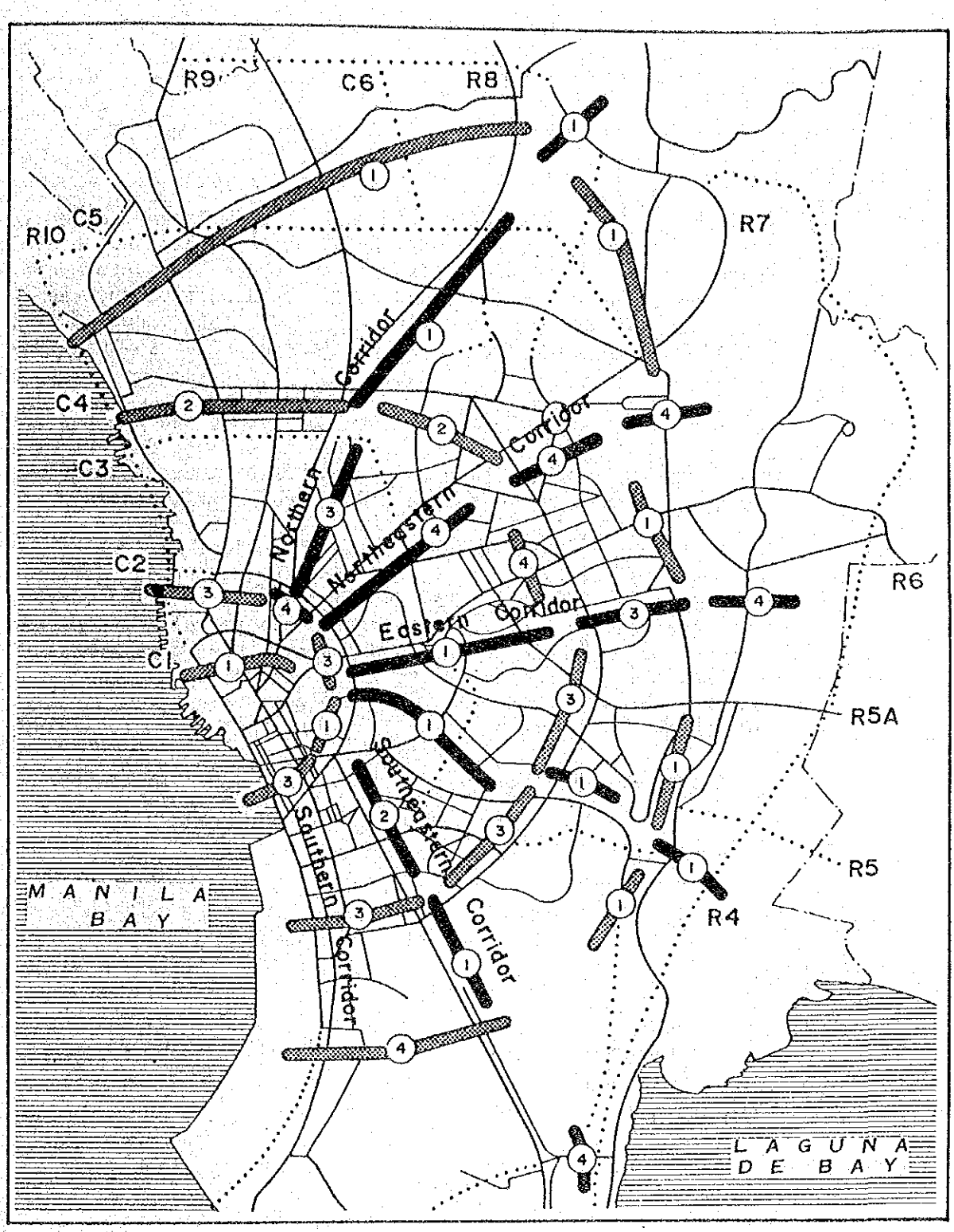
Mini Screenline 1/	Major Roads Included	Available Sidestreets	No. of Lanes
C21	Taft Avenue	Ma. Orosa	(4)
		T.M. Kalaw	(4)
		M.H. del Pilar	(2)
		A. Mabini	(2)
		M. Adriatico	(2)
		Pedro Gil	(2)
		San Andres	(2)
		United Nations Avenue	(2)
		Vito Cruz	(2)
		Leon Guinto	(2)
		Gen. Luna	(2)
		Tramo	(2)
		Estrada	(2)
		Bautista	(2)
		Zobel Roxas	(2)
		Dian	(2)
C22	H. Lopez Boulevard, Rizal Avenue, A. Bonifacio, J. Luna	10th Avenue	(2)
		B. Serrano	(2)
		Heroes del 96	(2)
		University Avenue	(2)
		Gov. W. Pascual Avenue	(2)
		Gen. Luna	(2)
		H. Lopez Boulevard	(2)
C23	Roosevelt Avenue, Quezon Avenue	Del Monte Avenue	(2)
		Talayan Road	(2)
		West Avenue	(2)
		Road 1	(2)
C24	E. Rodriguez Sr. Blvd., Aurora Boulevard	New York Avenue	(2)
		Gen. Romulo Avenue	(2)
		P. Tuazon	(2)
		Gen. Aguinaldo	(4)
		Gen. McArthur	(4)
		Main Avenue	(2)
		Col. Boni Serrano	(2)
		3rd Avenue	(2)
		Yale	(2)
C25	Ortigas Avenue, Shaw Boulevard	Blumentritt	(2)
		Wilson	(2)
		Martinez	(2)
		J. Rizal	(2)
		Boni Avenue	(2)
		Maysilo	(2)
		Primo Cruz	(2)
		Acacia	(2)
		Pioneer	(2)
		Meralco Avenue	(4)

1/ Location of the mini-screenlines are shown in Figure 2.12.

(Cont. Table 4.7)

Mini Screenline 1/	Major Roads Included	Available Sidestreets	No. of Lanes
C26	Buendia Avenue, Dr. J.P. Rizal	McKinley Road	(2)
C27	South Superhighway, Roxas Boulevard, Taft Avenue	Libertad	(2)
		Dolores	(2)
		Pio del Pilar	(2)
		Filmore	(2)
		Evangelista	(2)
		Protacio	(2)
		Aurora Boulevard	(4)
		F.B. Harrison	(2)
		Park Avenue	(2)
		Airport Road	(2)
		Airport Avenue	(2)
C28	Quirino Highway, N. Diversion Rd., Mc Arthur Highway, M.H. del Pilar	Arkong Bato	(2)
		M.M. del Pilar	(2)
		Panghulo Road	(2)
		Pinagkabalian	(2)
		M.H. del Pilar	(2)
		Rincon Road	(2)
		T. Santiago	(2)
C29	Don M. Marcos Avenue, Tandang Sora, Visayas Avenue		
C30	R10, Aurora Boulevard	Anonas	(2)
		20th Avenue	(2)
		Raha Soliman	(2)
C31	Pasig Boulevard	Hilcrest	(2)
		C. Raymundo Avenue	(2)
		Christian	(2)
		Canley Road	(2)
		Kapasigan	(2)
C32	National Road		
C33	South Superhighway, Quirino Avenue, R1	MIA Road	(4)
		Imelda Avenue	(2)
		E. Rodriguez Sr. Avenue	(2)
		Naga Road	(2)
		CAA Road	(2)
		E. Rodriguez Avenue	(2)
		Armstrong Avenue	(2)
		Merville Avenue	(2)

1/ Location of the mini-screenlines are shown in Figure 2.12



LEGEND :

①	~ 1.00
②	1.01 ~ 1.25
③	1.26 ~ 1.50
④	1.51 ~

$$\left(\frac{\text{POSSIBLE ROAD CAPACITY INCLUDING SIDESTREETS}}{\text{ROAD CAPACITY OF MAJOR ROADS}}\right)$$

SOURCE : JUMSUT II

Figure 4.8
Availability of
Sidestreets by
Mini-Screenline

4.4 ASSESSMENT OF INTERMODAL RELATIONS

4.4.1 Determinants of Modal Choice

A. General

From a number of studies in the past, attempts were made to model intermodal relationships based on passenger and travel characteristics. These efforts succeeded in determining modal split between private and public transport users, as in the case of JUMSUT I Report Part V "Home Interview Survey (HIS)", where difference in income levels proved to be significant.

However, the sub-modal split between jeepney and bus has not so far been explained clearly. This is perhaps due to the fact that passengers tend to use the first mode that comes along and partly due to the methodological difficulties.

To address this interesting problem of choice, a series of passenger interview surveys was conducted covering jeepney, ordinary bus, love bus, LRT and passenger car. The surveys were carried out along Taft Avenue - where all modes are represented. For the jeepney and ordinary bus, similar routes were selected (from Baclaran to the direction of Quezon Avenue and vice-versa). The number of samples obtained ranged from 110-160 for each mode with the following items of information:

1) Passenger Characteristics

- Sex
- Age
- Occupation
- Income Level
- Car Ownership

2) Trip Characteristics

- Purpose of Trip
- Origin/Destination
- Trip Chain: Mode Used
  Point of Transfer
  On-board Time
  Waiting Time
  Access Time
  Fare

Since it would be insufficient to explain the interrelationship between the jeepney and bus simply on the foregoing factors, the following data were derived after careful examination of the trip chain in each sample:

Difference in Number of Transfers
Difference in Travel Time
Difference in Fare

* assuming a realistic route for the competing mode (jeepney for bus and bus for jeepney along Taft Avenue

B. Application of the Disaggregate Behavioral Model

The Disaggregate Behavioral Model was initially developed during the 1960's to analyze the choice of travel mode on a probabilistic basis. It purports to explain people's behavior as in terms of probabilistic choice among possible alternatives, with the assumption that some unknown variables influence the final selection but that people always try to decide in a rational fashion.

Accordingly, JUMSUT II adopted the logit type model for disaggregate behavior. It hypothesized the probability of modal choice between two modes according to the formula below:

$$P = \frac{1}{1 + \exp\left(\sum_i a_i x_i\right)}$$

where: P = probability of selecting a bus

e.g.: 1 or 100%, if bus
0 or 0%, if jeepney

a_i = coefficient for variable x_i

x_i = explanatory variable

On the premise that the above formula holds, the passenger behavior as to modal selection was studied.

C. Jeepney vs. Bus

As a first approximation, the dependency was evaluated based on passenger characteristics only. The result is shown in Table 4.8. It is apparent from the table that modal split between jeepney and bus cannot be explained adequately by passenger characteristics. Nevertheless, the following tendencies are observable:

- As a single variable, the income level has the strongest influence on modal selection, though not sufficient.

- If there is no material difference between jeepney and bus supply characteristics, the probability for the jeepney being selected is higher than the bus. As shown in Figure 4.9, in order for the bus to be chosen, its travel time must be shorter than the jeepney by four (4) minutes on the average or be cheaper in fares than the jeepney by about 23 centavos. In addition, the time cost perceived by jeepney/bus passengers can be calculated at 3.70 pesos/hour from the above relation.

- Among the three variables, the difference in number of transfers is the most influential determinant. When there is no difference in number of transfers between the jeepney and bus, the jeepney is preferred unless the bus is faster by more than four (4) minutes, as stated earlier. However, if the number of transfers on the jeepney is one more than that on the bus, the jeepney will not be selected unless it is faster than the bus by about 13 minutes, as shown in Figure 4.10. From this analysis, it can be surmised that one transfer is equivalent to 17 minutes or ₱1.50 for jeepney and bus passengers.

- As income level increases, a passenger tends to go more for the jeepney along Taft Avenue.

- By occupation, the administrative/professional workers prefer bus while the factory/transport and clerical/service workers tend to ride the jeepney.

- By sex and age, the difference is neglible.

Based on the above analysis, a tentative conclusion is that jeepney and bus passengers have no significant differentiation.

Table 4.8
Result of the Disaggregate Behavioral Model Application
(Jeepney vs. Bus, Passenger Characteristics)

Composition of Explanatory Variables				Explanatory Rate (%)	Ro-Square Value
Income Level	Sex	Age	Occupation		
o	-	-	-	61.0	0.06054
-	o	-	-	52.9	0.00412
-	-	o	-	53.2	0.00460
-	-	-	o	58.4	0.03253
o	o	-	-	66.1	0.06043
o	-	o	-	64.2	0.06260
o	-	-	o	65.8	0.10824
-	o	o	-	51.6	0.00536
-	o	-	o	60.0	0.03833
-	-	o	o	60.6	0.03444
o	o	o	-	64.5	0.06284
o	o	-	o	69.0	0.11648
o	-	o	o	65.8	0.10924
-	o	o	o	59.4	0.03984
o	o	o	o	69.4	0.11712

Source: JUMSUT II

Figure 4.9
Schematic Illustration of Modal Choice Behavior of Jeepney/Bus Passengers in Relation to the Difference in Travel Time and Fare

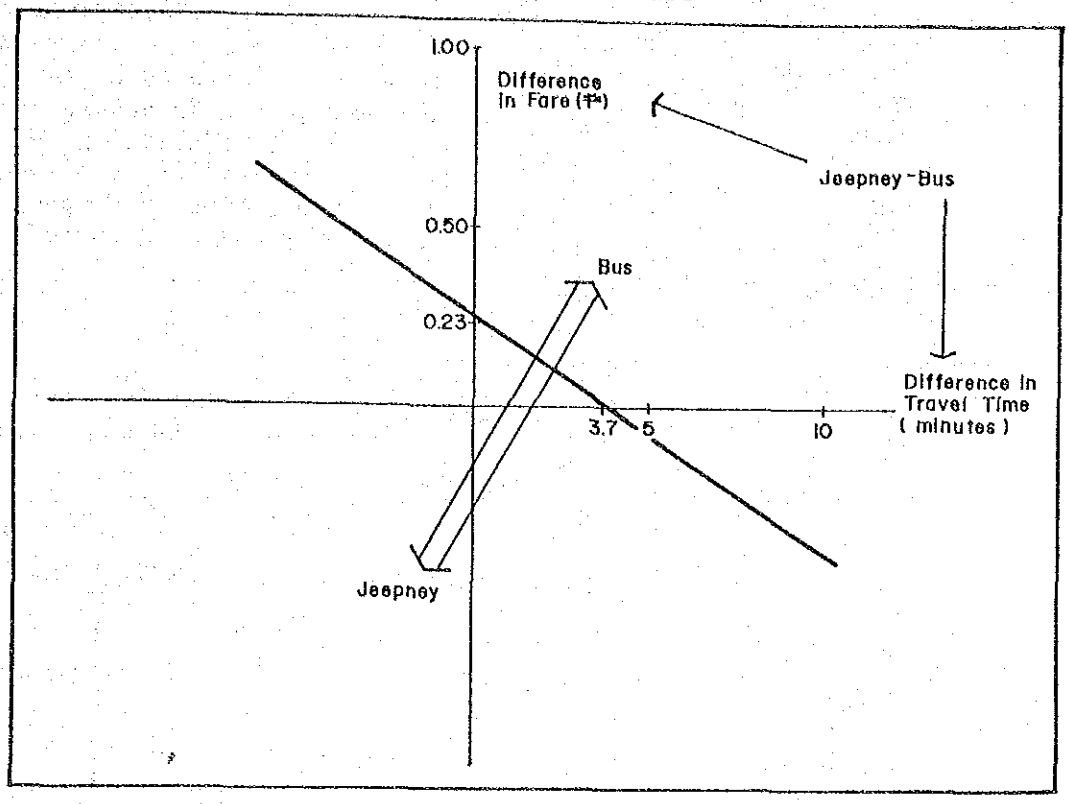
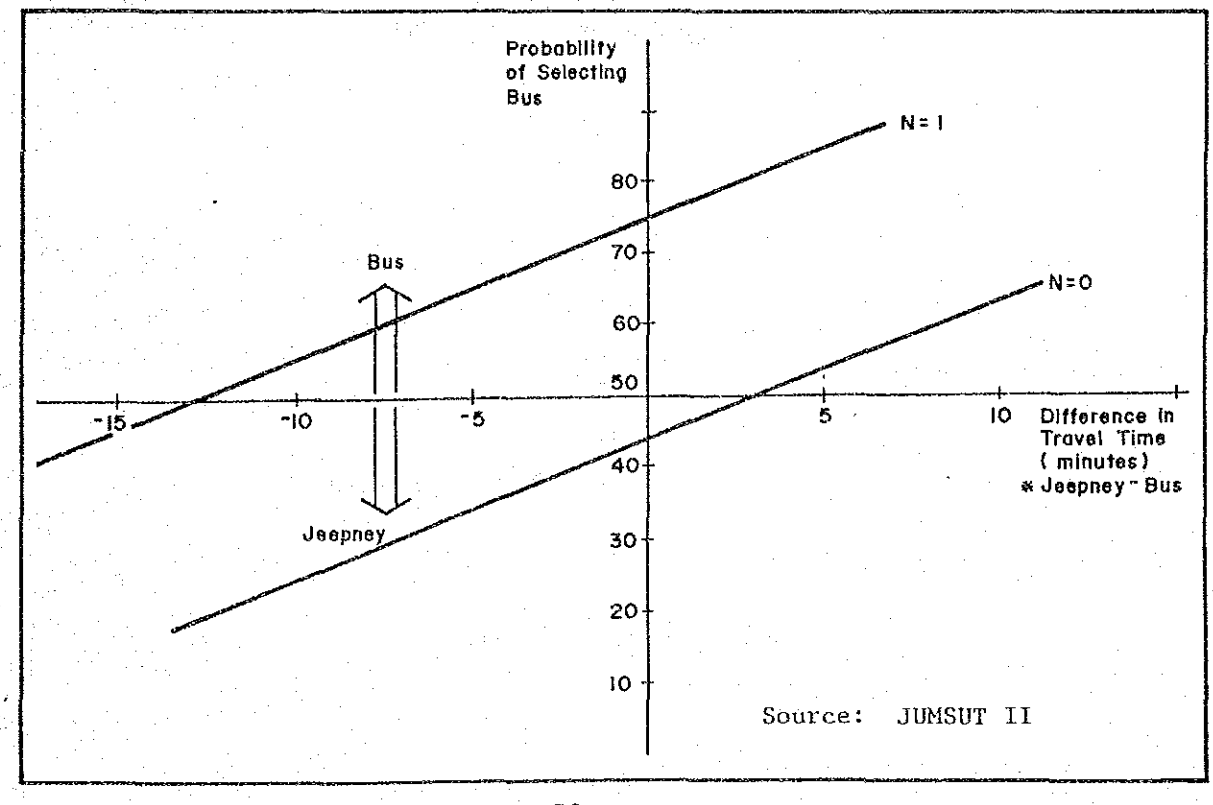


Figure 4.10
Schematic Illustration of Modal Choice Behavior of Jeepney/Bus Passengers in Relation to the Difference in Number of Transfers and Travel Time



The second stage of the analysis examined variables pertinent to the characteristics of jeepney and bus, e.g., difference in travel time, fare and number of transfers. For travel time, both the ratio and the difference were tested and the latter proved to be more related. The result is presented in Table 4.9. Compared to the previous table, the Ro-square value, (which indicates the "likelihood" of the model being correct) is high but still short as the explanatory rate remained on the same level. However, the choice between a jeepney or a bus seems to be influenced more by the supply characteristics rather than by passenger differences.

Table 4.9
Result of the Disaggregate Behavioral Model Application
(Jeepney vs. Bus, Difference in Supply Characteristics)

Difference in Travel Time	Difference Difference in Fare	Difference in No. of Transfers	Explana-tory Rate (%)	Ro-Square Value
o	-	-	66.3	0.07348
-	o	-	68.7	0.08543
-	-	o	66.7	0.14165
o	o	-	69.3	0.14778
o	-	o	69.7	0.20962
-	o	o	66.0	0.14006
o	o	o	70.0	0.20712

Source: JUMSUT II

The final phase of the model test combined the variables for passenger characteristics and supply characteristics. The results were consistent with the first two stages, but the explanatory rate and the Ro-square value went up. The most successful case uses 5 variables in the following equation.

Resultant Equation

$$Z = 1.37149 - 0.27673 \times \begin{bmatrix}\text{Income}\\ \text{Level}\end{bmatrix} + \begin{bmatrix}-0.48584\\ 0.22875\\ -1.40999\\ 0.04110\\ 0.18367\end{bmatrix} \times \begin{bmatrix}\text{Occupation}\\ \text{Matrix}\end{bmatrix} + \begin{bmatrix}0.34707\\ 0.25114\\ -0.20145\\ -0.12421\\ 0.05502\end{bmatrix} \times \begin{bmatrix}\text{Trip}\\ \text{Purpose}\\ \text{Matrix}\end{bmatrix} + 0.08982 \times \begin{bmatrix}\text{Difference}\\ \text{in Travel}\\ \text{Time}\end{bmatrix} + 1.82293 \times \begin{bmatrix}\text{Difference}\\ \text{in number}\\ \text{of Transfer}\end{bmatrix}$$

where Z = Utility Function in

$$P = \frac{1}{1 + \exp(-Z)}$$

* in this case P = 1 (100% bus)
P = 0 (100% jeepney)

Income Level :

1	0 - 500/month
2	501 - 1000
3	1001 - 1500
4	1501 - 2000
5	2001 - 2500
6	2501 - 3000
7	3001 - 3500
8	3501 - 4000
9	4001 - 5000
10	5001 - 7000
11	7001 -

Occupation Matrix (Identify matrix where 1 = True; 0 = False) for the following categories:

- Clerical/Service/Sales
- Administrative/Professional
- Factory/Transport
- Student
- Housewife/Jobless/Others

Trip Purpose Matrix (Identity matrix where 1 = True; 0 = False):

- To Work
- To School
- Private
- Business
- To Home

Difference in Travel Time:

In terms of Minutes (always expressed as Jeepney-Bus)

Difference in Number of Transfers:

In terms of Times, expressed as Jeepney-Bus

The overall explanatory rate is 79.9% for the foregoing equation. Applying it to the samples gives the following table.

Table 4.10
Result of Disaggregate Behavioral Model Applied on Jeepney vs. Bus, Passenger and Supply Characteristics

Actual	Forecasted		Total
	Jeepney	Bus	
Jeepney	113	28	141
Bus	32	125	157
Total	145	153	298

Ro-square Value: 0.335355

D. Choice among Jeepney, Bus, Love Bus, and LRT

The same methodology was applied for the expanded modal choice behavior among various public transportation passengers. Due to the limited availability of the Love Bus and the LRT, the analysis was confined to passenger characteristics and trip purposes. The result is presented in Table 4.11.

Judging from the results, it can be concluded that the choice of modes is more complex than what passenger characteristics and trip purpose could explain. Salient findings are:

- The modal choice between the Jeepney and the Love Bus is strongly influenced by income level and occupation of passengers. The income level of Love Bus passengers is, in general, higher than that of jeepney passengers and more than 50% of Love Bus passengers are administrative/professional workers. The trip purpose is also significantly different between the two modes; "private" and "business" purposes claim a larger portion for Love Bus.

- The modal choice between the jeepney and the LRT is very fuzzy due to the similarity in the distribution of occupation and trip purpose, inspite of a difference in income level.

- The choice between Ordinary and Love Bus appears to behave as that between jeepney and Love Bus. The important factors are income level, occupation and trip purpose.

- Between the Ordinary Bus and the LRT, the most influential factor is income level, followed by occupation(for the LRT, the share of clerical/service/sales is high) and trip purpose.

- The intermodal relationship between the Love Bus and the LRT is probably the only one with clear patterns. Although the income level is neutral, the following factors are found influential:

  a) Occupation. The share of administrative/professional workers is more than 50% for the Love Bus, while, for the LRT, the shares of clerical/service/sales, student and housewife/jobless/others predominate.

  b) Trip Purpose. For the Love Bus, the "private" and "business" purposes share a high percentage while "to work", "to school" and "to home" purposes are dominant on the LRT.

Table 4.11
Result of Disaggregate Behavioral Model Application
(Various Public Transport Modes Passenger Characteristics and Trip Purpose)

Modes \ Variables Used	Income Level	Income Level Sex	Income Level Occupation	Income Level Sex Occupation	Income Level Sex Occupation Trip Purpose
Jeepney \ Ordinary Bus	61.0 (0.06054)	66.1 (0.06043)	65.8 (0.10824)	69.0 (0.11648)	69.0 (0.10555)
Jeepney \ Love Bus	58.8 (0.00445)	59.5 (0.00552)	71.0 (0.12460)	71.0 (0.12175)	73.1 (0.18124)
Jeepney \ LRT	63.8 (0.00206)	58.7 (0.00069)	59.1 (0.02033)	59.1 (0.01696)	64.4 (0.01805)
Ordinary Bus \ Love Bus	62.9 (0.05453)	62.9 (0.05117)	68.9 (0.10416)	69.3 (0.10291)	73.5 (0.18040)
Ordinary Bus \ LRT	65.9 (0.07120)	65.6 (0.07330)	66.6 (0.12083)	66.9 (0.12640)	70.2 (0.14934)
Love Bus \ LRT	50.9 (0.00625)	55.4 (0.00503)	69.4 (0.10157)	69.4 (0.09874)	77.5 (0.28505)

Note: Upper Column - Explanatory Rate (%)
Lower Column - Ro-square Value

E. Choice between Public and Private Modes

The same analysis were conducted with the private car as the base alternative to different public transportation modes. The results are summarized in Table 4.12.

Table 4.12
Result of Disaggregate Behavioral Model Application
(Private vs. Public, Passenger Characteristics and Trip Purpose)

Variables / Public Mode	Income Level	Income Level Sex	Income Level Occupation	Income Level Sex Occupation	Income Level Sex Occupation Trip Purpose
Jeepney	87.7 (0.31499)	85.0 (0.37851)	86.4 (0.38261)	87.7 (0.42472)	87.3 (0.44386)
Ordinary Bus	85.6 (0.35935)	84.5 (0.40262)	90.2 (0.56347)	91.3 (0.59096)	89.4 (0.60506)
Love Bus	75.1 (0.19626)	73.8 (0.27298)	83.7 (0.29664)	82.8 (0.36400)	86.7 (0.44557)
LRT	83.3 (0.18277)	73.8 (0.27669)	82.1 (0.28771)	81.7 (0.35084)	80.6 (0.35918)

Note: Upper Column - Explanatory Rate (%)
Lower Column - Ro-square Value

As can be seen from the table, income level plays a dominant role in determining modal split. This is due to the fact that 65% of private car users belong to the highest bracket (more than ₱7,000/month) while public mode users are mostly poor (the share of the highest bracket is only 4%, even for the Love Bus). Since the explanatory rate as well as the Ro-square value is quite high compared to the previous analyses, it can be concluded that the modal split between public and private modes can be explained adequately by the household income level.

The following equation relates choice between the private car and the jeepney based on income level:

$$Z = -3.14994 + 0.36550 \times [\text{Income Level}]^*$$

* [For the income level category and the meaning of Z, see the previous section]

Explanatory Rate = 87.7%

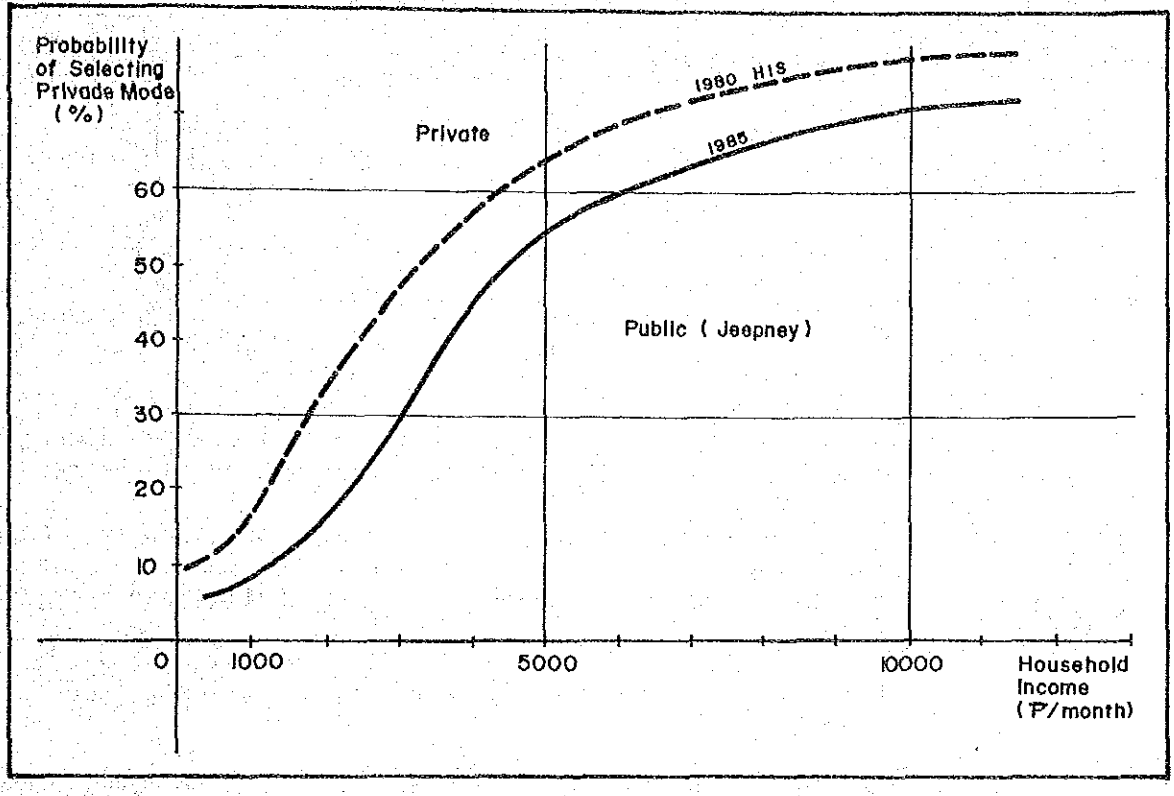
Table 4.13
Result of Disaggregate Behavioral Model Application
(Public vs. Private, Income Level)

Actual	Forecasted: Jeepney	Forecasted: Private Car	Total
Jeepney	144	9	153
Private Car	23	84	107
Total	167	93	260

Ro-square Value: 0.32499

Figure 4.11 shows schematically the modal split between private and public (the jeepney in this case) modes in relation to household income. Compared to the 1980 HIS, the curve has shifted to the public transport side for the same income group. This is not unnatural because of inflation.

Figure 4.11
Schematic Illustration of Modal Choice
Behavior of Public and Private Transportation
Passengers in Relation to the Income Level



4.4.2 Jeepney and Bus Suitability by Road Type

In general, the bus is said to be twice more efficient in road space than the jeepney because of its advantage of being able to carry 24 passengers per p.c.u. (60 seats/2.5); while the jeepney can only accommodate 9 - 12 passengers per p.c.u. (14-18 seats/1.5).

This observation is true in wide multi-lane roads where the bus, jeepney and other vehicles can run freely without any significant conflicts between them. However, on narrow roads, the physical dimension as well as the operational characteristics of the vehicles interact to such an extent as to alter the overall service level of the road. Figure 4.12 illustrates the case typical for three-lane roads such as N. Domingo, J. P. Rizal, F. B. Harrison, etc. In this case, the bus can hardly be overtaken when the road is congested; thus making the speed of the bus as the controlling factor.

Figure 4.12
Comparison of the Size of Ordinary Bus
Jeepney and Car on a Typical 3-Lane Road

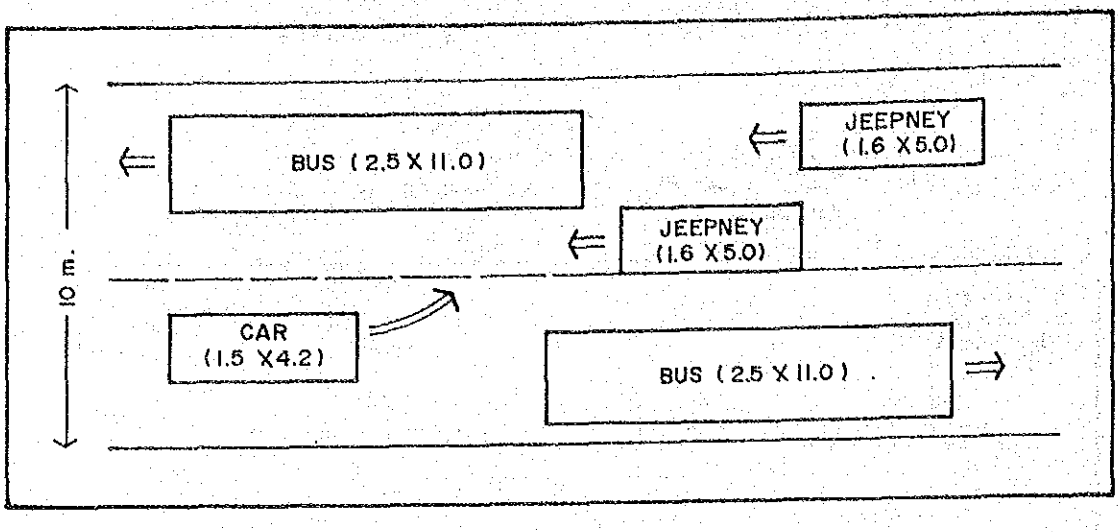


Table 4.14 records the result of a survey to validate or disprove the foregoing hypothesis. The following observations can be made:

- On N. Domingo, which is actually used as a two-lane road due to rampant curbside parking, the bus is hardly overtaken inspite of speed lower than that of the jeepney.

- On J. P. Rizal, which is a typical three-lane road, the bus can be overtaken by 3.7 vehicles per kilometer on the average.

- On Aurora Boulevard, Shaw Boulevard and R. Magsaysay, which are multi-lane roads, the bus can be easily overtaken compared to the above narrower roads, although buses run much faster.

While still lacking in detailed simulation, some useful rule of thumbs can already be adopted:

- For narrow roads (2 to 3 lanes), the bus is not the appropriate mode as it is likely to decrease capacity.

- Where traffic volume is small, the bus can be accommodated on narrow roads without adverse impact. However, at this level of demand the jeepney is more economical.

Table 4.14
Number of Vehicles Overtaking Jeepney/Bus
and Number of Vehicles Overtaken by Jeepney/Bus
(Jan. 17-18 and 21-23, 1985, 4:00-7:00 p.m.)

Road	Carriage-way Width (m.)	Mode	Average Travel Speed (kph) 1/	No. of Vehicles Overtaken by Sur-veyed Jeepney/ Bus (per km.)	No. of Vehicles that Overtook Surveyed Jeepney/ Bus (per km.)
N. Domingo (V. Mapa-Pinaglabanan)	8.0-9.4	Jeepney	16.0	1.3	1.6
		Bus	11.4	2.2	0.7
J. P. Rizal (P. Gil-EDSA)	9.0-9.1	Jeepney	14.8	1.4	1.4
		Bus	11.4	0.3	3.7
Aurora Boulevard (V. Mapa-EDSA)	12.0	Jeepney	19.6	1.3	4.8
		Bus	19.0	4.4	7.4
Shaw Boulevard (Aurora-EDSA)	20.5	Jeepney	18.2	5.2	9.0
		Bus	17.2	1.9	7.6
R. Magsaysay (Nagtahan-V. Mapa)	24.0	Jeepney	9.6	7.3	11.2
		Bus	15.6	5.0	11.0

Source: JUMSUT II

1/ JUMSUT I Data for evening peak hours for both directions

4.5 ASSESSMENT OF EXISTING ROAD NETWORK

In the same manner as described in Section 2.3, a series of traffic assignments was experimented on the existing as well as future road network using the 1984 and 1990 OD tables.

The main objective of the exercise was to determine problem corridors/roads which will become saturated by 1990 despite the completion of committed transportation projects such as the LRT, C-3 and R-10.

Because the network analysis made was too coarse, the results have to be examined. The following aspects were taken into account:

Existing Situation: Where the road is already saturated, the congestion will remain unless some countermeasures are taken. In this connection, latest available traffic data were assembled to identify saturated road sections. Then, the impacts of the committed projects were assessed based on the results of traffic assignments.

Availability of Sidestreets: For convenience, traffic assignment is usually done on a road network consisting of major roads only, i.e., excluding sidestreets. Since this procedure neglects the road capacity available in sidestreets, the resultant volume/capacity ratio tends to be over-estimated, especially where sidestreets are numerous. This is discussed in Section 4.3.

The procedure for determining problem roads or corridors for the mid-term period is schematically shown in Figure 4.13.

Figure 4.14 presents the problem corridors/roads based on the actual traffic situation and the potential traffic demand in 1990. Most of the problem roads/corridors are found in the eastern part of Metro Manila. After some screening, Figure 4.15 emerges with the following roads as critical:

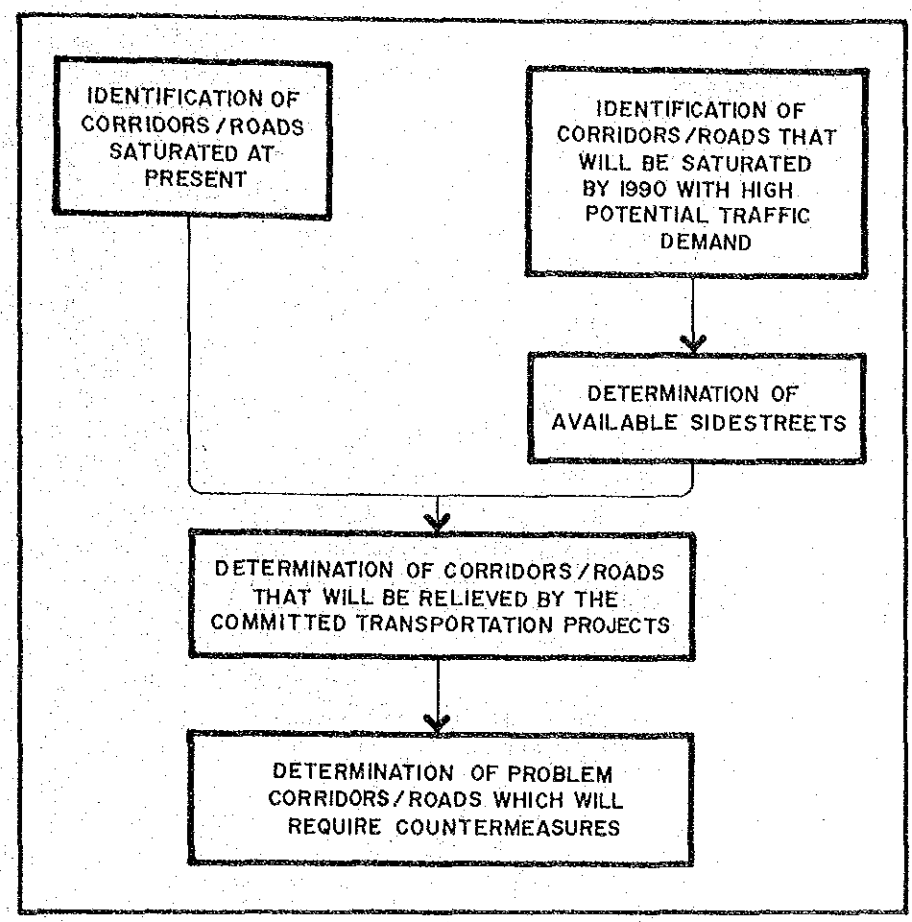
- McArthur Highway
- Quirino Highway
- España
- E. Rodriguez
- Kamuning/Kamias
- R. Magsaysay
- Aurora Boulevard
- Shaw Boulevard
- EDSA (Crossing-Cubao)
- Santolan Road
- Nagtahan/P. Quirino
- J. P. Rizal/P. Gil
- Buendia
- Pasay Road

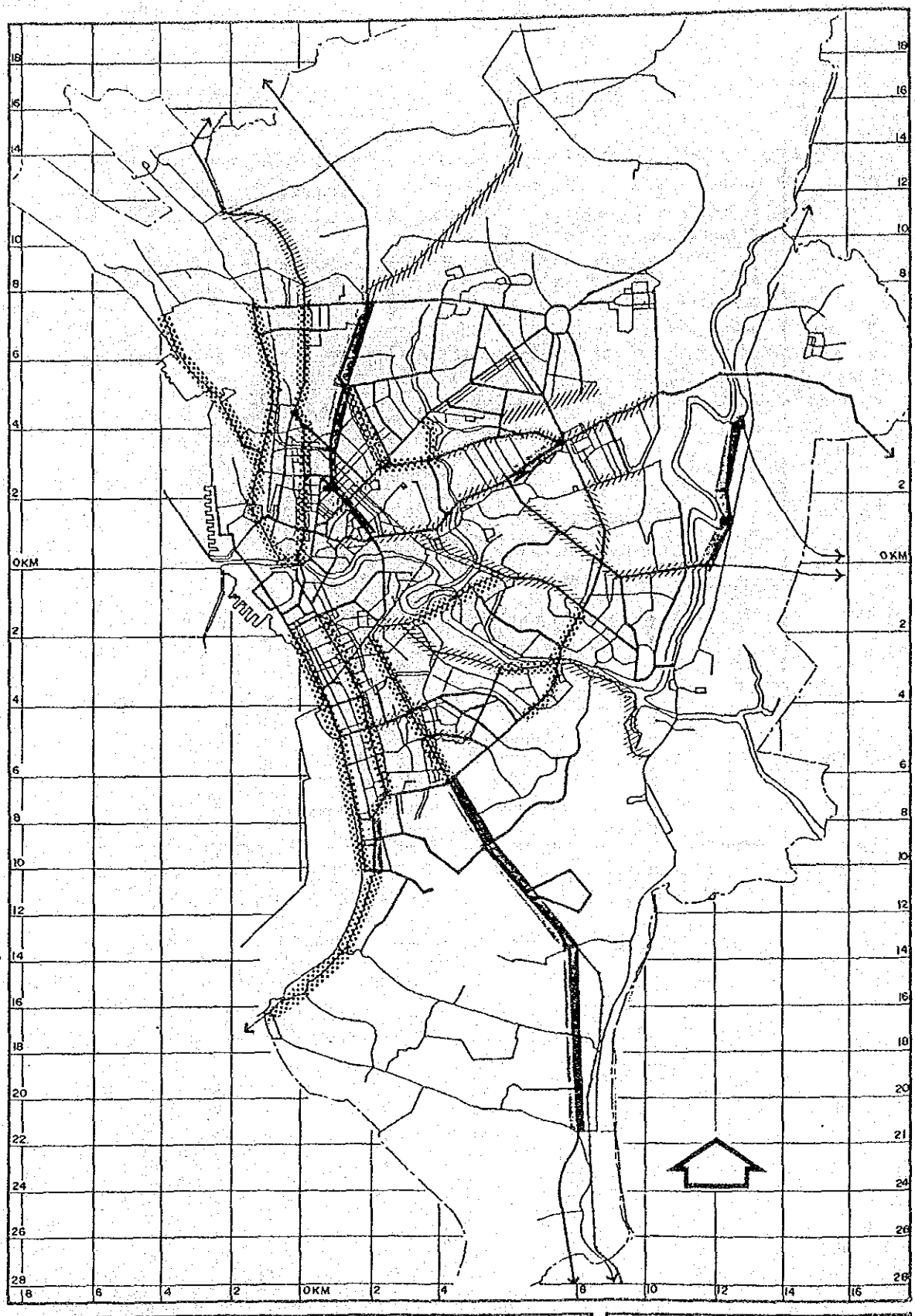
Most of them are located in the central-eastern part of Metro Manila. To obviate congestion, remedial measures must be pursued in the short and mid-term.

Corollarily, the following intersections are expected to become bottlenecks by 1990.

- EDSA/Kamuning/Kamias
- EDSA/Aurora/E. Rodriguez
- EDSA/Santolan
- EDSA/Ortigas
- EDSA/Shaw
- R. Magsaysay/V. Mapa/Aurora
- R. Magsaysay/Nagtahan
- España/A. Mendoza
- P. Gil/P. Quirino
- South Superhighway/Buendia

Figure 4.13
Procedure for Determining Problem Corridors/Roads



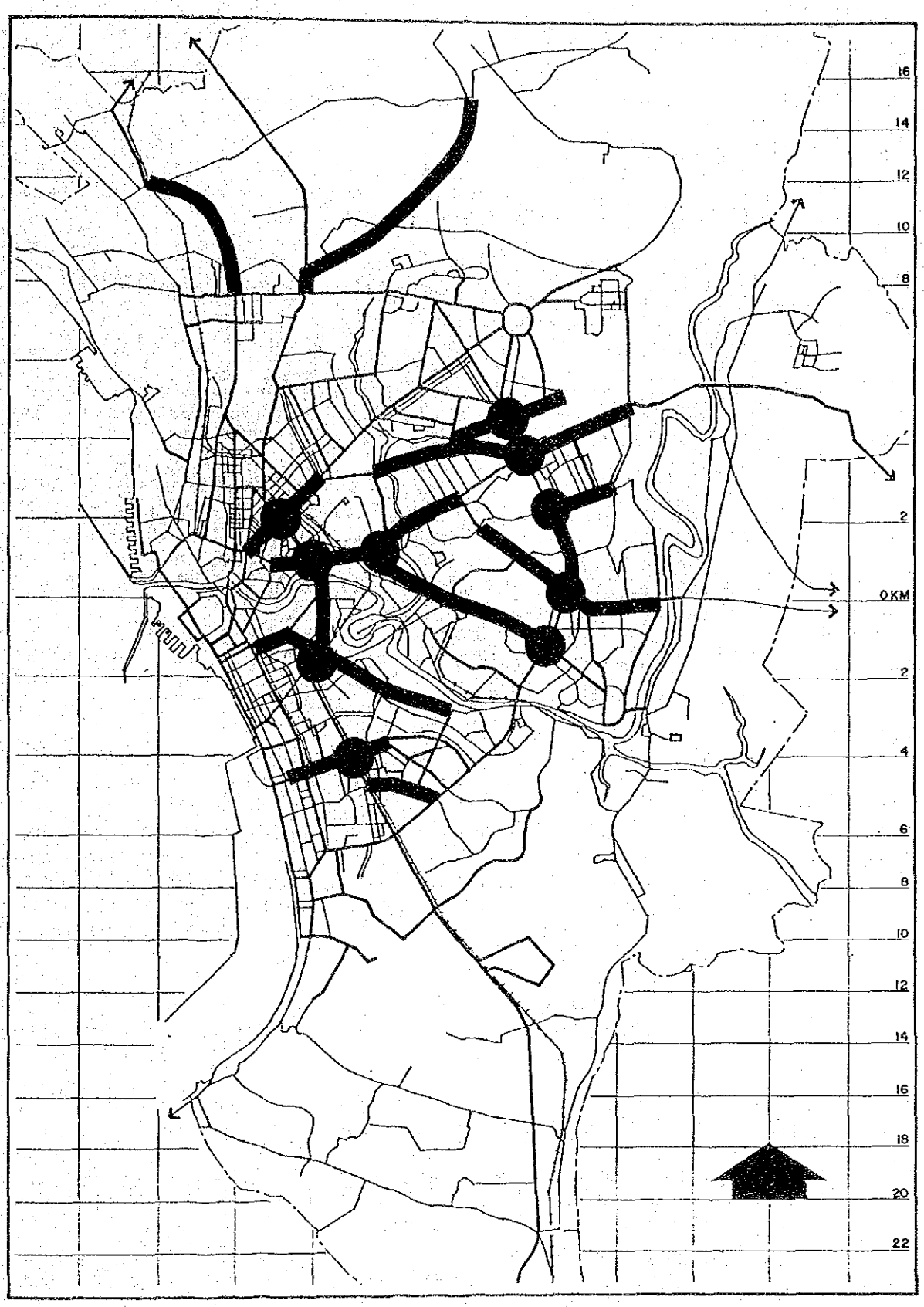


LEGEND :

- SATURATION EXPECTED BY 1990 DUE TO HIGH POTENTIAL TRAFFIC DEMAND
- CONGESTION EXPECTED TO BE RELIEVED BY LRT AND NEW ROADS
- CONGESTION POSSIBLE TO BE REDUCED BY AVAILABLE SIDESTREETS

Figure 4.14
Assessment of
Major Corridors

JUMSUT II



CRITICAL CORRIDORS / ROADS

CRITICAL INTERSECTIONS

Figure 4.15
Determined Mid-term Problem Corridors/ Roads, and Intersections

4.6 IMPACT OF THE COMMITTED ROAD INVESTMENTS

4.6.1 Overall Impact

As noted in Section 2.3, there are on-going or committed road projects expected to be completed by 1990, viz.:

- C-3 (R-10 to Quezon Ave.)
- R-10 (Del Pan Bridge to Samson Road, including the upgrading of Samson Road)
- R-1 Extension

With their impact felt, Figure 4.16 shows the ratio of vehicular traffic volume in 1990 to that of the existing road network. The comparison yields the following observations:

- At the northern corridor, the combined effects of R-10 and C-3 are remarkable. The traffic congestion at Honorio Lopez, J. Luna/A. Mabini, J. A. Santos, Rizal Avenue/Rizal Avenue Extension, Dimasalang/A. Bonifacio, and Del Monte will be greatly alleviated. EDSA and C-2 will also benefit at some sections

- At the northeastern corridor, C-2 (A. Mendoza), Mayon and a part of E. Rodriguez will similarly be decongested by C-3.

- At the eastern and southeastern corridors, the effects of Makati-Mandaluyong Road and C- 3 are significant. The heavily traversed section of EDSA (Guadalupe Bridge) and J. P. Rizal now will exhibit acceptable traffic flow by 1990. Kalentong/Panaderos, will also benefit from the Makati-Mandaluyong Road. However, inside the Makati Business District, Buendia, Makati Avenue and Pasay Road will get worse from additional traffic caused by passing-through vehicles.

- At the southern corridor, the effect of R-1 Extension will have a considerable effect. Quirino Avenue will be free from traffic congestion.

On the whole, total vehicle-hours would decrease by about 6% with a slight increase in the total vehicle-kilometers.

With regards to the estimated average trip length on new roads, Table 4.15 indicates that R-1 Extension will have the longest average trip length of 15 kilometers.

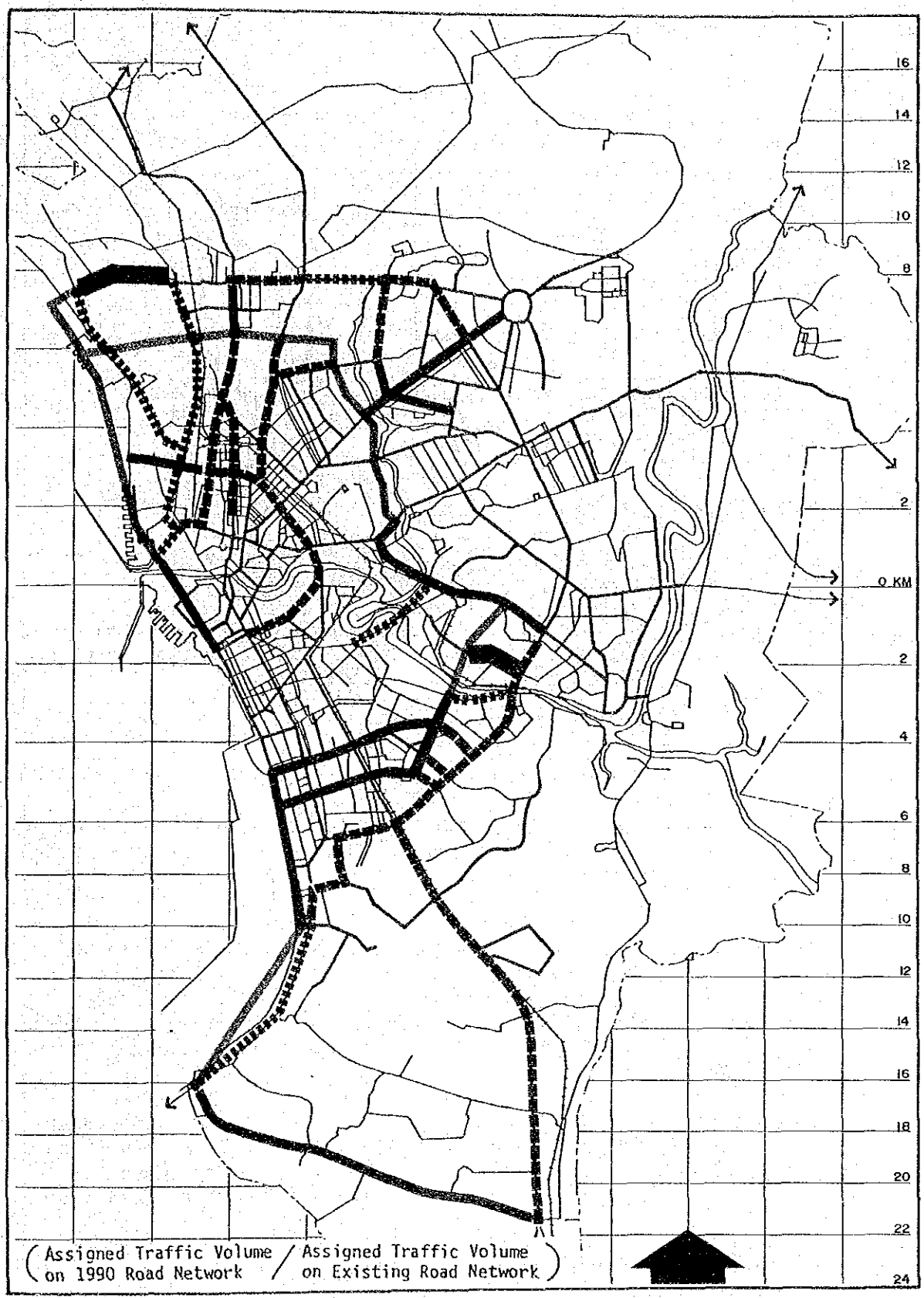


Figure 4.16
Impact of New Roads to be Constructed

Table 4.15
Average Trip Length of Potential Passengers
on New Roads, 1990

Road	Average Trip Length (kms.)
C-3	9 - 14
R-10	8 - 9
Makati-Mandaluyong Road	7 - 12
R-1 Extension	15

Source: JUMSUT II

4.6.2 Impact of C-3

Although it is not likely for C-3 to be completed up to Makati by 1990, this case was also examined considering its importance.

a) Although the direction of improvement is the same, the completion of C-3 up to Makati will further mitigate traffic congestion at the following roads:

- EDSA (Cubao-Ayala)
- Buendia (EDSA-C-3)
- Taft Avenue and other roads feeding into Makati

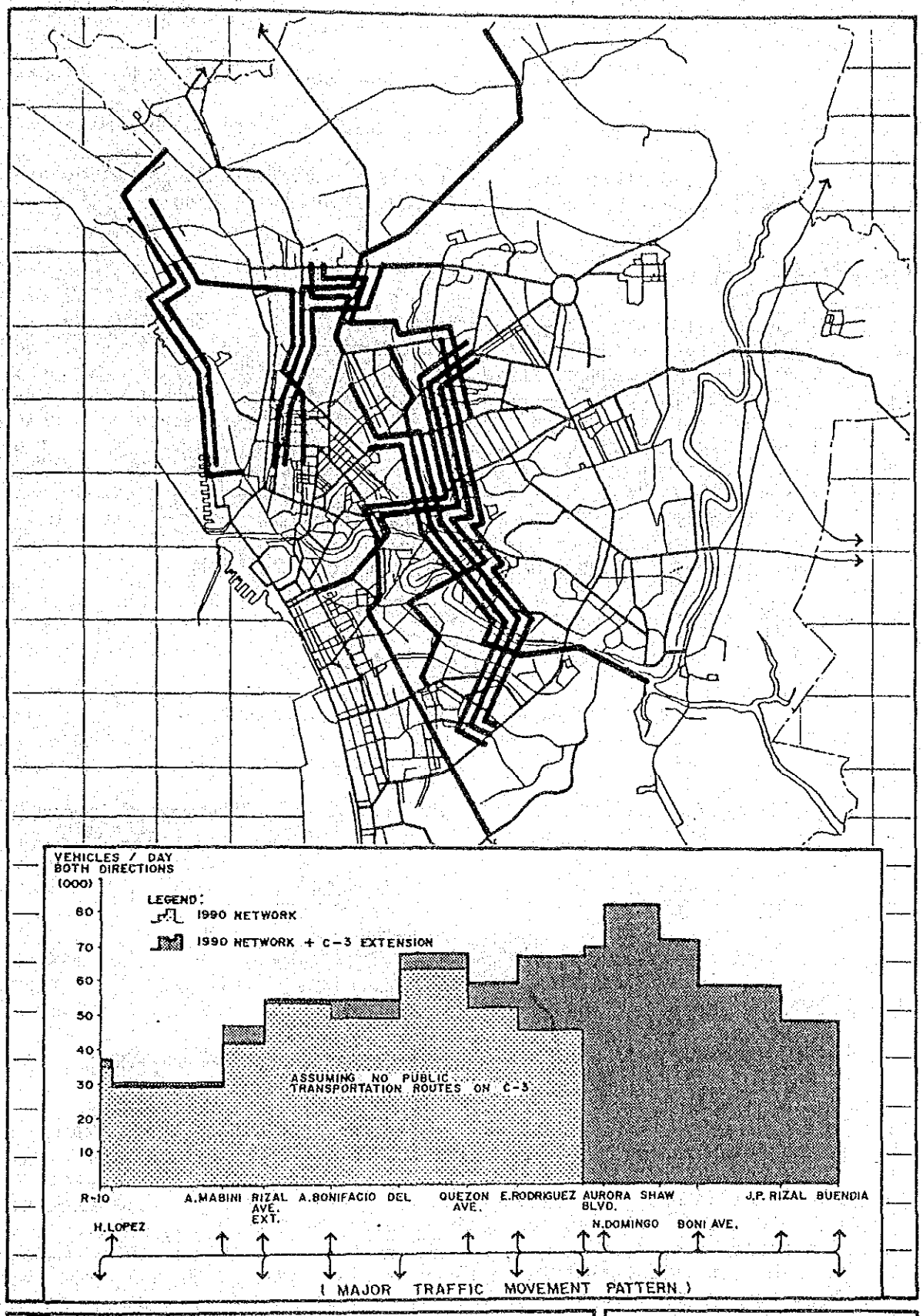
b) On the whole, the total vehicle-hours would decrease by about 11% with only negligible increase in the total vehicle-kilometers.

Figure 4.17 outlines the 1990 traffic demand distribution and loading pattern on C-3. Upon construction C-3 could easily absorb a traffic volume greater than its capacity in some sections. Especially when extended to Buendia Avenue, it will be extensively used at its eastern-southern segments. However, the loading pattern for C-3 at the northern sections will not be changed by the extension.

The estimated traffic volume on C-3 is large and almost comparable to that of EDSA or C-2. Therefore, its impact is very significant. Especially for the traffic generated and attracted by Makati, C-3 will be a very important artery coupled with Makati-Mandaluyong road.

C-3 would divert traffic away from existing roads such as:

- from EDSA
  - . Navotas/Malabon/Valenzuela/Caloocan - Makati
  - . Quezon City - Makati



LEGEND:

——— MAJOR TRAFFIC FLOW

Figure 4.17
Major Demand Distribution
for C-3, 1990