Figure 4.2
Relationship between Population Density (1980)
and Population Growth Rate (%/year between 1975 and 1980)

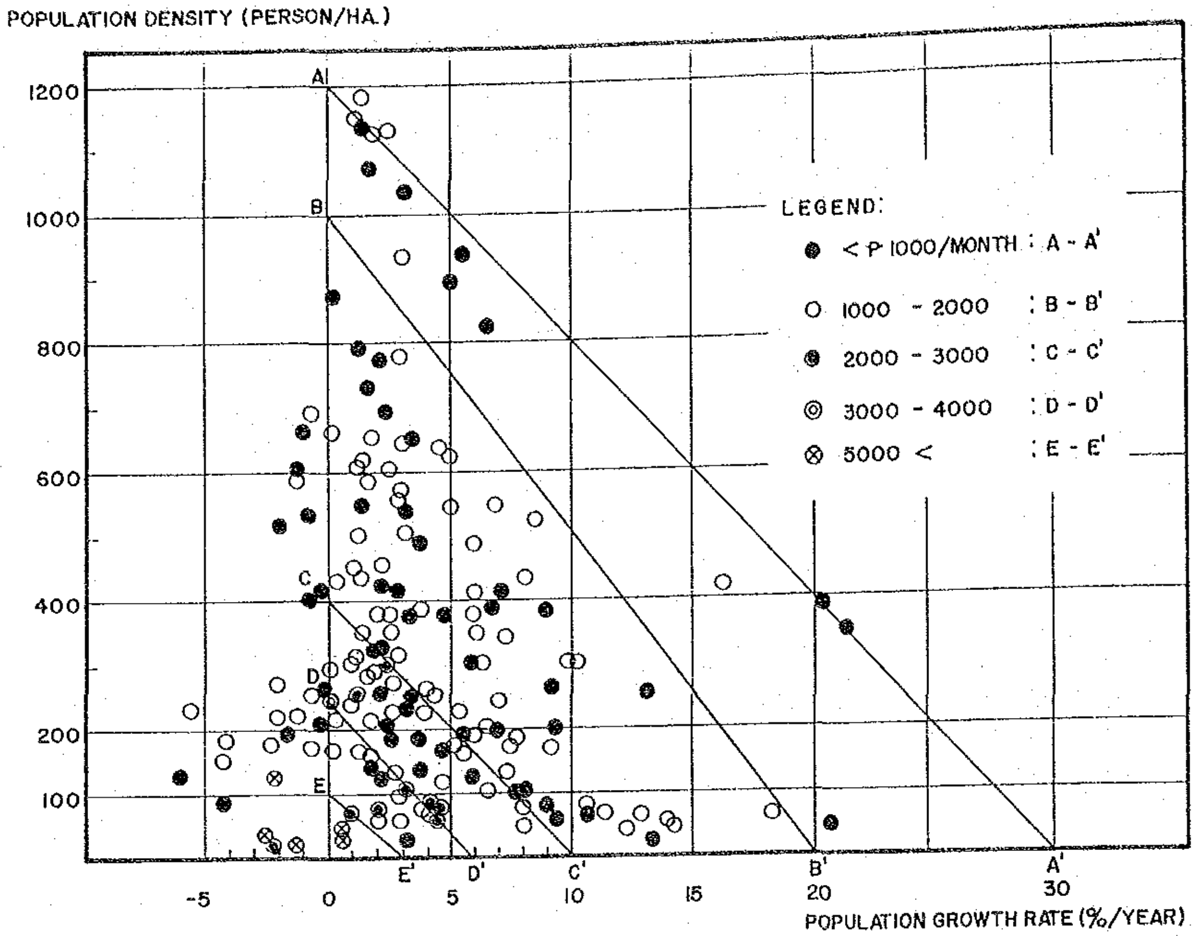
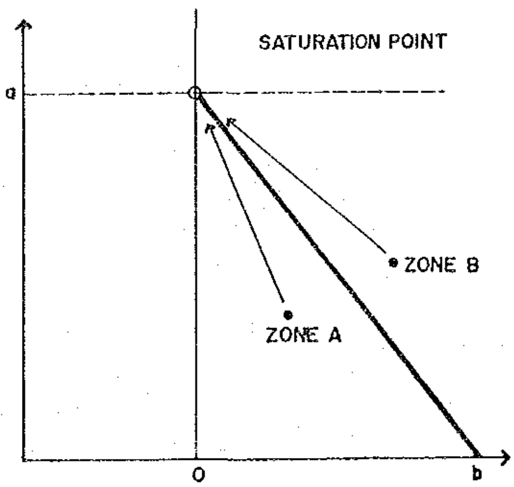


Figure 4.3
Population Growth Model1/



1/ VALUES OF a AND b ARE ASSUMED AS FOLLOWS:

AVERAGE HOUSEHOLD INCOME GROUP	VALUES AT SATURATION POINT a. POPULATION DENSITY (PERSON/HA.)	b. POPULATION GROWTH RATE(%/YR)
LESS THAN P1000/MONTH	1200	30
P1,001 - 2000	1000	20
P2,001 - 3000	400	10
P3,001 - 4000	250	6
MORE 5000	100	3

ii) Secondary Sector Employment – assumed static areas within EDSA. There are three alternative growth rates for the areas outside EDSA, (depending upon its level of current development, accessibility, and employment)

- Zero growth
- Half of GRDP growth rate
- 150% of GRDP growth rate

iii) Tertiary Sector Employment – estimated separately for large-scale commercial/business centers and for small-to-medium scale neighborhood commercial areas, thus:

- Employment in the large-scale commercial/business centers in Metro Manila will grow with the population growth rate of their respective catchment area multiplied by GRDP growth rate. These areas include Quiapo/Sta. Cruz (Zones 10, 12, 13, 14), Ermita (34, 35, 36, 38, 43, 44), Makati (68, 70, 71), Greenhills (88), Cubao (177). Reclamation area (201, 202), and Bagong Bantay (132) – where the new Shoe Mart department store (with a total floor area of 14 hectares) is currently being constructed are also in this category.

- The balance of the tertiary sector employment are allocated in proportion to the current employment level of each zone.

C. **School Attendance**

1) **School attendance by residence** are estimated to grow in proportion to population.

2) **School attendance by school address** are estimated separately for primary, and secondary and upper levels.

- primary school attendance will grow in proportion to population.

- secondary and upper level school attendance will grow maintaining the same present share among zones.

D. **Average Household Income** – is assumed to grow at the same rate as the GRDP growth rate of Metro Manila.

4.3.3 **1990 Socio-economic Parameters**

Tables 4.4 and 4.5 summarize the resultant 1990 parameters, by municipality, while detailed breakdowns by zones are shown in the Technical Report entitled "Transportation Demand Analysis."

Table 4.4
Forecasted Population, Employment and School Attendance of Metro Manila by Municipality (By Residence), 1990[1]

City/Municipality	Population (000)			No. of Employment (000)			School Attendance (000)		
	1980	1990	GR[2] (%)	1980	1990	GR[2] (%)	1980	1990	GR[2] (%)
City of Manila	1,630	1,849	1.3	483	574	1.7	486	523	0.7
Pasay City	288	364	2.4	83	106	2.3	80	95	1.7
Makati	373	433	1.5	119	139	1.5	106	116	0.9
Mandaluyong	205	247	1.9	66	85	2.5	58	65	1.1
San Juan	130	143	1.0	40	45	2.5	36	37	2.7
Quezon City	1,166	1,671	3.6	365	545	4.0	341	457	2.9
Caloocan City	468	652	3.3	134	197	3.9	130	170	2.7
Valenzuela	212	344	4.9	55	106	6.6	60	93	4.4
Malabon	191	281	3.9	55	87	4.6	54	74	3.7
Navotas	126	200	4.6	35	72	7.2	37	54	3.8
Marikina	212	306	3.7	66	105	4.7	62	84	3.0
Pasig	269	428	4.7	83	146	5.7	78	118	4.1
Pateros	40	54	3.0	12	17	3.5	11	14	2.4
Taguig	134	225	5.2	40	74	6.2	35	56	4.7
Parañaque	209	298	3.5	69	101	3.8	60	81	3.0
Muntinlupa	137	240	5.6	41	77	6.3	37	40	4.8
Las Piñas	137	241	5.7	43	80	6.2	37	61	5.0
MMANILA TOTAL	5,927	7,976	3.0	1,789	2,556	3.6	1,708	2,158	2.3
Bulacan	392	567	3.7	119	143	1.8	103	161	4.5
Rizal	405	602	4.0	117	145	2.1	110	171	4.4
Laguna	269	397	3.9	84	103	2.0	72	105	3.7
Cavite	441	647	3.8	122	149	2.0	120	184	4.3
Adjoining Area	1,507	2,213	3.8	442	540	2.0	405	621	4.3
TOTAL	7,434	10,189	3.2	2,231	3,096	3.2	2,113	2,779	2.7

1) Includes all ages
2) Average Annual Growth

Table 4.5
Forecasted Population, Employment and School Attendance
of Metro Manila by Municipality
(by Workplace and School Address), 1990[1]

City/Municipality	No. of Employment (000)			Sch. Attendance (000)		
	1980	1990	GR[2] (%)	1980	1990	GR[2] (%)
City of Manila	547	717	2.7	789	950	1.8
Pasay City	79	102	2.5	64	76	1.7
Makati	216	293	3.0	71	82	1.4
Mandaluyong	72	89	2.1	56	66	1.6
San Juan	28	34	1.9	23	26	1.2
Quezon City	358	496	3.3	274	360	2.7
C-loocan City	93	133	3.6	104	133	2.5
Valenzuela	61	113	6.2	48	69	3.6
Malabon	39	57	3.8	54	72	2.9
Navotas	26	54	7.3	23	34	3.9
Marikina	60	114	6.4	55	72	2.7
Pasig	100	173	5.5	67	91	3.1
Pateros	7	10	3.6	12	15	2.2
Taguig	44	78	5.7	27	41	4.2
Parañaque	56	82	3.8	35	45	2.5
Muntinlupa	52	92	5.7	36	55	4.2
Las Piñas	36	55	4.2	27	39	3.7
MMANILA TOTAL	1,874	2,692	3.6	1,765	2,226	2.3
Bulacan	85	102	1.8	85	130	4.2
Rizal	83	103	2.2	81	122	4.1
Laguna	64	78	2.0	66	98	4.0
Cavite	81	99	2.0	100	154	4.3
Adjoining Area	313	382	2.0	332	504	4.2
TOTAL	2,187	3,237	4.0	2,097	2,730	2.6

1) Includes all ages
2) Average Annual Growth

4.4 DEVELOPMENT OF 1980 AND 1984 OD TABLES

4.4.1 Objectives

The objectives of the development of 1980 and 1984 OD tables are:

a) To further update 1980 OD tables which was updated in JUMSUT I in such a way that traffic movement to/from the adjoining areas of Metro Manila (considered to be a part of the actual Metropolitan area) can be properly defined and included in the OD tables.

b) To estimate the current level of traffic demand in the form of 1984 OD tables wherein adjoining areas are also incorporated.

4.4.2 Development of 1980 OD Tables

The procedure of developing 1980 OD tables is understood from Figure 4.4. In order to define the traffic movement of adjoining areas more specifically, four relevant zones in 1980 HIS zoning system were further divided into a total of nine zones. Consequently, the total number of zones (232) in the updated OD tables became as follows:

Metro Manila : no change in a total of 202 zones

Adjoining Areas: increased from 13 zones to 18 zones

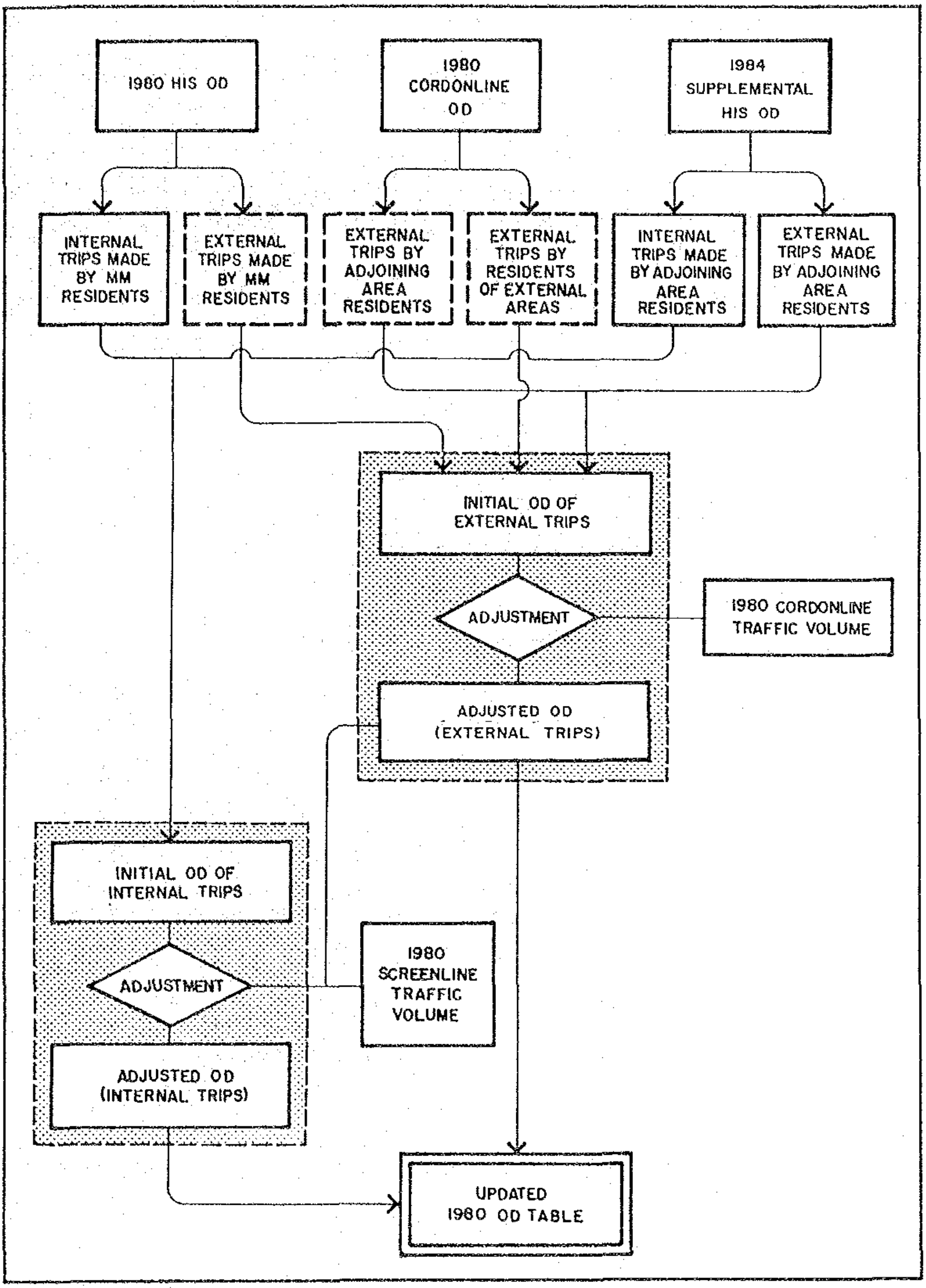
External Areas: integrated into a total of 12 zones.

Trips comprising the OD tables are those made by the residents of Metro Manila, Adjoining Areas and External Areas. These movements are available from 1980 HIS OD, 1980 Cordonline OD and 1984 HIS OD. As shown in Figure 4.4, the trips were integrated by internal and external movement. External trips OD tables initially developed were calibrated against 1980 Cordonline traffic volume. Similarly, initially developed internal trip OD tables were calibrated against 1980 screenline traffic volume wherein movement of above determined external traffic is taken into account. Finally, the updated 1980 OD tables were made available by adding the OD tables for external and internal movements.

4.4.3 Development of 1984 OD Tables

The method applied to this task was the same as the one developed and applied in the calibration stage of updating 1980 OD tables in JUMSUT I. The 1980 OD tables updated based on the refined zoning of adjoining areas were calibrated against 1984 screenline traffic volume.

Figure 4.4
Overall Procedure for Updating 1980 OD Tables



4.5 DEVELOPMENT OF 1990 OD TABLES

4.5.1 Approach

The OD tables to be created for 1990 are classified into:

a) public transportation passenger OD tables (by purpose for a weekday, all purposes for a weekday, and all purposes for morning/evening peak hour of a weekday)

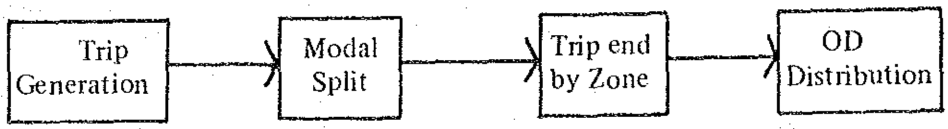
b) private transportation passenger/vehicle OD tables (by purpose for a weekday, all purposes for a weekday, and all purposes for morning/evening peak hour of a weekday)

The basic concept behind forecasting demand is the development of applicable models which explain the verifiable relationships between trip demand and socio-economic parameters, mathematically expressed in the following function:

$$D = f(Xi)$$

where: D = trip demand
Xi = socio-economic parameter i

This is a conventional four (4) step paradigm of estimating trip demand shown below and amplified in Figure 4.5.



4.5.2 Estimate of Total Number of Trips

The total number of trips for the study area is determined by trip purpose. This consists of motorized trips such as those by bus, jeepney, tricycle, car, truck, and so on. Trips made by motorcycle, railway and walking are disregarded initially since the role of railway is considered negligible and major improvements in PNR service is unlikely before 1990.

The trip rate (number of trips per person) is determined from existing data based on personal characteristics such as sex, occupation, age, car-ownership, and so on. Trip rates, were estimated by following the occupational categories;

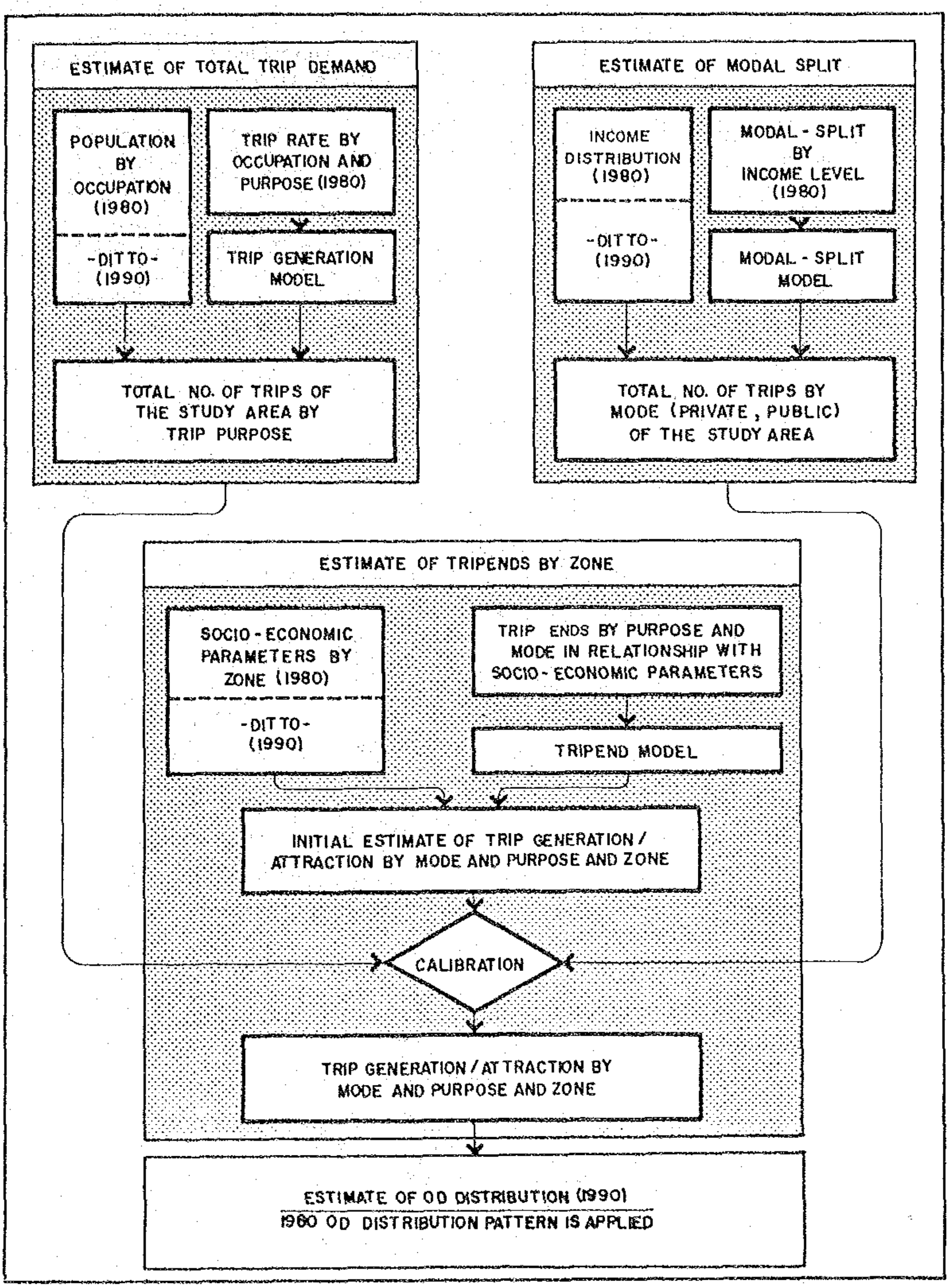
a) employment by industrial sector; primary, secondary and tertiary

b) enrolment by education level; elementary (primary level) and secondary and above

c) housewives

d) others

Figure 4.5
Analysis Framework for Forecasting 1990 Trip Demand



The trip rates determined for the study area are shown below in Table 4.6.

Table 4.6
Trip Rates by Trip Purpose and Population Category

Population	Trip Rates by Trip Purpose (No. of Trips/day/person)					
	To Work	To School	Pri-vate	Busi-ness	Home	Total
Employment (Prim. Sector)	0.362	0.001	0.188	0.079	0.567	1.197
Employment (Sec. Sector)	0.938	0.022	0.205	0.142	1.227	2.535
Employment (Tert. Sector)	1.017	0.049	0.358	0.201	1.451	3.077
Students (Prim. Level)	0.005	0.571	0.013	0.001	0.707	1.298
Students (Sec. & Above)	0.014	1.288	0.056	0.016	1.527	2.900
Housewife	0.005	0.006	0.604	0.037	0.357	1.008
Others	0.155	0.010	0.564	0.099	0.491	1.320
Total	0.378	0.346	0.292	0.087	1.009	2.112

The composition of the population for 1990 by occupational categories are shown in Table 4.7 below.

Table 4.7
Estimated Population in 1990 (000)[1)]

Population Category	1990	1990/1980
Employment (Primary Sector)	272	1.00
Employment (Secondary Sector)	957	1.42
Employment (Tertiary Sector)	1,867	1.22
Students (Primary Level)	1,359	1.32
Students (Secondary and above)	1,422	1.32
Housewife	1,367	1.43
Others	1,235	1.78
Total	8,479	1.36

1) includes 7 years and above

After the trip rates and the population subsets have been estimated, the number of trips can be calculated by simply multiplying these variables:

$$G_i = RG_{i,k} * P_k$$

wherein: G_i = trip generation by purpose i

$RG_{i,k}$ = trip rate by purpose i, of person with occupation k

P_k = population by occupation k

The results are shown in Table 4.8, which implies a 37% increase in total trips over 1980.

Table 4.8
Number of Trips Generated in 1990 (000)

Trip Purpose	No. of Trips	% to Total	Ratio 1990/1980
To Work	3,111	17.9	1.37
To School	2,740	15.8	1.32
Private	2,532	14.6	1.45
Business	728	4.2	1.40
To Home	8,251	47.5	1.36
Total	17,361	100.0	1.37

4.5.3 Estimate of Modal Split

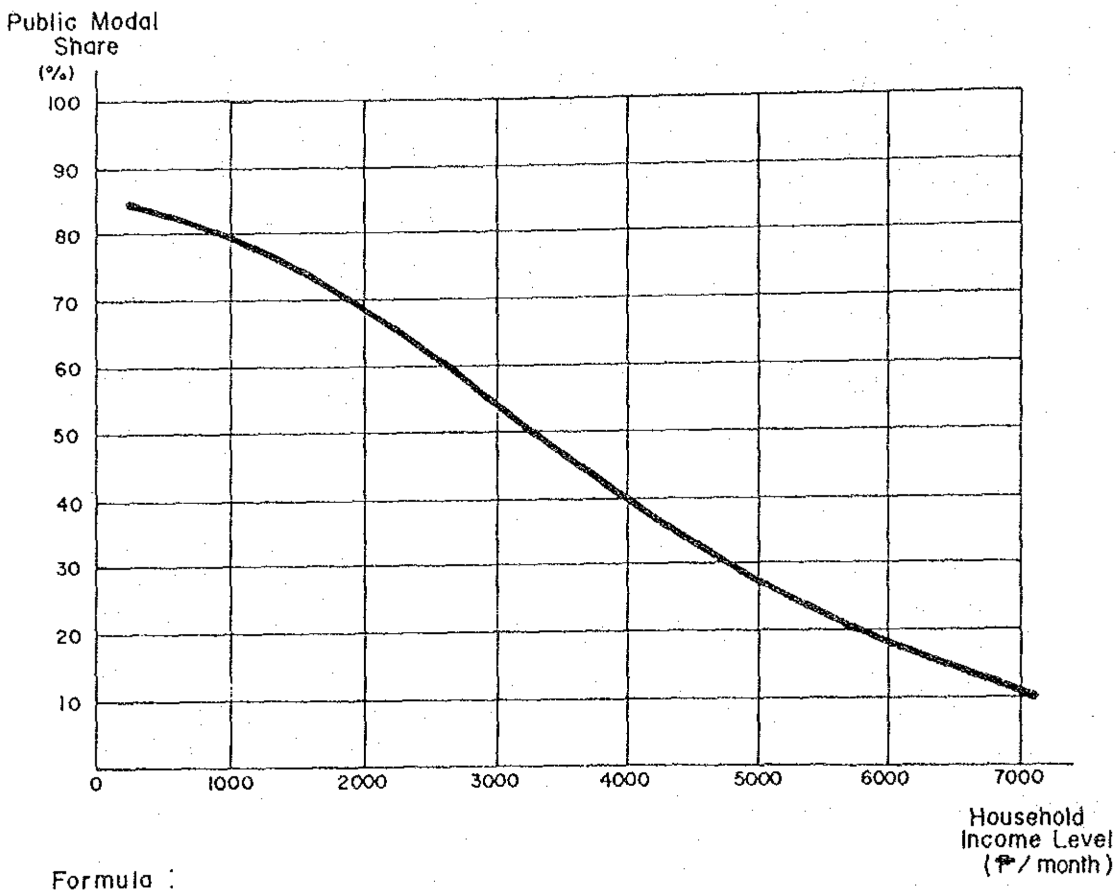
The modal split between public (bus, jeepney and tricycle) and private modes (car, taxi and truck) is determined next after trip purpose since car ownership or availability or income level are more critical determinants of modal choice than the former. In cities where competition exists in the choice of two basic modes, a modal split analysis is normally done after the OD distribution process.

Statistical analysis suggests that car ownership bears a close relationship to modal split and household income level. Accordingly, the following formula as shown in Figure 4.6 is applied.

4.5.4 Trip Generation and Attraction by Zone

The third phase of the forecasting is to breakdown the total number of trips made in the study area into two types: "Generation" and "Attraction". All trips have two ends – origin and destination. Trip generation is counted at the origin, while trip attraction is counted at the destination. Trip generation/attraction depends on the magnitude of urban activities by zone, which are in turn explained by socio-economic indicators of the zone. After evaluation, the more reliable socio-economic parameters are chosen in forecasting respective trip demands (these are given in Table 4.9).

Figure 4.6
Modal-Split Model
Between Public and Private Modes



Formula :

$$Y = \frac{1}{1 + 0.1552 * e^{(5.7169 \times 10^{-4}) * x}} * 100\ (\%) \quad (R = 0.9412)$$

Y = Public Modal Share (%)
x = Household Income Level (₱ / month)
R = Correlation Coefficient

Table 4.9
Socio-economic Parameters Chosen
for Trip Generation/Attraction Model

Mode	Generation/ Attraction	Purpose	Socio-economic Parameters	Symbol
Public	Generation	To work	No. of employment (secondary and tertiary) by residence Car-ownership rate	E2N+E3N RCO
		To school	No. of students (secondary and above) by residence Car-ownership rate	STN RCO
		Private	Population Car-ownership rate	PN RCO
		Business	No. of employment (secondary and tertiary) by residence	E2N+E3N
		To home	Daytime Population	PD
	Attraction	To work	No. of employment (secondary and tertiary) by workplace	E2D+E3D
		To school	No. of students (secondary and tertiary) by school address	STD
		Private	Daytime Population	PD
		Business	No. of employment (secondary and tertiary) by workplace	E2D+E3D
		To home	Population Car-ownership rate	PN RCO
Private	Generation	To work	No. of employment (secondary and tertiary) by residence Car-ownership rate	E2N+E3N RCO
		To school	No. of students (secondary and above) by residence Car-ownership rate	STN RCO
		Private	Population Car-ownership rate	PN RCO
		Business	No. of employment (secondary and tertiary) by workplace	E2D+E3D
		To home	Daytime Population	PD
	Attraction	To work	No. of employment (secondary and tertiary) by workplace	E2D+E3D
		To school	No. of students (secondary and above) by school address	STD
		Private	Daytime Population	PD
		Business	No. of employment (secondary and tertiary) by workplace	E2D+E3D
		To home	Population Car-ownership rate	PN RCO

Table 4.10 shows high coefficients of correlation, implying accuracy of predictions of models using 27 zones of the study area (municipality levels including adjoining areas of Metro Manila).

Table 4.10
Trip Generation/Attraction Model[1/]

	Generation/ Attraction	Trip Purpose	Formula	Correlation Coefficient
Public Mode	Generation	To Home	$Y = 0.0328 * PD^{1.2269}$	0.9040
		To Work	$Y = 1.7219 * (E2N+E3N)^{0.9374} * RCO^{-0.0603}$	0.8750
		To School	$Y = 1.0046 * STN^{1.0553} * RCO^{-0.0716}$	0.9125
		Private	$Y = 0.7143 * PN^{0.8828} * RCO^{-0.1504}$	0.6748
		Business	$Y = 1530.66 + 0.0953 * (E3N+E3N)$	0.6576
	Attraction	To Home	$Y = 2.8456 * PN^{0.8874} * RCO^{-0.7091}$	0.8786
		To Work	$Y = 0.0650 * (E2D+E3D)^{1.2138}$	0.9663
		To School	$Y = 1.86042 * STD^{0.9842}$	0.9595
		Private	$Y = 0.0080 * PD^{1.2307}$	0.8277
		Business	$Y = -273.212 + 0.1507 * (E2D+E3D)$	0.7680
Private Mode	Generation	To Home	$Y = 0.0011 * PD^{1.3998}$	0.7446
		To Work	$Y = 0.0882 * (E2N+E3N)^{0.9510} * RCO^{0.8181}$	0.9275
		To School	$Y = 0.0036 * STN^{1.2058} * RCO^{1.0744}$	0.7835
		Private	$Y = 2.0719 \times 10^{-4} * PN^{1.2464} * RCO^{1.2051}$	0.7204
		Business	$Y = 2042.25 + 0.1096 * (E2D+E3D)$	0.6667
	Attraction	To Home	$Y = 0.0222 * PN^{1.0067} * RCO^{0.9740}$	0.7358
		To Work	$Y = 0.0068 * (E2D+E3D)^{1.3124}$	0.9216
		To School	$Y = 0.1551 * STD^{1.0665}$	0.7330
		Private	$Y = 1.3353 \times 10^{-5} * PD^{1.6503}$	0.6940
		Business	$Y = -2868.27 + 0.1754 * (E2D+E3D)$	0.7838

1/ Symbols in formula is referred in Table 4.9.

Trip generation and attraction are disaggregated from 27 zones to 220 zones, inclusive of the adjoining areas to Metro Manila, in proportion to the growth of their respective socio-economic parameters given in Table 4.9.

The initial values calculated on the basis of 220 zones are then adjusted in such a way that their totals will correspond to the control totals estimated in sections 4.5.2 and 4.5.3.

The aggregate modal split in the demand forecast for 1990 are summarized in Table 4.11.

Table 4.11
Calibrated Total Number of Trips
by Trip Purpose and by Mode, 1990

	Number of Trips (000) by Purpose					
Mode	To Work	To School	Private	Business	To Home	Total
Public	2,427	2,404	2,055	396	6,894	14,176
Private	739	344	568	485	1,628	3,764
Total	3,166	2,748	2,623	881	8,522	17,940

4.5.5 Estimate of Trip OD Distribution

Finally, the trip OD distribution is determined by constructing the 1990 OD tables. This step of analysis involves two options:

a) one is to apply a theoretical model of trip distribution, such as "gravity model" and "opportunity model".

b) the second is to extrapolate the present pattern of the OD apparent in the existing OD tables into the future.

The choice between the two methods depends mainly on the availability of data, accuracy, the target year for forecast, and the magnitude of urban development potentials.

The "present pattern" method was applied for the trip OD distribution estimate. Thus, the 1990 OD distribution follows the present pattern of OD manifested by existing OD tables with regard to trip generation and attraction by zones. The reason for this choice is the expectation of no drastic change in land use structure for Metro Manila from 1980 to 1990.

More specifically, for trip OD distribution, the following tables were prepared:

a) By Trip Purpose: To work, to school, private, business, to home and total

b) By Time Period: Morning Peak Hour and Daily

c) By Mode: Private (Passenger and Vehicle)
Public (Passenger)
Total Passenger)

4.6 COMPARISON OF THE 1980, 1984 AND 1990 OD TABLES

Generally, an increase in the total number of trips was observed in 1984 over 1980 (13%) and this upward trend has been forecasted to continue in the year 1990 (22%) as shown in Table 4.13. Overall, the estimated increase in person trips from 1980 (13.0 million trips) to 1990 (18.0 million trips) is around 37%.

As can be deduced also from the Table 4 13, majority of trip purposes in 1984 and 1990 registered significant increases. In the case of trips by public mode, "to work", "to school", "to home", and private trips showed marked increases in 1990 over 1980, ranging from 40% to 60%. Business trips, however, exhibited just a little over 20% rise over 1980 and an insignificant 6% increase in 1984 over 1980.

Trips by private mode showed favorable increases in business and "to work" trips: 59% and 15% respectively.

In order to have a better insight into the changes in the OD traffic distribution between 1980 and 1990, desire lines are drawn for public and private modes, as illustrated in Figure 4.7.

However for analytical purposes, Metro Manila and its adjoining and external areas were grouped anew according to the following table:

Table 4.12
Zoning System Used
for Person Trip OD Distribution

Zone No.	Location	City/Municipality
1	Central	City of Manila
2	East Central	Quezon City (I, III, IV) San Juan, Mandaluyong
3	South Central	Pasay City, Makati
4	North Central	Caloocan City, South, Valenzuela, Navotas, Malabon
5	Northwest	Quezon City II, CaloocanCity North
6	East	Marikina, Pasig
7	South	Pateros, Taguig, Parañaque, Muntinlupa, Las Piñas

In totality, the pattern of the 1990 inter-area movement is almost similar with that of 1980, with the CBD reflecting the busiest trip interaction.

Both 1980 and 1990 trips by public mode show the heaviest concentration of trip movements to/from the CBD, east central (Quezon City I, III, IV, San Juan, Mandaluyong, and south central(Pasay City and Makati). This is followed by the interaction between the CBD, and north central (Caloocan City South, Valenzuela, Navotas, and Malabon) and between the CBD and the south (Pateros, Taguig, Parañaque, Muntinlupa, and Las Piñas). In the year 1990, more trip movements is expected between south central and the south, than in 1980.

In terms of private trip, both 1980 and 1990 exhibited an almost equal distribution of trip movements. A slight increase is seen in the interzonal movement between south central and the northwest in 1990 over 1980.

Table 4.13
Comparison of 1980,1984 and 1990 Number of Trips
by Trip Purpose and by Mode (000)

Mode: Public

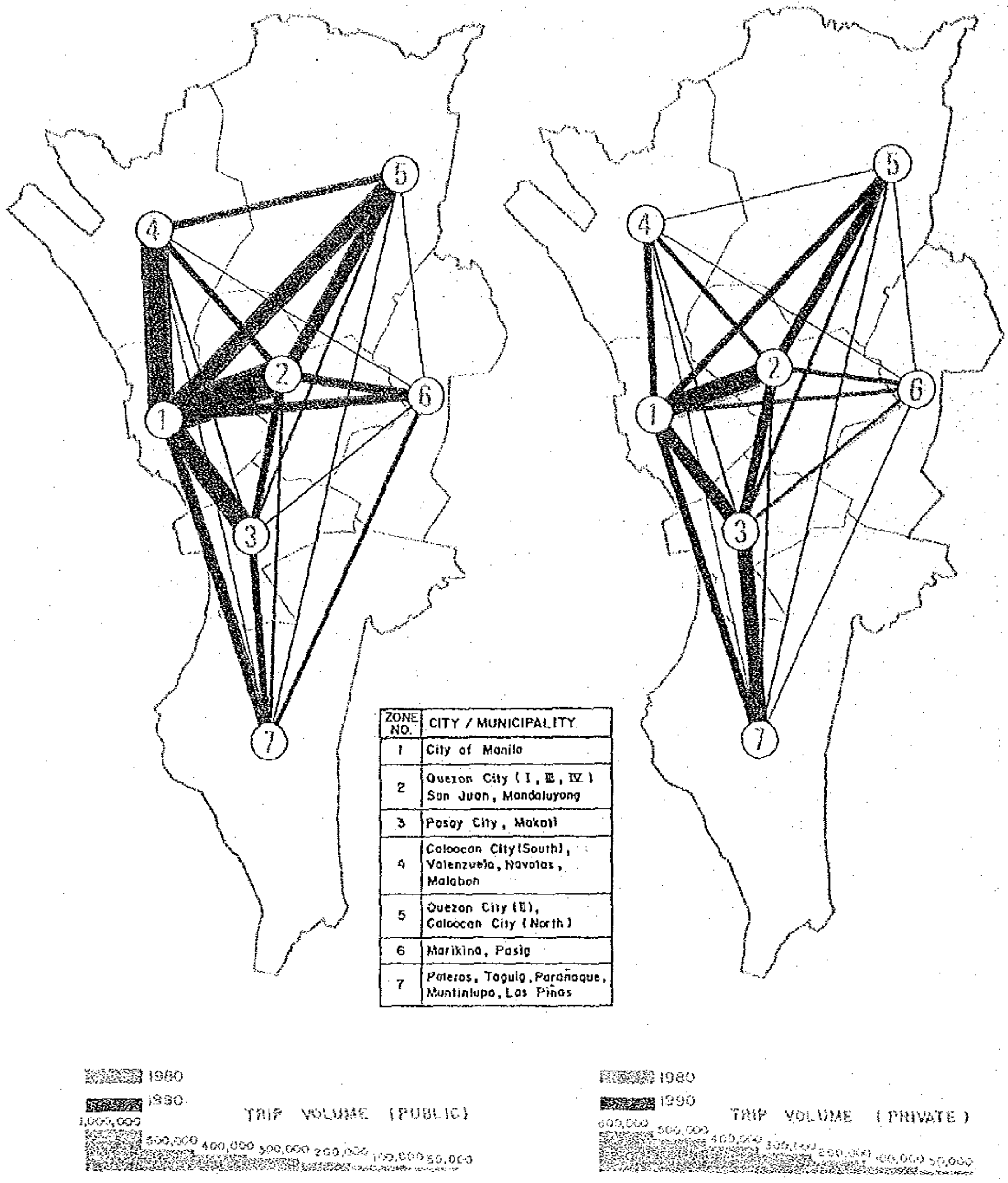
	Total No. of Trips (000/day)			Growth Rate (%)		
Purpose	1980	1984	1990	1984/1980	1990/1984	1990/1980
To Work	1,676	1,953	2,427	1.17	1.24	1.45
To School	1,698	1,957	2,404	1.15	1.22	1.42
Private	1,278	1,477	2,055	1.16	1.39	1.61
Business	326	373	396	1.14	1.06	1.22
To Home	4,671	5,393	6,894	1.15	1.28	1.48
Total	9,649	11,153	14,176	1.16	1.27	1.47

Mode: Private

	Total No. of Trips (000/day)			Growth Rate (%)		
Purpose	1980	1984	1990	1984/1980	1990/1984	1990/1980
To Work	643	673	739	1.05	1.10	1.15
To School	378	402	344	1.06	0.86	0.91
Private	534	556	568	1.04	1.02	1.06
Business	306	328	485	1.07	1.48	1.59
To Home	1,582	1,672	1,628	1.06	0.97	1.03
Total	3,443	3,631	3,764	1.06	1.04	1.09

Total (Public + Private)

	Total No. of Trips (000/day)			Growth Rate (%)		
Purpose	1980	1984	1990	1984/1980	1990/1984	1990/1980
To Work	2,319	2,626	3,166	1.13	1.21	1.37
To School	2,076	2,359	2,748	1.14	1.17	1.32
Private	1,812	2,033	2,623	1.12	1.29	1.45
Business	632	701	881	1.11	1.26	1.39
To Home	6,253	7,065	8,522	1.13	1.21	1.36
Total	13,092	14,784	17,940	1.13	1.22	1.37



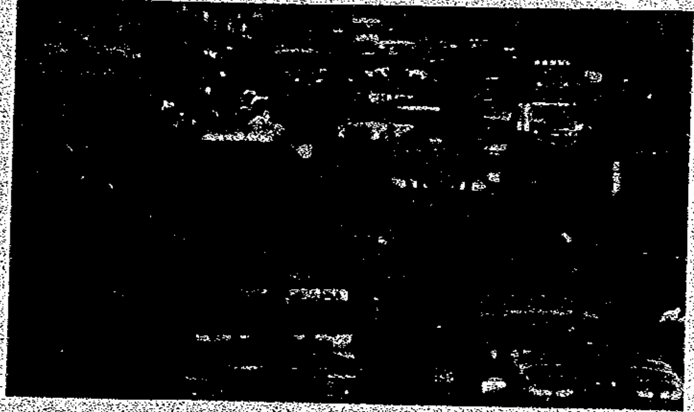
ZONE NO.	CITY / MUNICIPALITY
1	City of Manila
2	Quezon City (I , III , IV) San Juan , Mandaluyong
3	Pasay City , Makati
4	Caloocan City (South) , Valenzuela , Navotas , Malabon
5	Quezon City (II) , Caloocan City (North)
6	Marikina , Pasig
7	Pateros , Taguig , Parañaque , Muntinlupa , Las Piñas

LEGEND:

(2) ZONE NUMBER

Figure 4.7
Changes in the OD Traffic Distribution between 1980 and 1990

5.0 PUBLIC TRANSPORTATION ROUTE PLANNING



5.0 PUBLIC TRANSPORTATION ROUTE PLANNING

5.1 ROUTE STUDY FRAMEWORK

5.1.1 Rationale

The transport and traffic problems of Metro Manila have not escaped the critical attention of various groups such as TEAM, CHPG, MOTC, MMC, and the Police. The recently-completed MMUTSTRAP B1 Study, for example, summarized most of the activities and pending proposals; also, it recommended other measures for the region. With these studies as initial inputs, JUMSUT II examined the role and operating characteristics of public transportation – particularly the route structure from a short-term and mid-term viewpoint. The study's special contributions to the mitigation of traffic congestion and to raising the level of public transport service are in terms of plans toward:

- improving public transport route structure;
- reducing the congestion impact of public transport and facilitating their control;
- improving support facilities attendant to the first two.

5.1.2 Study Area

While the entire Metro Manila is included in the network analyses, only the central-eastern part of the metro region was subjected to detailed planning, as shown in Figure 5.1.

The study area's transport network is fairly well-defined by the radial and circumferential roads, viz.:

Radial Roads	– España/Quezon Avenue/D. M. Marcos Avenue (R-7) – E. Rodriguez – R. Magsaysay/Aurora Boulevard (R-6) – Ortigas Avenue (R-5A) – Shaw Boulevard (R-5) – J. P. Rizal (R-4) – Buendia
Circumferential Roads	– C-2 – C-4 (EDSA) – C-3 (partially existing)

PNR

LRT

STUDY AREA FOR DETAILED SHORT-TERM PLANNING FOR SELECTED AREAS

NORTH 0 1 2 4 KM

Figure 5.1
Study Area for Public Transportation Route Improvement Study

5.1.3 Approach

Short-term Approach: All existing studies relevant to JUMSUT II's objectives were reviewed and their findings and proposals were summarized and listed as springboards for analysis. The problems were then reformulated in terms of physical location and nature; surveys were conducted where appropriate before drawing up the proposals.

Practical solutions suitable for short-term applications were limited to the following:

- local rerouting of public transport units in and around congested terminals or turning points and other traffic generating sources;
- traffic management and control to regulate the use of road space by both vehicles and pedestrians;
- minor improvement of facilities to complement the first two.

Mid-term Approach: The restructuring of public transport routes over a 5-year period is outlined based on the following change factors:

- future transport demand and probable modal split between public and private transport, with further classification for the latter mode;
- the impact arising from the completion of the committed transportation projects such as LRT, PNR, R-10, C-3, and other roads;
- effectivity of new route management and regulatory policies.

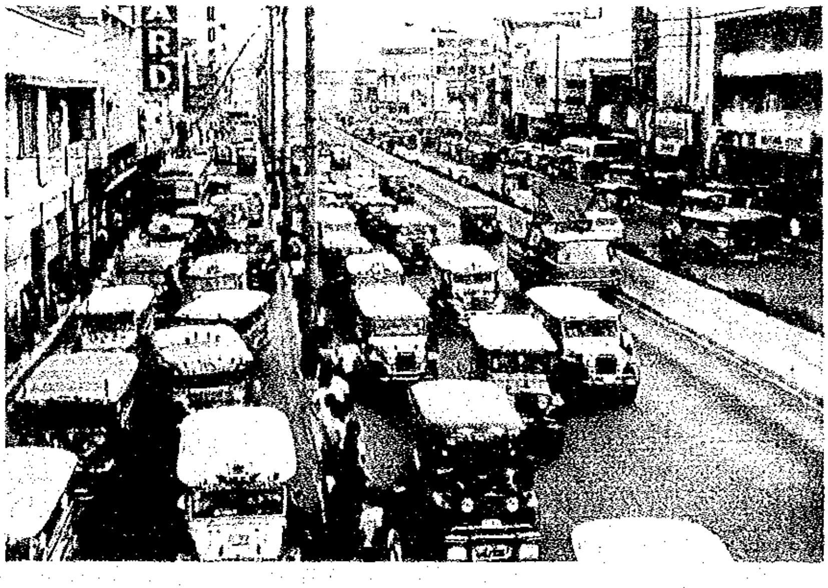
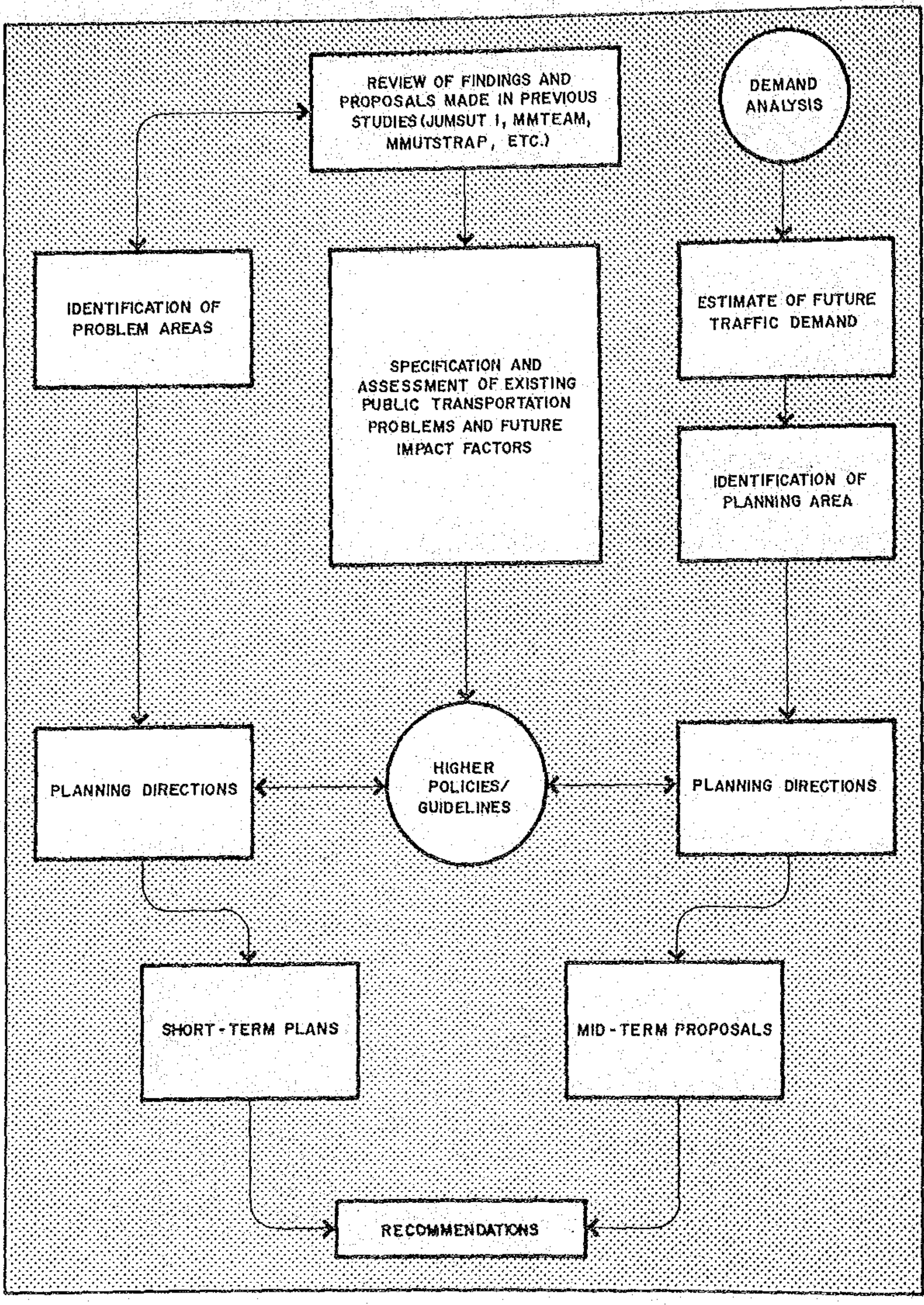


Figure 5.2
Framework for Public Transportation Route Improvement Study



5.2 THE PRESENT STATE OF PUBLIC TRANSPORT

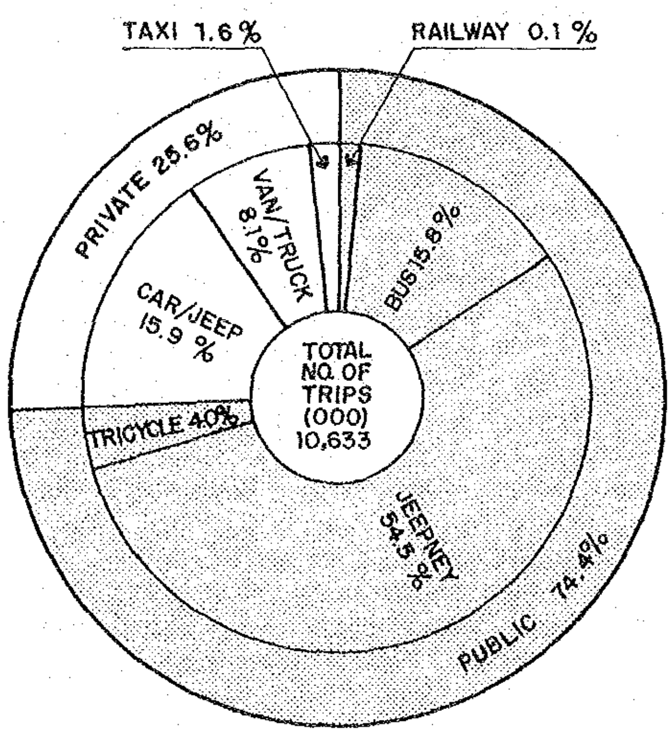
5.2.1 Overall Transport Demand

In 1980, the total number of linked trips generated by Metro Manila residents was estimated to be 10,633 thousand per day, excluding walk trips. Total trips were divided into those using public transport modes (bus, jeepney, PNR, tricycle) and those by private modes (car/jeep, van/pick-up/truck, taxi). The former mode had a share of 74.4% or 7.9 million trips, while the latter, 25.6% or 2.7 million trips (see Figure 5.3). Within the public transport mode, jeepneys recorded the highest share -- 54.5% of total demand or 73.4% of public transport demand alone. A significant 40% of "business" trips were made on cars.

Of the total trips, 77% were made by persons from the non-car-owning households; they relied heavily on public transport, especially jeepney. The remaining 23% were made by persons who belong to car-owning households and more than half of these trips were by private car.

The most significant factor determining the inter-modal relation between private and public transportation was the income of users. Public transport was used mainly by people with a monthly family income of less than P2,500, while the high income group with more than P4,000 used mostly private transport.

Figure 5.3
Overall Transport Demand by Transport Mode 1980



Source: JUMSUT I

Traffic demand in vehicle kilometers is shown in Table 5.1, where total vehicle-kilometers in 1980 was 16.2 million. Of this total 67.5% were due to private vehicles (car, taxi, truck), while 32.5% from bus and jeepney. When compared with 74.4% for public transport mode and 25.6% for private transport mode in terms of passenger demand, one gets the inefficient allocation of road spaces as follows: 40% private car/taxi, 40% by bus/jeepney, and 20% by truck and others.

Table 5.1
Vehicular Traffic Volume on Metro Manila Roads, 1980

Mode	No. of Trips 000	Vehicle Kms/day 000	%
Private	1,380	10,917	67.5
Car and Taxi	1,109	8,724	53.9
Truck and Others	271	2,193	13.6
Public	–	5,267	32.5
Bus	–	793	4.9
Jeepney	–	4,474	27.6
Total	–	16,184	100.0

Source: JUMSUT I

5.2.2 Road Network and Traffic Flow

The Metro Manila road network spans a total of 4,078 kilometers consisting of national, provincial and municipal roads. The major roads are 10 radial and 6 circumferential roads (as shown in Table 5.2), some sections of which are still lacking.

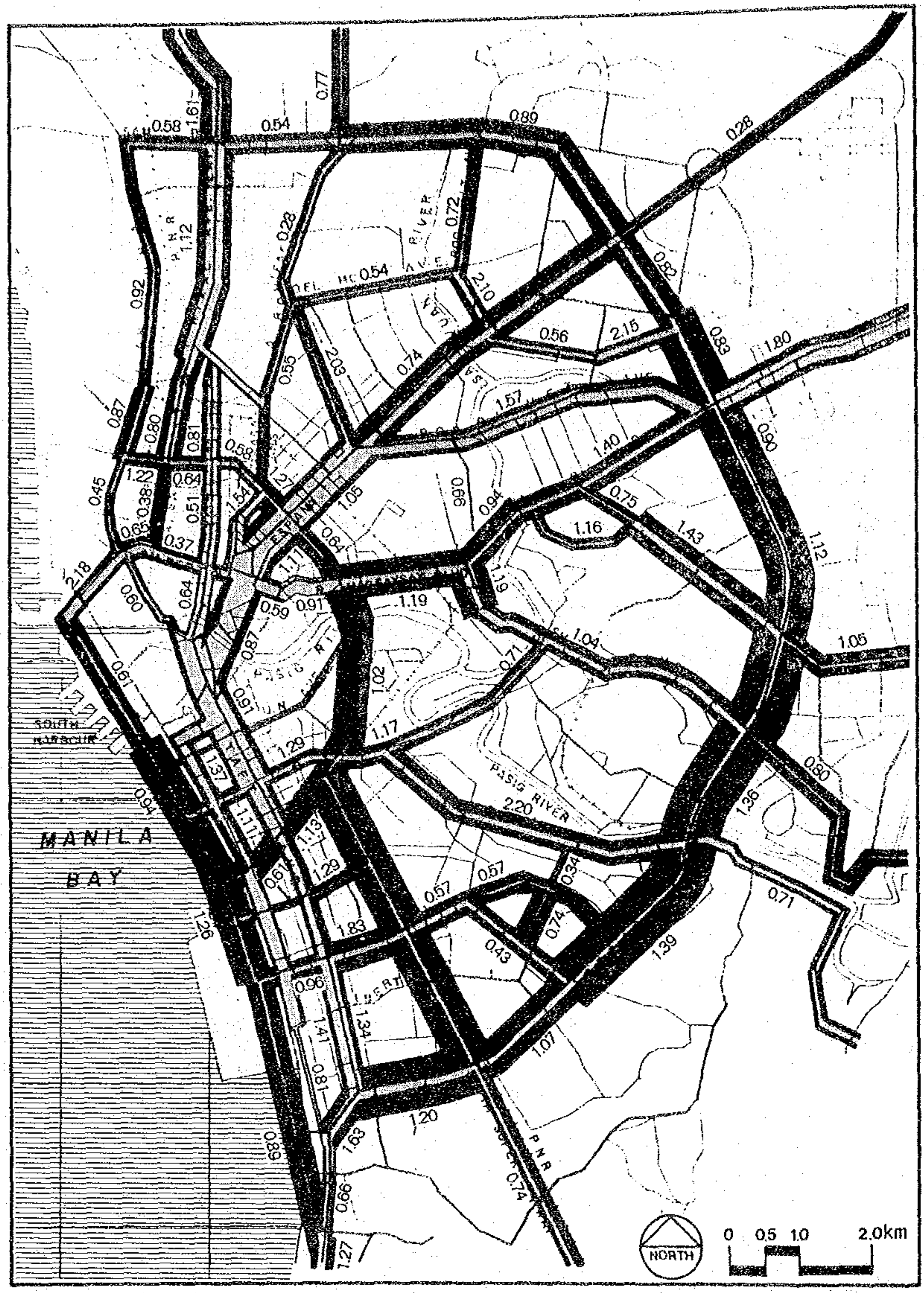
The observed traffic volumes on major corridors for 1979/81 are depicted in Figure 5.4. The traffic volume ranges from a low of 10 to a high of 100 thousand vehicles per day. Heavier vehicle volume could be observed along EDSA, Quezon Boulevard, South Superhighway, Roxas Boulevard, and Taft Avenue where volume exceed 65,000 vehicles per day and reach as much as 100,000 along some sections (J. P. Rizal and Ayala) of EDSA. On these major roads, the modal splits are distinctive; thus, EDSA, South Superhighway, Roxas Boulevard, P. Quirino (C-2), and Buendia are dominated by private vehicles, while the other roads, by public vehicles. This phenomenon is partly a result of a policy restricting jeepneys along most sections of EDSA, Roxas Boulevard and South Superhighway. No jeepney routes exist along Pres. Quirino, although a demand exists. Along EDSA, South Superhighway, and Roxas Boulevard, over 85% of total vehicular traffic consist of private vehicles. About 60% of the total is occupied by the jeepneys on Quezon Boulevard and Taft Avenue.

Table 5.2
Current Status of Radial/Circumferential Roads

Major Roads	Planned Length (Km)	Planned No. of Lanes1/	Existing Length (Km)	Existing No. of Lanes1/	Status of the Remaining Sections2/
R-1 Roxas Boulevard	16	D6	9	D6	Being designed
R-2 Taft Ave., Quirino Ave.	6	–	6	4-D6	Completed
R-3 South Super Highway	24	–	26	D6	Completed
R-4 Imelda Ave., Mercedes Street	11	4	5	2	D/D completed (partially)
R-5 Shaw Boulevard	11	4	8	4	Under planning
R-5A Ortigas Avenue	9	4 partly 2	9	2-4	Under planning
R-6 R. Magsaysay Blvd. Aurora Blvd.	16	6-8	16	4-D6	–
R-7 España, Quezon Ave., Don Marcos Ave.	17	6-10	17	D4-6	–
R-8 Andalucia, Dimasalang	16	4-D4	16	2-D4	Under planning
R-9 J.A. Santos, Rizal Ave. Ext., McArthur Hwy.	14	4	14	2-6	–
R-10 not existing	13	4-6	–	–	D/D completed, partly under construction
C-1 C.M. Recto	7	4-8	7	2-8	Under planning
C-2 Pres. Quirino Ave. A. Mendoza, Tayuman					
C-3 5th Ave., Sgt. Rivera St., G. Araneta Ave.	10	6	19	2-6	D/D completed
Buendia	18	6	10	2-6	D/D completed
C-4 EDSA, Samson Road	27	D10	24	2-D10	Implementation being awaited
C-5 Rodriguez Ave. Katipunan	38	6	12	2	F/S partly completed
C-6 not existing	49	6	–	–	Under planning

Source: Available Study Reports and Plans.

1/ figures with "D" means number of lanes divided
2/ D/D: detailed design, F/S: feasibility study



1.07 ← VOL-CAPACITY RATIO

ALL VEHICLES BUS/JEEPNEY

100,000 50,000 (VEH./DAY)

Figure 5.4
Vehicular Traffic Flow on Major Roads, 1979-1981

5.2.3 Operating Characteristics of Public Transport

The public transport of Metro Manila, as it is generally known, consists largely of jeepneys and buses. The buses are further classified into standard bus, double decker, limited bus, love bus, and mini-bus. They span the length and breadth of Metro Manila and its environs. Since the actual Metropolitan area extends to the neighboring areas of Metro Manila, short distance provincial operations also form an important role though at a lesser extent than intracity operation.

Table 5.3
Number of Existing Jeepney and Bus Routes
in the Study Area, 1983

Mode	Metro Manila	Intercity	Total
Jeepney:	640	104	744
Bus:	150	47	197
– Standard Bus	106	13	119
– Double Decker	3	0	3
– Limited Bus	5	0	5
– Love Bus	27	1	28
– Mini-bus	9	20	29
– Provincial Bus	0	13	13

Source: JUMSUT I

The coverage of jeepney and bus service is apparent from Table 5.4. Jeepney operates on a total of 610 kilometers of Metro Manila roads, while bus runs on 330 kilometers. Approximately 290 kilometers are served by both modes. Of the total bus route network, 88% is also served by the jeepney.

Table 5.4
Length of Roads Covered by Jeepney and Bus
within Metro Manila, 1983

Mode	Road Length (kms.) Within EDSA	Outside EDSA	Total Metro Manila
Jeepney	288.8	320.7	609.5
Bus	153.5	173.7	327.2
Total	318.7	331.0	649.7

Source: JUMSUT I

Operating characteristics of bus and jeepney are further amplified in Table 5.5 and discussed below.

a) The number of jeepney units actually operating for any given day is approximately 35,600 units (29,300 units for intra-city routes and 6,300 for inter-city routes). Considering that the utilization rate of jeepney units is approximately 85%, then it is reasonable to say that 41,000 units (of which 34,500 are for intra-city routes alone), is the size of the jeepney fleet.

b) Jeepney routes are generally short in length and concentrated on radial roads – especially Taft Avenue, Rizal Avenue, España, and R. Magsaysay. Bus routes are long and concentrated on circumferential roads (EDSA). Figure 5.5 shows the intensity of jeepney and bus vehicular traffic on the major arteries.

The average length of jeepney routes is 10.4 kilometers and 24.6 kilometers, for intra-city and inter-city services, respectively. Corresponding figures for bus routes are 21.1 kilometers and 40.5 kilometers, respectively.

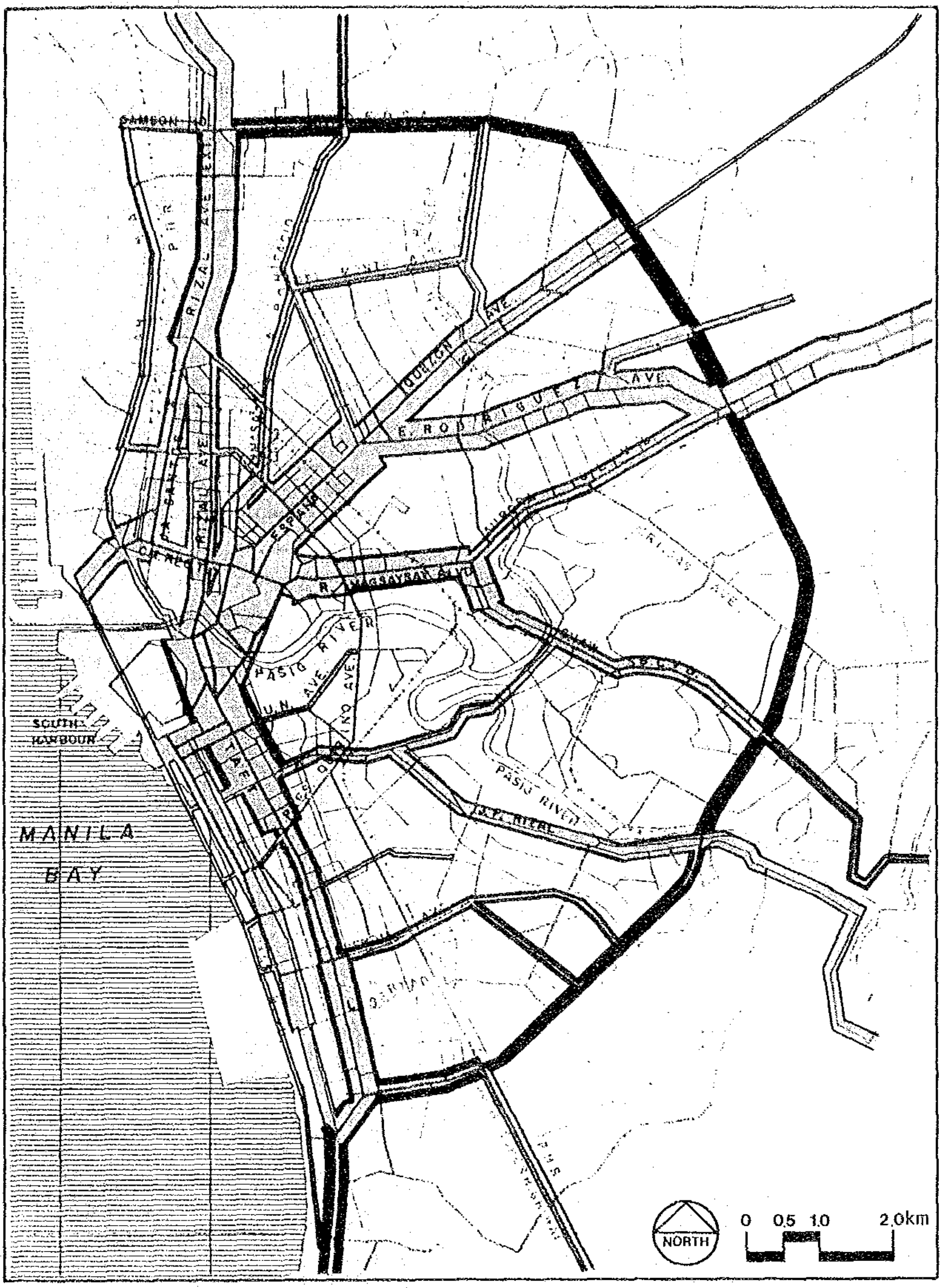
c) The combined public transport seating capacity offered by bus and jeepney is 107 million seat-kilometers; 61% of this is provided by the jeepney.

Table 5.5
Metro Manila Public Transport
Supply Characteristics, 1983

MODE		Route				Fleet Capacity			Operating Characteristics		
		No. of Routes	Road Coverage (Kms.)	Total Route Length (Kms.)	Ave. Route Length (Kms.)	Estd. No. of Units2/ Running	Total Vehicle Kms./16 Hrs. (000)	Total Seat-Kms./16 Hrs.	Ave. Kms. Running 16 Hrs.	Ave. No. of Turn-Arounds Trips/ 61 Hrs.	Ave. Daily Load Factor1/
INTRACITY	Jeepney	640	571	6.661	10.4	29.261	3.154	48.995	107.8	5.2	54.1
	Bus	149	287	3.148	21.1	4.368	506	29.508	115.9	2.7	57.2
	Subtotal	789	608	9.809	–	33.629	3.660	78.503	–	–	55.2
INTERCITY	Jeepney	104	195	2.559	24.6	6.226	1.043	16.118	166.5	3.4	52.0
	Bus	48	172	1.944	40.5	1.543	237	12.740	153.9	1.9	53.7
	Subtotal	152	255	4.503	–	7.809	1.280	28.858	–	–	52.7
TOTAL	Jeepney	744	610	9.220	12.4	35.527	4.197	65.112	118.1	4.8	53.5
	Bus	197	327	5.092	25.8	5.911	744	42.248	125.8	2.4	56.1
	Subtotal	941	650	14.312	–	41.438	4.941	107.360	–	–	54.6

1/ Load Factor is calculated by dividing Passenger-Kms. by Seat-Kms.

2/ Only those actually operating are included.



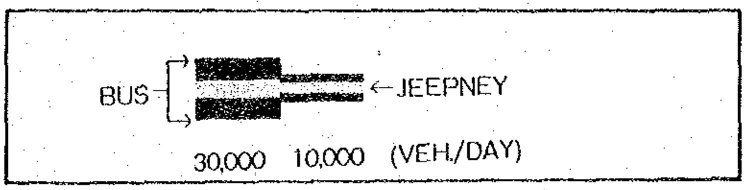


Figure 5.5
Bus/Jeepney Vehicular Traffic
Flow on Major Roads, 1979-1981

The average trip lengths of passengers vary widely between bus and jeepney and between intra and inter-city movements. These are 3.8 kilometers and 8.8 kilometers for intra-city and inter-city jeepney routes, respectively, and 8.5 kilometers and 15.6 kilometers for the corresponding bus routes (see Table 5.6).

Location-wise, the CBD is the largest passenger generating source, followed by areas located inside EDSA. The demand share of bus is small in the northern part of Metro Manila. The inter-city service function of jeepney and bus becomes more pronounced in the peripheral areas, especially in the northern and southern portions.

Although jeepney passengers are everywhere, the heavier concentration is seen in the area within C-2 and in other major terminal areas such as Blumentritt, Monumento, Cubao, Sta. Mesa, Guadalupe, Baclaran, Libertad, etc. On the other hand, major traffic generating areas for buses are confirmed to those along EDSA and other areas such as Plaza Lawton, Quiapo and Divisoria.

Table 5.6
Public Transport Demand Characteristics, 1983

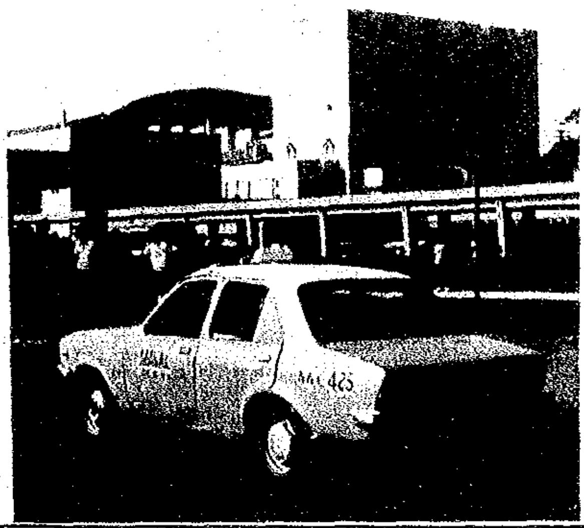
Mode	Total No. of Pass./16 Hrs.		Total Pass. Kms./16 Hrs.		Ave. Trip Length of Pass. Kms.
	000	(%)	000	(%)	
INTRA-CITY:					
Jeepney	6,935	(67.3)	26,485	(45.2)	3.8
Bus	1,990	(19.3)	16,875	(28.8)	8.5
Subtotal	8,925	(86.6)	43,360	(74.0)	4.9
INTER-CITY:					
Jeepney	947	(9.2)	8,382	(14.3)	8.8
Bus	437	(4.2)	6,838	(11.7)	15.6
Subtotal	1,384	(13.4)	15,220	(26.0)	11.0
TOTAL:					
Jeepney	7,882	(76.5)	34,867	(59.5)	4.4
Bus	2,427	(23.5)	23,713	(40.5)	9.8
Total	10,309	(100.0)	58,580	(100.0)	5.7

Source: JUMSUT I

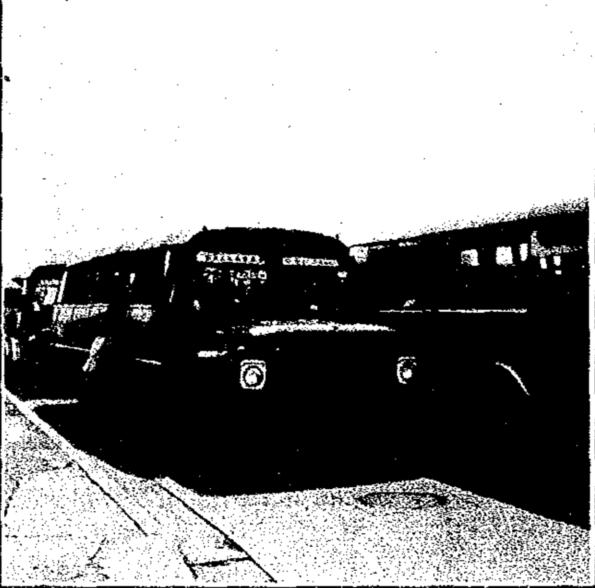
PUBLIC TRANSPORTATION MODES

Jeepney

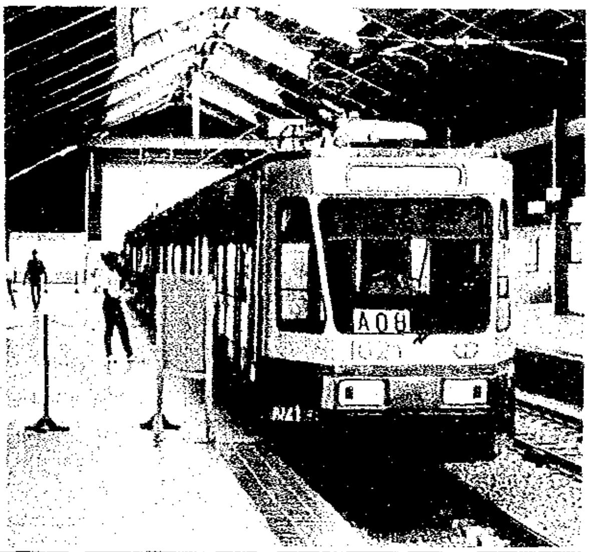
Taxi



City Bus

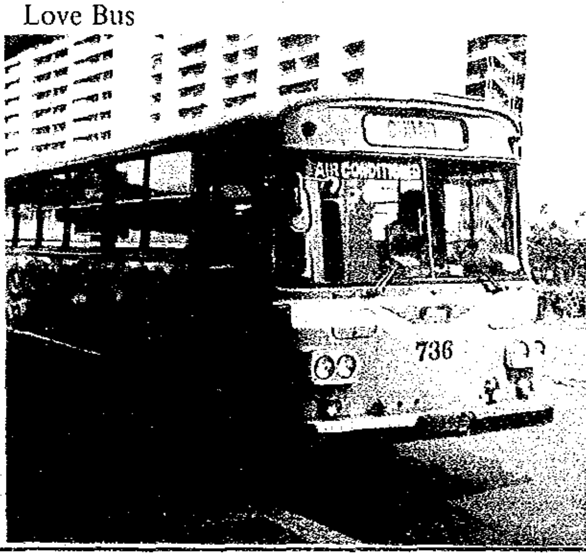


LRT



Tricycle

Love Bus



5.3 PROBLEMS AND OPPORTUNITIES: THE PLANNING AGENDA

5.3.1 Array of Problems

A convenient way of looking at the array of transport problems is to classify them into categories amenable to piece-wise solutions. These categories are:

a) those related to road section

b) those related to intersection

c) those related to pedestrian facility

d) those related to public transportation

e) those related to enforcement

f) those related to vehicles

g) those related to construction work

Of particular interest in JUMSUT II are the locations of problematic areas in so far as public transport is concerned and these are:

- Congested places with long vehicle queues throughout the day or, at least, during peak hours;

- Zones of conflicts among PUVs, private vehicles, pedestrians and commercial activities with long vehicle queues or very low vehicle speed.

These problem areas are shown in Figure 5.6 and enumerated below.

Major Problem Areas – where the magnitude of the problem is large and 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 traffic congestion is primarily due to lack of capacity. Though not fully effective, short-term palliatives could be experimented on.

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

In addition to the above, certain roads and intersections loomed as problematic should the 1990 scenario fan out. These are:

Corridors/Roads	McArthur Highway Quirino Highway España E. Rodriguez Kamuning/Kamias 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/P. Quirino South Superhighway/Buendia

Minor Problem Areas – where the magnitude of the problem is less severe and possible solutions are relatively simple.

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

Aside from the above locations, Cubao emerged also as a major problem area. It is however, discussed and analyzed separately as a mode interchange area.

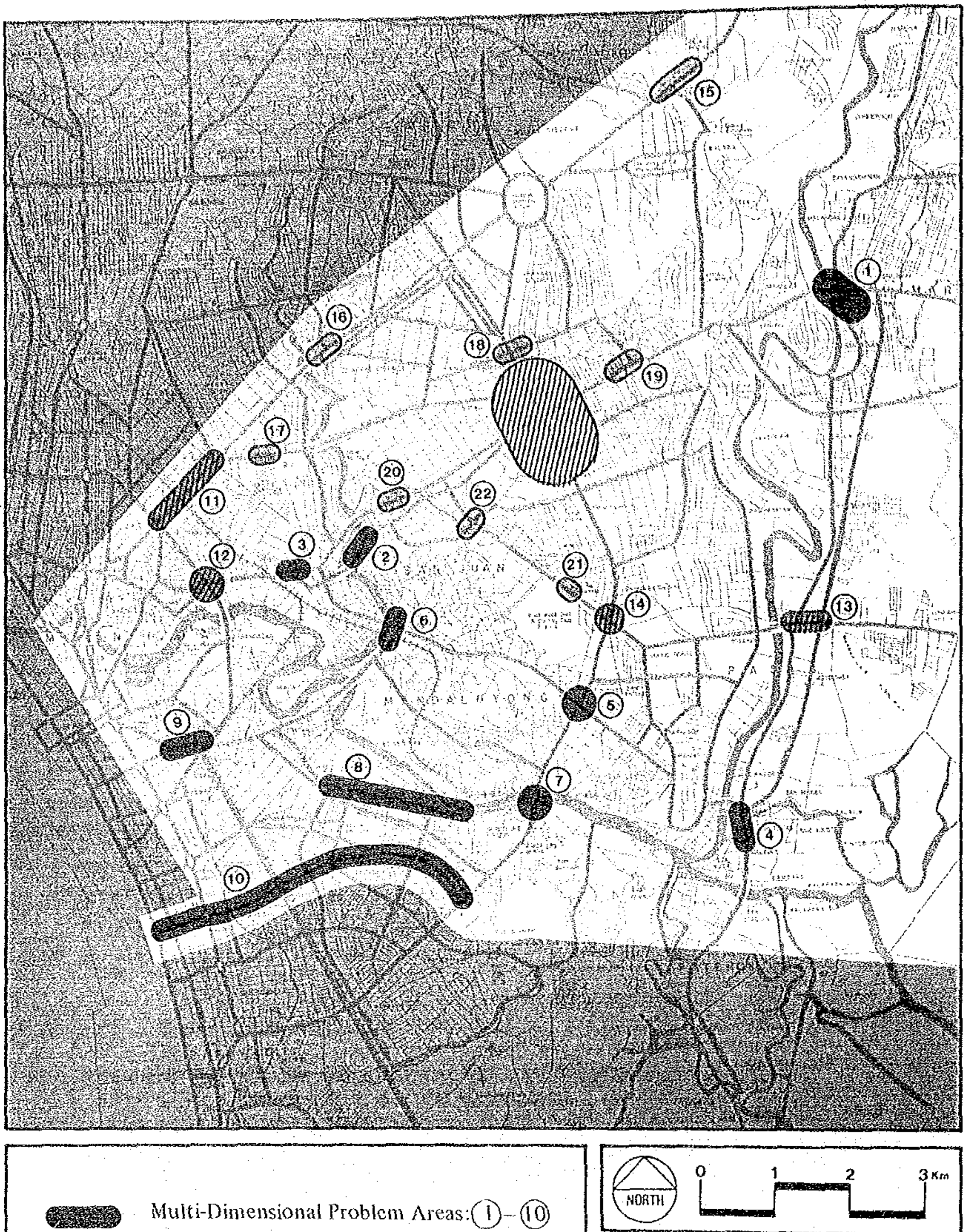
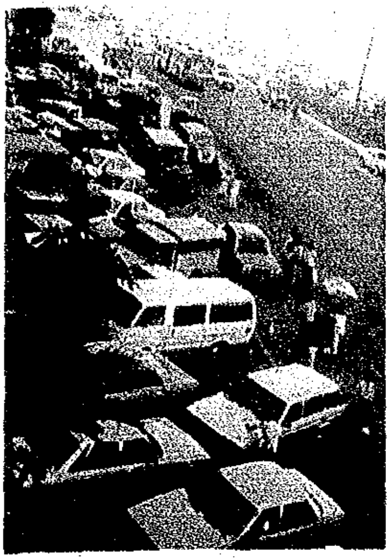
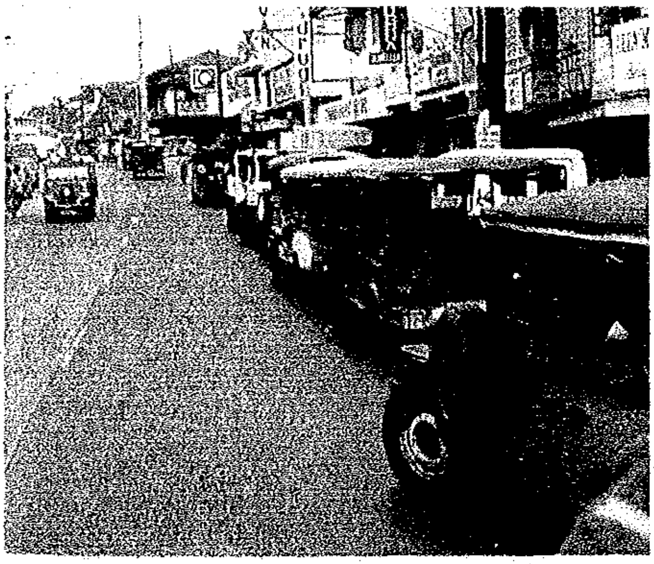


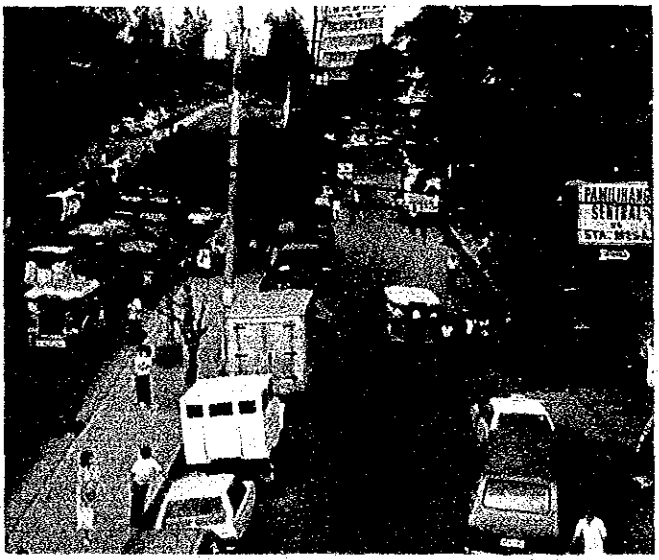
Figure 5.6
Identified Problem Areas for
Short-Term Planning



A. Guadalupe: – angle parking in front of ABC – risky situation of pedestrians	D. J.P. Rizal – Street digging which aggravates present traffic situation
B. LRT Stations – Sidewalk vendors are a common sight in most LRT stations forcing pedestrians to encroach on the carriageway.	SELECTED PROBLEM AREAS
C. EDSA/Shaw – Haphazard bus and jeepney maneuver coupled with disregard of traffic rules by pedestrians.	E. Buendia – long queue length at Buendia/EDSA paralyzes nearby intersections

F. Marikina – Conflict among pedestrians,jeepneys and tricycles at W.C. Paz	I. Kalentong – Pedestrians walk on the carriage-way under PNR overpass due to non-existence of sidewalks
G. Pasig – Inefficient traffic management – Lack of pedestrian facilities	SELECTED PROBLEM AREAS
H. N. Domingo – jeepney queueing along carriageway	J. Sta. Mesa – bothside parking along service road





5.3.2 Service Deficiencies of Public Transport

While recognizing that public transport in Metro Manila is equalled only by a few other cities of the world, the Consultant cast a critical eye on its area of coverage, route structure, transfer capability, and captive riders. For the deficient areas, recommendations were made to expand the coverage or adjust the operations of jeepney and bus.

Figure 5.7 shows the areas where service is considered poor. These areas are far from any existing jeepney and bus route by more than 250 meters. Relatively extensive areas are not served by the jeepney and bus, particularly those outside EDSA. In most cases, however, tricycles fill up the gaps.

The areas not covered by the jeepney and bus are mostly subdivisions or low density residential areas and open spaces. However, there are high density areas where public transport services are poor (ex. Bagumbayan) or lacking as in Sta. Mesa which is a traffic generating/attracting zone. On the other hand, the areas served only by tricycles are mostly medium or high-density residential areas where streets are often too narrow for jeepneys, more so for buses.

A small-scale household interview survey conducted by JUMSUT II in selected transport deficient areas (see Table 5.7) reveals that people in low-income areas are forced to walk; but in higher income areas, tricycles and cars supplement the jeepney and bus service.

Table 5.7
Interrelation between Household Income and Access Mode
in Poor Public Transportation Service Area (as of December 1984)

Area	No. of Samples Interviewed	Average Household Income (P/month)	Access Mode (%)					
			Car Jeep	Jpy	Bus	Tri-cycle	Others	Walk
New Manila	63	5,300	37	0	3	0	5	55
Sampaloc	61	3,200	5	15	0	21	0	59
San Juan	98	2,700	4	4	0	0	2	90
Tatalon Estate (Q.C.)	8,	2,200	0	1	0	0	0	99
Kalentong	77	3,400	5	0	1	51	3	40
Total	380	3,300	9	4	1	14	2	70

Based on income and degree of dependency on public transport, Metro Manila can be broadly classified into:

a) High Dependence and Low Income Area – are of two types, viz.: those with high traffic demand where bus and/or jeepney services need to be strengthened such as along

- Quirino Highway
- J. Luna
- H. Lopez

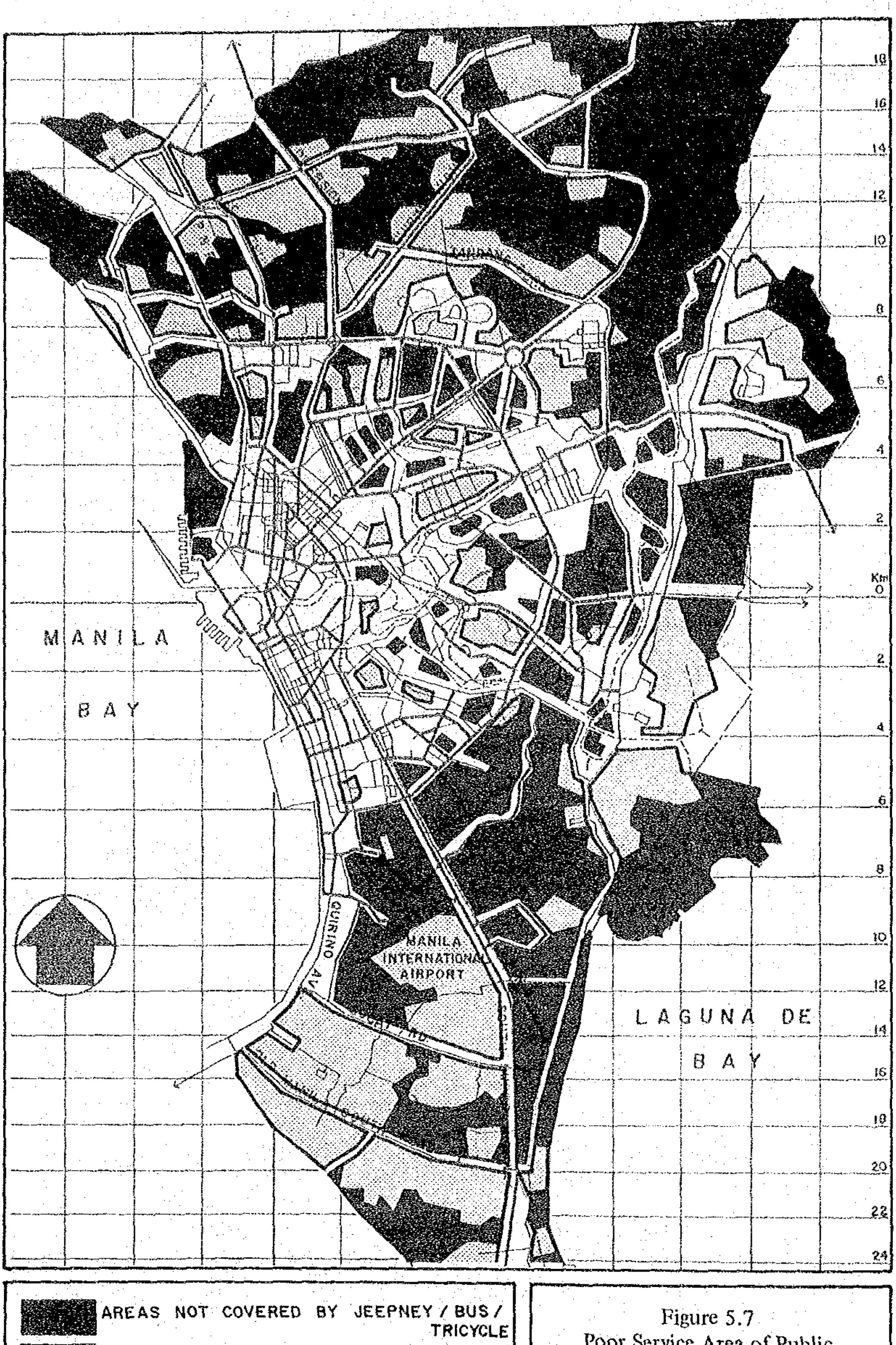


Figure 5.7
Poor Service Area of Public Transportation

Those with relatively low traffic demand where tricycles can be offered such as in

- Upper Caloocan
- Northern part of Quezon City (Novaliches, Fairview, etc.)
- Taguig

b) Low Dependence and High Income Area – can be supplied with more premium buses to encourage diversion from private cars. They are areas along

- EDSA
- South Superhighway

There are a number of areas where passengers suffer unduly due to frequent transfers. This can be attributed to route structures which do not reflect actual demand. These are:

a) The area along A. Bonifacio between Mayon and EDSA
b) Balic-Balic area in Quezon City
c) Kalentong area in Mandaluyong
d) Pandacan area in Manila City
e) Makati Commercial Center
f) Magallanes Village in Makati

5.3.3 Problems from a Traffic Engineering Perspective

A. Traffic Congestion

To many, the biggest traffic problem of Metro Manila is congestion. The term "congestion", however, assumes different meanings to different people. It may be the ratio of traffic volume against the road capacity. The mixture of vehicles and pedestrians and their conflicts can also be considered as "congestion", so is the build up of slow moving vehicles in a queue. The "congestion" is sometimes related to traffic safety, passenger convenience, and the living environment. From a public transport standpoint, congestion is manifested in the following:

- For jeepney and bus, loading/unloading passengers is one of the major causes of repeated stopping or slowing down;

- The loading/unloading of passengers by jeepney and bus slow down other vehicles;

- Pedestrians crossing the roadway, walking along the curbside and waiting for PUVs on the carriageway tend to block vehicle movements.

Although the causes of traffic congestion differs by road sections according to the characteristics of the traffic and the section itself, traffic congestion traceable to PUV operation and pedestrian activities are numerous. Table 5.8 provides evidences with the following features:

- The wider the road, the more vehicles tend to overtake or be overtaken by other vehicles. This leads to the conclusion that PUVs, especially buses, determine the average vehicle speed on narrow streets.

- PUVs make a stop every 70-200 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 made for trying to get passengers is more for the jeepney than for the buses).

- The negative effects of pedestrian activities is less in wider roads.

Table 5.8
Number of Jeepney/Bus Stopping by Reason,
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	Number of Jeepney/Bus Stoppings by Reason (per km.)												No. of Vehicles Overtaken by Surveyed Jeepney /Bus (per km.)	No. of Vehicles that Overtook Surveyed Jeepney /Bus (per km.)
	Carriage-way Width (m.)	Mode	Average Travel Speed (kph)1/	Load/ Unload	Try to Load/ Unload	Other PUV's Load/ Unload	Other Vehicle's 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	Jeepney	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	Jeepney	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	Jeepney	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	Jeepney	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	Jeepney	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

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

B. **Traffic Signal Operation**

The traffic signals in Metro Manila are characterized by the following features:

a) Manual operation by traffic police
b) Multi-phasing

At major intersections, it is frequently observed that traffic policemen override central control of traffic signals. The above practice is considered to be practical and effective only in few cases. Where vehicle queues often extend far beyond the policemen's sight, the manual operation of traffic signals tend to be inefficient. As proof, JUMSUT II conducted a traffic signal cycle time survey along Buendia Avenue, which produced the following observations.

a) The cycle time of traffic signals differs widely among the various section. Although it is natural for the cycle time to vary depending on the local traffic situation, a large difference is unfavorable to attaining smooth traffic flow as their system effect is to create long vehicle queues.

b) The cycle times at some intersections under manual control were unbelievably long. At the EDSA/Buendia intersection, the maximum cycle time observed was nearly ten (10) minutes. The effect is illustrated in Figure 5.8 where nearby intersections (EDSA/Buendia and Paseo de Roxas) become clogged also.

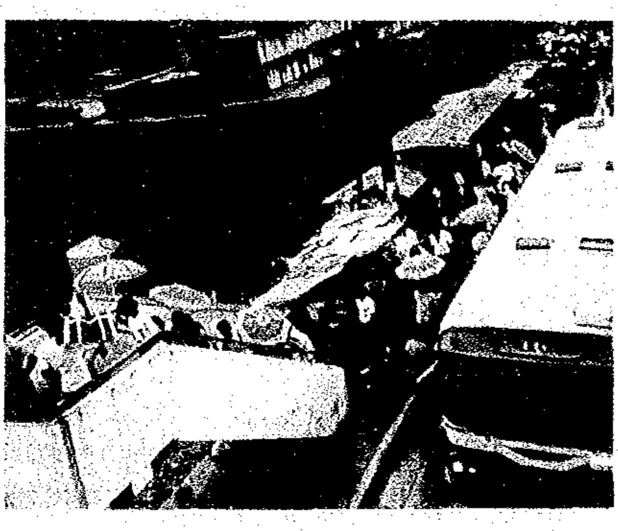
c) The phasing of traffic signal is unstable. In the case of the EDSA/ Buendia intersection, the green time for the Buendia approach fluctuated between 14 to 257 seconds. This invites not only long vehicle queues but also exasperation from vehicle drivers who are unable to evade congestion.

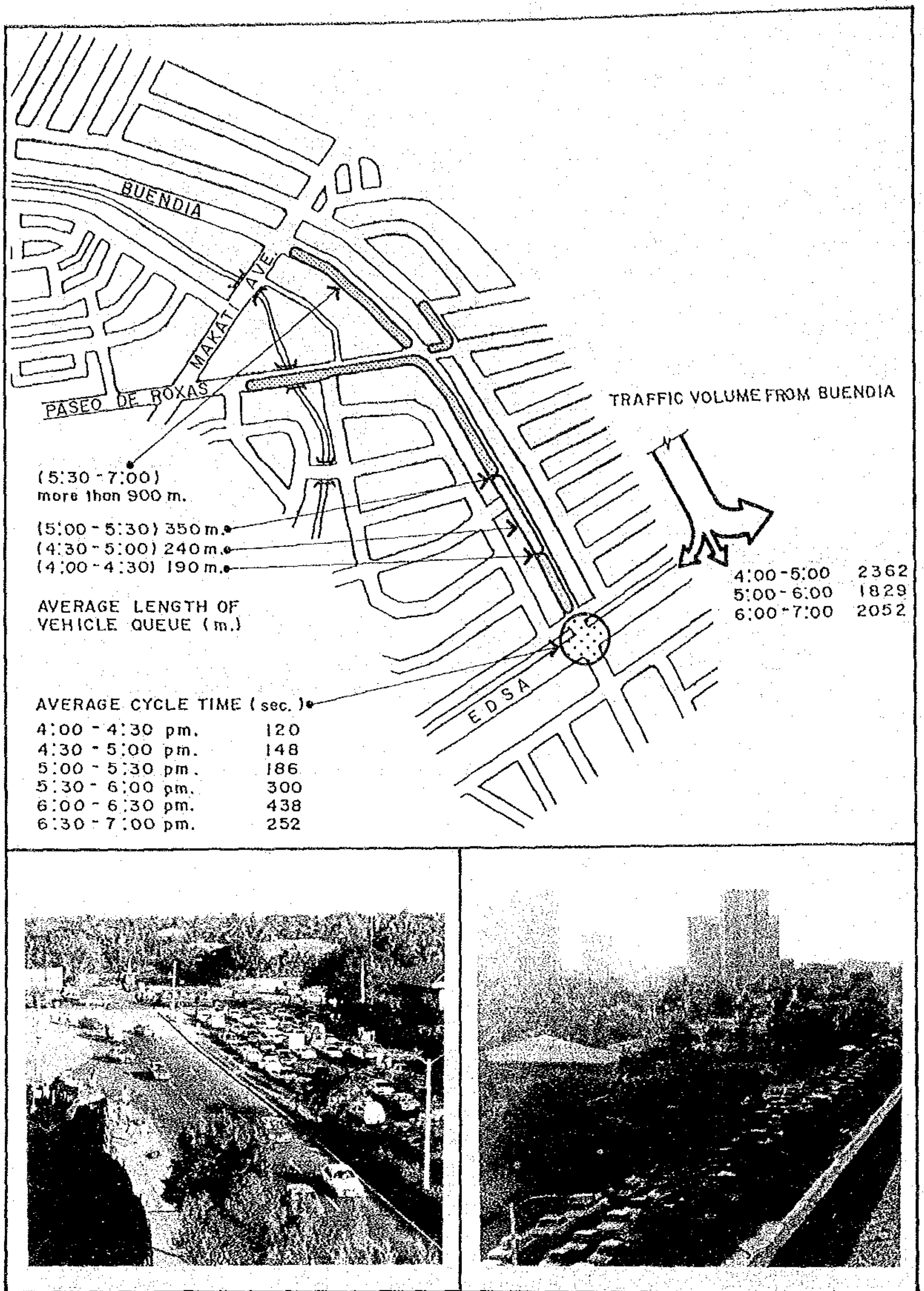
C. **Pedestrians**

Another Metro Manila phenomenon is a perennial conflict between pedestrian activity and vehicular traffic. This can be partly attributed to the undisciplined movements of both vehicles and pedestrians. A more tangible factor is the lack or deficiency of pedestrian facilities, which are described in Table 5.9.

Availability of a pedestrian facility is no guarantee of use. A survey conducted by JUMSUT Phase II on the extent of usage of pedestrian overpass showed that:

- Utilization could range from 38% (Balintawak) to 100% (Lerma).
- Those avoiding the overpass have a penchant for short-cuts, or finds them cluttered with vendors.
- The physically-handicapped and goods-carrying persons are not served.





(4:00 – 7:00 p.m., January 18, 1985)

Figure 5.8
Change of Vehicle Queue Length of the Buendia Approach to the EDSA/Buendia Intersection

Table 5.9
Deficiencies of Pedestrian Facilities

Pedestrian Facility	Differences
Sidewalk	Lack of facilities Unsealed surface Existence of gaps Encroachment of private activities (vendors) Obstacles Lack of width Lack of shade
Pedestrian Crossing	Lack of designated location Unclear marking
Overpass	Psychological resistance Dangers at night Blocked by vendors Improper location Lack of capacity (especially staircase) Inadequate design
Pedestrian Signal	Lack of facility Malfunction
Pedestrian Barrier Fence	Lack of facility Vandalism, ignored by pedestrians
PUV Waiting Shed Loading/Unloading Zone	Lack of facility/designation Inadequate location Occupied by vendors or other private activities Ignored by pedestrians/PUV drivers

5.3.4 Planning Goals and Opportunities

In many instances, the problems themselves suggest the elements of the solutions. The very obvious (and overlooked) low-cost ones are in the wider use of sidestreets, changes in traffic signals operations, and redistribution of traffic via rerouting.

A. Use of Sidestreets

Sidestreets can be defined as roads other than major thoroughfares which can serve either of the following functions:

– as alternative routes for vehicles

– as turning circuit for PUVs

The former, if realized, will expand the road capacity of major thoroughfares while the latter could facilitate PUV movements.

Although there are some sidestreets where usage has been quite extensive, most of them are not for a variety of 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.

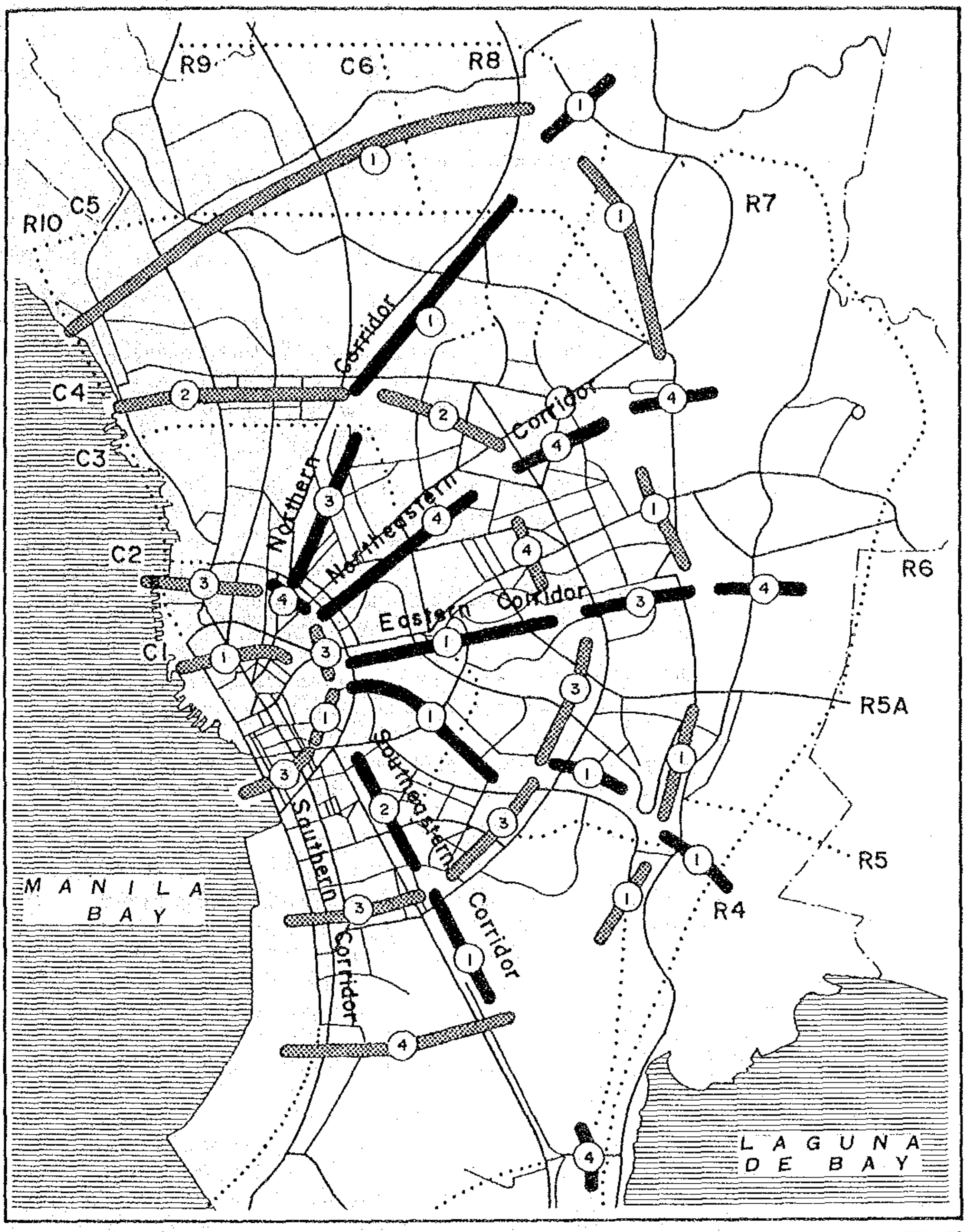
– used as a playground

– used as a market

The distribution of available sidestreets are relatively dense in the following cases:

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

Figure 5.9 shows the ratio of possible road capacity (with sidestreets) to the road capacity used in the network analysis (major roads only) in each screenline. The ratio indicates the potential for capacity expansion via use of the available sidestreets. In general, many sidestreets are available inside C-4 (except the Pasig River and some other screenlines) where they are most needed in relieving congestion.



LEGEND:

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

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

SOURCE: JUMSUT II

Figure 5.9
Availability of Sidestreets
by Mini-Screenline

B. Changes in Signal Operations

It is evident from the previous section that operation of traffic signals leads to numerous problems. The solutions are obvious, viz.:

a) Stop manual operation in major intersections. This can be sustained by

- well-trained traffic policemen
- provision of equipment for monitoring vehicle queue.

b) Reduce cycle time of the signals manually controlled to the extent that it jibes with that of nearby intersections.

Correspondingly, a reduction in the number of phases of traffic signals at saturated intersections may be explored:

a) When the traffic volume turning to the left is small, elimination of the left-turn phase (still allowing left-turning) should be introduced though advance notice or campaign will be needed.

b) When the traffic volume turning to the left is small and where alternative routes can be identified, banning left-turn is practicable.

c) Where one-way pair of roads can be secured, conversion of the road into one-way street is desirable.

C. Traffic Redistribution

Because of missing links or incomplete road network, there is distortion in the present distribution of traffic. The present traffic pattern in the radial direction inside C-2 appears to be equilibrium. Around C-4, however, the northern, northeastern and southern corridors seem to have more potential demand than the current traffic volume shown. Instead, the southeastern corridor (including Ortigas Avenue, Shaw Boulevard, J. P. Rizal, Buendia, and Ayala) absorbs the detour traffic. Outside C-4, Ortigas Avenue and Shaw Boulevard also appear to be overutilized by diverted traffic.

As to the circumferential movements, C-4 and its outside parallel roads are used extensively at present, but this is also caused by diverted traffic from the non-existent C-5 and C-3. Demand could become higher than the actual traffic now on C-2 and some circumferential roads along the planned route of C-3.

The special concern of JUMSUT II is the restructuring of the public transportation routes. In view of the fact that the bus and jeepney play a significant role in urban transportation, in terms of passengers as well as vehicle count, the consequences of such a route restructuring are tremendous. For example, traffic congestion in many cases can be mitigated by rerouting public transport to available sidestreets and by introducing other improvements.

5.4 THE MEDIUM-TERM OUTLINE IN TRANSPORTATION

5.4.1 Impact of the Committed Road Investments

On-going or committed major road projects are expected to be completed by 1990. These are:

- C-3 (R-10 to Aurora Boulevard)
- R-10 (Del Pan Bridge to Samson Road including the upgrading of Samson Road)
- R-1 Extension
- Makati – Mandaluyong Road

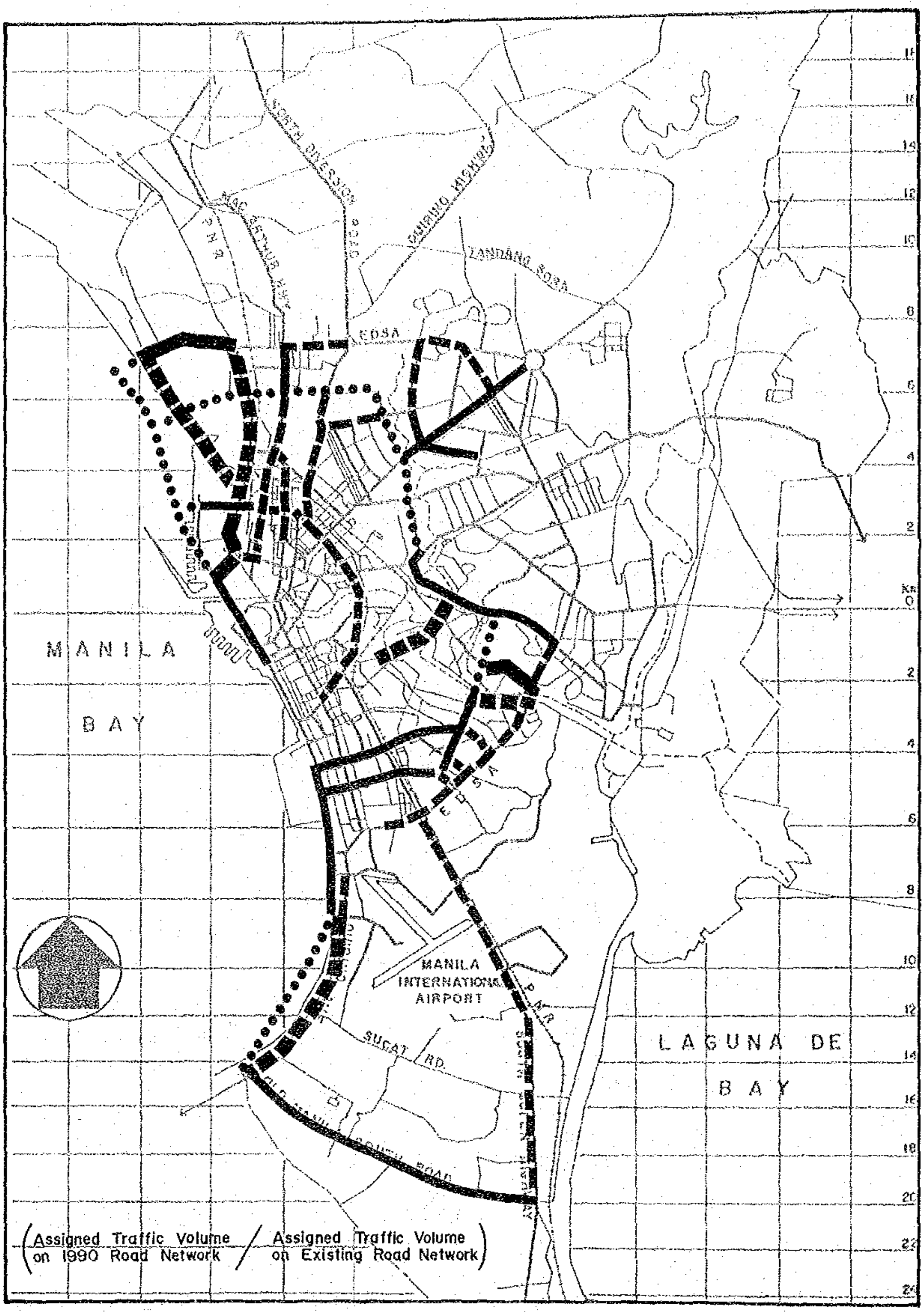
Where none of the above roads gets completed, the road capacity around the CBD will become more inadequate by 1990. Especially in the northern, eastern and southern corridors on a radial direction, and in the C-2/C-3 corridors on a circumferential direction, traffic demand is so strong that overflow could paralyze movement on the roads. Even outside C-4, the major roads will be saturated in the radial direction.

Figure 5.10depicts the changes in vehicular traffic volume assigned to the 1990 road network compared to the present road network. These are:

- In the northern corridor, the combined effects of R-10 and C-3 will be remarkable. The traffic congestion on H. Lopez, J. Luna/A. Mabini, J. A. Santos, Rizal Avenue/Rizal Avenue Extension, Dimasalang/A. Bonifacio, and Del Monte Avenue will be greatly alleviated. EDSA and C-2 will also benefit in some sections.
- In the northeastern corridor, C-2 (A. Mendoza), Mayon and a part of E. Rodriguez will be relieved by C-3.
- In the eastern and southern corridors, the effect of the Makati-Mandaluyong Road and C-3 is also significant. The most heavily used section of EDSA (Guadalupe Bridge) and J. P. Rizal will be freed from traffic congestion. Kalentong/Panaderos is also one of the road sections which will be decongested by the Makati-Mandaluyong Road. However, inside Makati, Buendia, Makati Avenue and Pasay road, which are already congested, will be loaded with additional traffic.
- In the southern corridor, the effect of R-1 Extension is to free Quirino Avenue from its current traffic congestion.

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

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



(legend line)	– 0.75	(legend line)	1.11 – 1.25
(legend line)	0.76 – 0.90	(legend line)	1.26 –
		●●●●	Proposed New Road to be Constructed by 1990

Figure 5.10
Impact of the Construction of Proposed New Roads on Traffic

a) Although the general tendency is the same, the completion of C-3 up to Makati will further mitigate traffic congestion principally on 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 will shrink by about 11%, with only a negligible increase in total vehicle-kilometers.

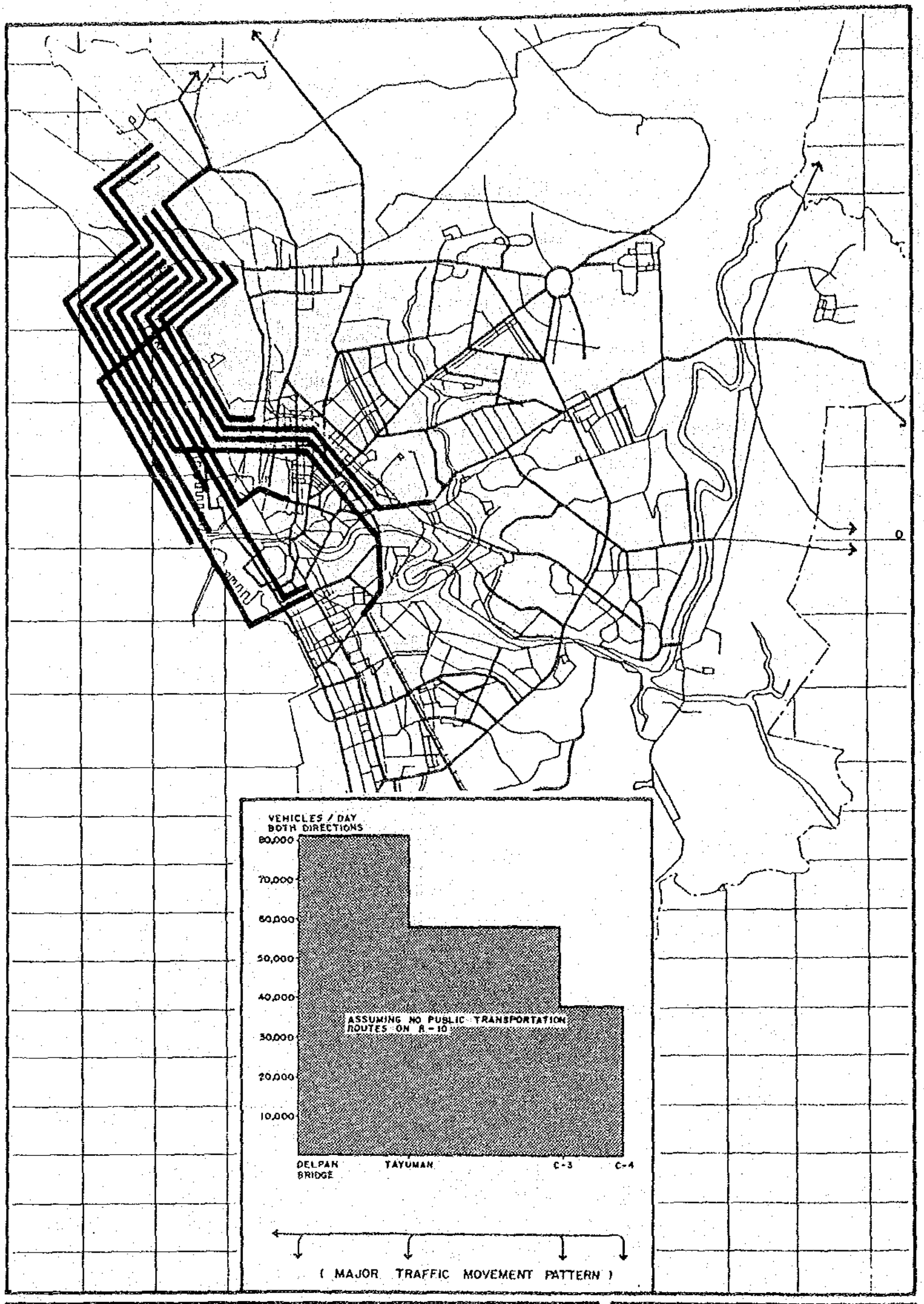
With regards to the average trip length on new roads, Table 5.10 indicates that R-1 Extension will have the longest average trip length of 15 kilometers.

Table 5.10
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

Figures 5.11 & 5.12 show the estimated traffic loading patterns on R-10 and C-3 once completed and provide some indications on the impact of R-10 and C-3, respectively.

A number of corridors will remain congested even after completion of the planned road network by 1990. With the additional capacity on the north-south direction provided by the LRT and on the northeastern and southern corridors provided by relatively well-developed sidestreets, the most critical roads will be mostly in the eastern, northeastern, southeastern corridors, as shown in Figure 5.13. Especially, R. Magsaysay/Legarda is not only congested at present but also came up with strong potential demand in the future. It has no available sidestreets and the construction of C-3 will exacerbate its load.



LEGEND:

——— MAJOR TRAFFIC FLOW

Figure 5.11
Major Traffic Demand Distribution for R-10, 1990