REPUBLIC OF THE PHILIPPINES

No. 51

JICA

The Metro Manila Transportation Planning Study
Phase II Final Report

TECHNICAL REPORT

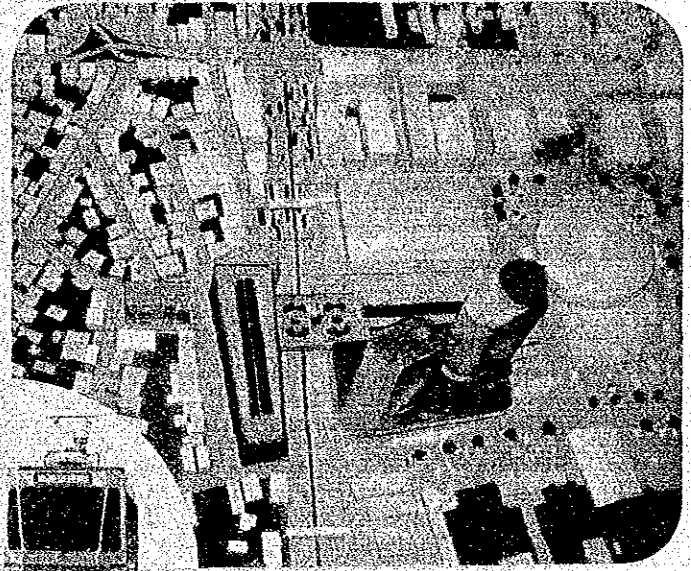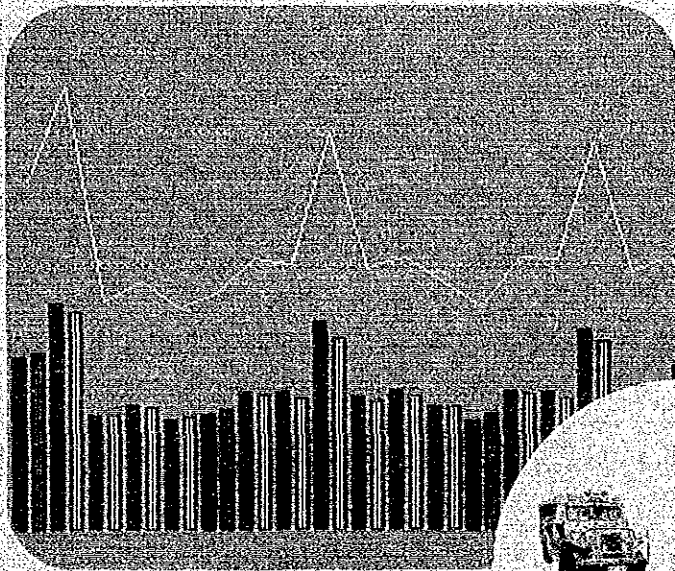Transportation Demand Analysis

REPUBLIC OF THE PHILIPPINES

The Metro Manila Transportation Planning Study Phase II Final Report

TECHNICAL REPORT
Transportation Demand Analysis

SEPTEMBER 1985

JAPAN INTERNATIONAL COOPERATION AGENCY

TABLE OF CONTENTS

Page No.

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0   INTRODUCTION

1.1   ANALYSIS FRAMEWORK

The objectives of the transportation demand analysis and forecasting activity in JUMSUT II are more clearly defined by the subtasks involved which are enumerated below and schematically shown in Figure 1:1.

a) Update of 1980 OD Tables: The 1980 OD tables developed in JUMSUT I were updated by consolidating and validating the results of the 1984 Supplemental HIS (conducted in the adjoining areas of Metro Manila) with the 1980 OD results.

b) Development of 1984 OD Tables: The 1984 OD tables were developed by calibrating the updated 1980 OD tables with the results of the 1984 screenline/cordonline surveys.

c) Estimate of 1990 Land Use Parameters: The 1990 land use parameters required to develop the 1990 OD tables were estimated based on the analysis of land use and existing data, in coordination with MMC.

d) Forecast of 1990 OD Tables: The 1990 OD tables were developed based on the review and refinement of the trip forecasting models evolved in JUMSUT I, and the results derived from a) and c).

1.2   COVERAGE AND LIMITATION

The physical coverage of the study was expanded from Metro Manila to the actual metropolitan area through the inclusion of the following adjoining areas:

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

The limitations of the task were due to the following constraints:

a) Although the Supplemental HIS covered the adjoining areas of Metro Manila, sample size was limited to approximately 2,000 households, chosen at random mostly from the more urbanized areas, due to the difficulties perceived if the interviewers were to interview households in remote areas.

b) Land use analysis was made using the best available data only and information from other government agencies.

Figure 1.1
Framework of Transportation Demand
Analysis and Forecasting
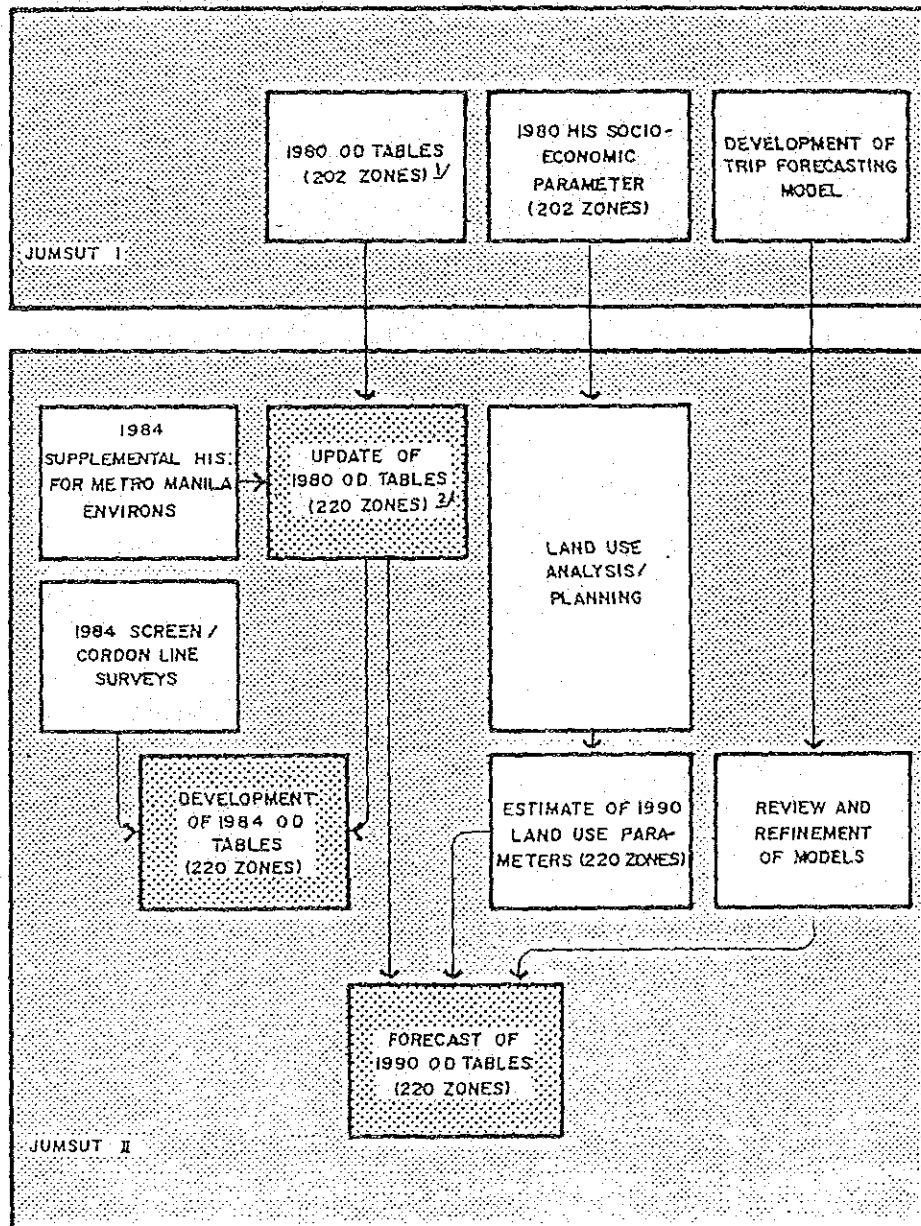
1/ 202 Zones cover Metro Manila only

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

2

2.0   LAND USE ANALYSIS

2.1   OBJECTIVES

The primary objective of this task is to provide a basis for forecasting the 1980 socio-economic parameters. However, in order to determine the forecasting methodology of relevant parameters on a zonal basis, the following aspects have to be clarified:

- the interrelationship of the 1980 zonal socio-economic parameters with the actual land use of the area.

- the presentation of land use characteristics in quantitative terms.

In view of the above, the following tasks were undertaken:

a) Preparation of the existing physical land use map and data.

b) Analysis of land use characteristics in relation with the zonal socio-economic parameters worked out from the 1980 HIS and the results of a) above.

c) Preliminary assessment of development potentials and restrictions of the areas in order to provide indications for further development.

2.2   DATA SOURCES

There are three major sources of existing land use data:

A. The 1980 socio-economic data by zone as derived from the 1980 HIS. They include:

- Population
- Number of Households
- Employment by Sector (by residence and by workplace)
- Number of Students (by residence and by school address)
- Car-owning Rate
- Average Household Income

B. The 1975/1980 population data by barangay: Taken from 1975 and 1980 population census of NCSO/NEDA.

C. The 1980 existing land use map: Derived from three major data sources, namely:

1) 1977 existing land use map (MMC 1/10,000; Marikina and San Juan not covered)

3

2) 1978-1980 aerial photos (CCP, 1/5,000, covering Metro Manila)

3) 1979-1982 aerial photos (BCGS, 1/32,000, covering Metro Manila)

2.3   PREPARATION OF THE EXISTING LAND USE MAP AND DATA

The existing 1980 land use map was worked out on the basis of the 1977 land use map prepared by MMC and existing aerial photos. In order to measure the area (using a planimeter), land use classifications determined by MMC, shown in Table 2.1, was used. Further sub-classification of parks/open spaces was done in order to define more explicitly potential development areas. The summarized results based on a 202-zone system are shown in Appendix 2.1.

Table 2.1
Land Use Classifications

Classifications	Description
Residential 1	: Low intensity residential
Residential 2	: Medium intensity residential
Residential 3	: High intensity residential
Commercial 1	: Low intensity commercial
Commercial 2	: Medium intensity commercial
Commercial 3	: High intensity commercial
Industrial 1	: Low intensity industrial
Industrial 2	: Medium intensity industrial
Industrial 3	: High intensity industrial
Institutional 1	: Low intensity institutional
Institutional 2	: Medium intensity institutional
Institutional 3	: High intensity institutional
Utilities	
Airports	
Agricultural Areas	
Fish Ponds	
Reclamation Areas	
Parks/Open Spaces[1/]	

Source: MMC

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

4

2.4   LAND USE CHARACTERISTICS

In general, open space shares the largest portion of land use (47.8%) in Metro Manila followed by residential use (37.3%). The total open spaces may be further classified according to their significant uses: Vacant areas (29.4%), agricultural areas (23.6%) and mountains and hills (32.3%). A summary of land use characteristics by municipality is presented in Table 2.2. They are described briefly hereinafter.

A.   Within EDSA : With the exception of Pasay City, the predo-
       minant land use is residential, while open space shares only
       about 10%.

       High density residential areas are distributed in the cities
       of Manila and Pasay, while low density residential areas are
       located in Makati and San Juan.

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

B.   Outside EDSA : In the areas outside EDSA, the predominant
       land use is open space, of which mountains/hills have the
       highest share, followed by vacant areas and agricultural
       areas. Approximately 9,000 hectares are considered vacant.

       Residential areas are normally of low density and share 30% to
       40% of the total area. Although subdivision developments are
       significant, vacant lots are still considerably observed.

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

Areas for potential development can be found outside EDSA, particu-
larly in Quezon City, with 33% of its open space area classified as
vacant. This is followed by Caloocan City and Las Piñas.

5

Table 2.2
Classification of Land Use
by Municipality

City/Municipality		Residential			Commercial			Indust-rial	Inst-itu-tional	Utili-ties	Open Space	Grand Total
		R1	R2/R2+C1	R3/R3+C1	Total	C2	C3	Total					
City of Manila	ha.	35	37	2128	2200	195	297	492	260	371	118	434	3875
	%	0.9	0.9	55.7	57.5	5.2	6.4	11.6	6.8	9.7	3.0	11.4	100.0
Pasay City	ha.	27	120	286	433	212	89	301	46	103	663	188	1734
	%	1.6	6.9	16.5	2.5	12.2	5.1	17.3	2.8	5.9	38.2	10.8	100.0
Makati	ha.	503	464	131	1098	33	168	201	86	232	0	249	1866
	%	27.0	25.9	7	58.9	1.8	9.0	10.8	4.6	12.4	0	13.3	100.0
Mandaluyong	ha.	144	270	223	637	5	3	8	166	91	6	291	1199
	%	12.0	22.5	18.6	53.1	0.4	0.3	0.7	13.8	7.6	0.5	24.3	100.0
San Juan	ha.	181	36	138	355	151	21	172	18	45	0	24	614
	%	29.4	5.9	22.5	57.8	2.5	3.1	28.1	2.9	7.3	0	3.9	100.0
Quezon City	ha.	4709	1887	649	7245	213	44	257	407	936	1	7911	16757
	%	28.1	11.2	3.9	43.2	1.3	0.2	1.5	2.5	5.6	0	47.2	100.0
Caloocan City	ha.	476	519	348	1343	119	1	120	201	193	20	3603	5480
	%	8.7	9.5	6.3	24.5	2.1	0	2.1	3.7	3.5	0.4	65.8	100.0
Valenzuela	ha.	1336	73	65	1474	45	0	45	621	6	2	2405	4553
	%	29.4	1.6	1.4	32.4	1.0	0	1.0	13.6	0.1	0	52.9	100.0
Malabon	ha.	297	280	120	697	24	0	24	185	29	0	838	1773
	%	22.3	15.8	1.2	39.3	1.4	0	1.4	10.4	1.6	0	47.3	100.0
Navotas	ha.	63	188	69	320	0	45	45	54	11	0	691	1121
	%	5.7	16.8	6.1	28.6	0	4.0	4.0	4.8	1.0	0	61.6	100.0
Marikina	ha.	1100	10	0	1110	162	0	162	266	49	0	728	2315
	%	47.6	0.4	0	48	7.0	0	7.0	11.5	2.1	0	31.4	100.0
Pasig	ha.	697	246	140	1083	114	0	114	466	31	0	1842	3536
	%	20.0	7.0	3.6	30.6	3.2	0	3.2	13.2	0.9	0	52.1	100.0
Pateros	ha.	0	109	5	114	10	0	10	1	6	0	76	207
	%	0	52.7	2.4	55.1	4.8	0	4.8	0.5	2.9	0	36.7	100.0
Taguig	ha.	0	85	358	443	3	0	3	93	804	18	2775	4136
	%	0	2.1	8.7	10.8	0	0	0	2.2	19.4	0.4	67.2	100.0
Parañaque	ha.	1403	121	86	1610	41	0	41	80	18	30	2512	4291
	%	32.7	2.8	2.0	37.5	1.0	0	1.0	2.0	0.3	0.7	58.5	100.0
Muntinlupa	ha.	936	122	27	1085	43	0	43	74	196	0	2261	3659
	%	25.6	3.3	0.8	29.7	1.2	0	1.2	2.0	5.4	0	61.7	100.0
Las Piñas	ha.	1396	73	15	1484	27	0	27	17	10	0	2326	3864
	%	36.1	1.9	0.4	38.4	0.7	0	0.7	0.4	0.3	0	60.2	100.0
TOTAL	ha.	13303	4640	4788	22731	1397	668	2065	3041	3131	858	29154	60980
	%	21.8	7.6	7.9	37.3	2.3	1.1	3.4	4.9	5.1	1.5	47.8	100.0

Source: JUMSUT II

Wherein:

R1 = Low Intensity Residential
R2 = Medium Intensity Residential
R3 = High Intensity Residential
C1 = Low Intensity Commercial
C2 = Medium Intensity Commercial
C3 = High Intensity Commercial

6

Table 2.3
Classification of Open Space Areas
by Municipality

City/Municipality		Vacant Area	Agri-culture	Fish-pond	Park/Ceme-tery	Race Track/Golf Club etc.	Water Surface	Mount-ains/Hills	Total
City of Manila	ha.	144	5	0	164	37	84	0	434
	%	33.0	1.0	–	38.0	9.0)	19.0	–	100.0
Pasay City	ha.	179	0	0	9	0	0	0	188
	%	95.0	–	–	5.0	–	–	–	100.0
Makati	ha.	58	0	0	40	120	31	0	249
	%	23.0	–	–	16.0	48.0	13.0	–	100.0
Mandaluyong	ha.	105	18	0	147	0	21	0	291
	%	36.0	6.0	–	51.0	–	7.0	–	100.0
San Juan	ha.	24	0	0	0	0	0	0	24
	%	10.0	–	–	–	–	–	–	100.0
Quezon City	ha.	2,639	0	0	775	0	139	4,358	7,911
	%	33.0	–	–	10.0	–	2.0	55.0	100.0
Caloocan City	ha.	2,459	981	0	132	0	31	0	3,603
	%	68.0	27.0	–	4.0	–	1.0	–	100.0
Valenzuela	ha.	76	1,863	414	0	0	52	0	2,405
	%	3.2	77.4	17.2	–	–	2.2	–	100.0
Malabon	ha.	183	129	388	0	20	118	0	838
	%	21.9	15.3	46.3	–	2.4	14.1	–	100.0
Navotas	ha.	82	0	529	0	0	80	0	691
	%	11.9	–	76.5	–	–	11.6	–	100.0
Marikina	ha.	164	127	0	30	3	56	348	728
	%	22.6	17.4	–	4.1	0.4	7.7	47.8	100.0
Pasig	ha.	217	1,515	0	7	0	103	0	1,842
	%	11.8	82.2	–	0.4	–	5.6	–	100.0
Pateros	ha.	13	63	0	0	0	0	0	76
	%	17.1	82.9	–	–	–	–	–	100.0
Taguig	ha.	320	821	0	0	0	66	1,568	2,775
	%	11.5	29.6	–	–	–	2.4	56.5	100.0
Parañaque	ha.	400	713	216	80	0	78	1,025	2,512
	%	15.9	28.4	8.6	3.2	–	3.1	40.8	100.0
Muntinlupa	ha.	507	419	0	34	0	11	1,290	2,261
	%	22.4	18.5	–	1.5	–	0.5	57.1	100.0
Las Piñas	ha.	990	241	189	3	0	74	829	2,326
	%	42.6	10.4	8.1	0.1	–	3.2	35.6	100.0
TOTAL	ha.	8,560	6,895	1,736	1,421	180	944	9,418	29,154
	%	29.4	23.6	6.0	4.9	0.6	3.2	32.3	100.0

Source: JUMSUT II

3.0 FORECAST OF SOCIO-ECONOMIC PARAMETERS

3.1 REVIEW OF EXISTING 1990 FRAMEWORK

Generally, the National Economic and Development Authority (NEDA) provides the fundamental national and regional socio-economic indicators such as Gross Domestic Product (GDP) or Gross Regional Domestic Product (GRDP), population, employment and household income; while the Ministry of Education, Culture and Sports (MECS) provides for school attendance.

The 1990 socio-economic framework for Metro Manila, however, has been developed by a number of agencies and studies, which made use of different figures, as summarized in Appendix 3.1. Since investment levels are indirectly affected by the socio-economic indicators, studies on this aspect should be monitored.

As far as Metro Manila is concerned, the Metro Manila Commission (MMC) stands in a better position to coordinate, as well as make necessary adjustments on all framework activities, particularly with regard to interpretation and breakdown of figures in such a way that they can be interrelated with urban development and management.

A series of discussions were held with MMC to determine the forecasting methodology and the values of the necessary socio-economic parameters to be used by JUMSUT II. The following matters were agreed upon in relation to the forecast of 1990 parameters:

    a) GRDP : To be determined by MMC in coordination with NEDA

    b) Population : As forecasted by NCSO (Series 2)

    c) Employment : To be determined by MMC in coordination with NEDA.

    d) School Attendance : As forecasted by MECS

    e) Other socio-economic parameters, such as household income and car-ownership level, have to be forecasted by JUMSUT II in coordination with MMC.

The up-to-date results are summarized in Table 3.1.

Table 3.1
Metro Manila Socio-Economic Framework

Item	1980	1990	Average Annual Growth Rate (%)
1. Population:			
1) Number	5,925,884	7,974,002	3.0
2) No. of Households	1,103,563	1,812,273	5.1
3) Ave. H.H. Size	5.4	4.4	–
2. Employment:			
1) Primary	122,621	122,621	–
2) Secondary	627,000	746,000	1.8
3) Tertiary	1,346,812	1,511,000	1.2
TOTAL	2,096,433	2,379,621	1.3
3. School Attendance:			
1) Primary	791,761	1,030,200	2.7
2) Secondary & Above	933,349	1,129,900	1.9
TOTAL	1,725,110	2,160,100	2.3
4. Income Level[1]:			
1) Ave. H.H. Income (₱/month)	1,152	855	-3.8
5. Real GDP (₱ million)[2]:	28,644	33,402	1.1
6. Average Per Capita Income: (Pesos)	5,060	4,189	-1.9

Source: MMC

1/ Estimated by JUMSUT based on determined GRDP.

2/ Metro Manila only.

3.2   METHODOLOGY

JUMSUT II had to further break down the relevant socio-economic parameters of Metro Manila into traffic zones, which is shown in Figure 3.1. The methodologies applied are described below:

A.   Population: The 1990 population was estimated on the basis of the following assumptions:

1)   In view of the current economic situation, the historical trend of population growth will continue.

CITY / MUNICIPALITY		ZONE NOS.
CITY OF MANILA	1	1,2,3,4,5,7,8,11
	2	6,9,10,12,13,14,15,16,18
	3	17,19,20,21,22,23,24,25,26,27, 28,29,31,32,33
	4	30,34,35,36,37,38,39,40,41, 42,43,44,45,46,47,48,49,50,51,52
PASAY CITY		53,54,55,56,57,58,59,60,61, 62,63,201,202
MAKATI		64,65,66,67,68,69,70,71,72,73, 74,75,76,77,78
MANDALUYONG		79,80,81,82,83,84,85,86
SAN JUAN		87,88,89,90,91
QUEZON CITY	1	95,96,97,98,99,100,101,102,103, 104,105
	2	122,123,124,125,126,127,128, 129,130,131,132,133
	3	114,115,116,117,118,119,120,121
	4	92,93,94,106,107,108,109, 110,111,112,113
CALOOCAN (S)		134,135,136,137,138,139,140, 141
CALOOCAN (N)		142,143,144
VALENZUELA		145,146,147,148,149,150,151,152
MALABON		153,154,155,156,157,158,159
NAVOTAS		160,161,162,163
MARIKINA		164,165,166,167,168,169,170,171
PASIG		172,173,174,175,176,177,178,179
PATEROS		180
TAGUIG		181,182,183,184,185
PARAÑAQUE		186,187,188,189,190,191,192,193
MUNTINLUPA		194,195,196
LAS PIÑAS		197,198,199,200

LEGEND :

━━━━ CITY / MUNICIPALITY BOUNDARY

Figure 3.1
Zoning System Used for
Forecasted Socio-Economic
Data

JUMSUT II

10

2) The committed projects summarized in Table 3.2 will be completed on schedule. Hence, the project population was initially allocated.

3) A population growth model was elaborated by analyzing the relationship of population density, population growth rate and average household income (residential type) of zones. Their significant relationship is shown in Figure 3.2. Accordingly, zones were classified into five groups according to the average household income level. For each group, population growth patterns were estimated based on the actual growth rate between 1975 and 1980, and the 1980 population density of each zone. This concept is illustrated in Figure 3.3. The population growth of a zone which belongs to a particular income group will continue to reach the saturation point.

4) Zero growth was assumed for the zones whose population growth rates between 1975 and 1980 are negative.

Table 3.2
Summary of Committed Development Projects

| Project Name | Target Development | | Location of Project: City/Municipality | Zone No. | Allocated Population | |
	Area (ha)	Population			1985	1990
Dagat-Dagatan	410	20,000	Caloocan City	137	1,240	39,340
				138	920	29,360
				Sub-total	2,160	68,700
			Malabon	156	2,740	87,000
			Navotas	162	22,200	22,200
			Total Dagat-Dagatan		27,100	177,900
Pasig Project	40.2	37,000	Pasig	173	1,030	37,000
TOTAL	450.2	237,000			28,130	214,900

Source: MMC

11

Figure 3.2
Relationship Between Population Density (1980)
and Population Growth Rate (% year between 1975 and 1980)

POPULATION DENSITY (PERSON/HA.)

LEGEND:

- ● < ₱ 1000/MONTH : A - A'
- ○ 1000 - 2000 : B - B'
- ◉ 2000 - 3000 : C - C'
- ◎ 3000 - 4000 : D - D'
- ⊗ 5000 < : E - E'

POPULATION GROWTH RATE (%/YEAR)
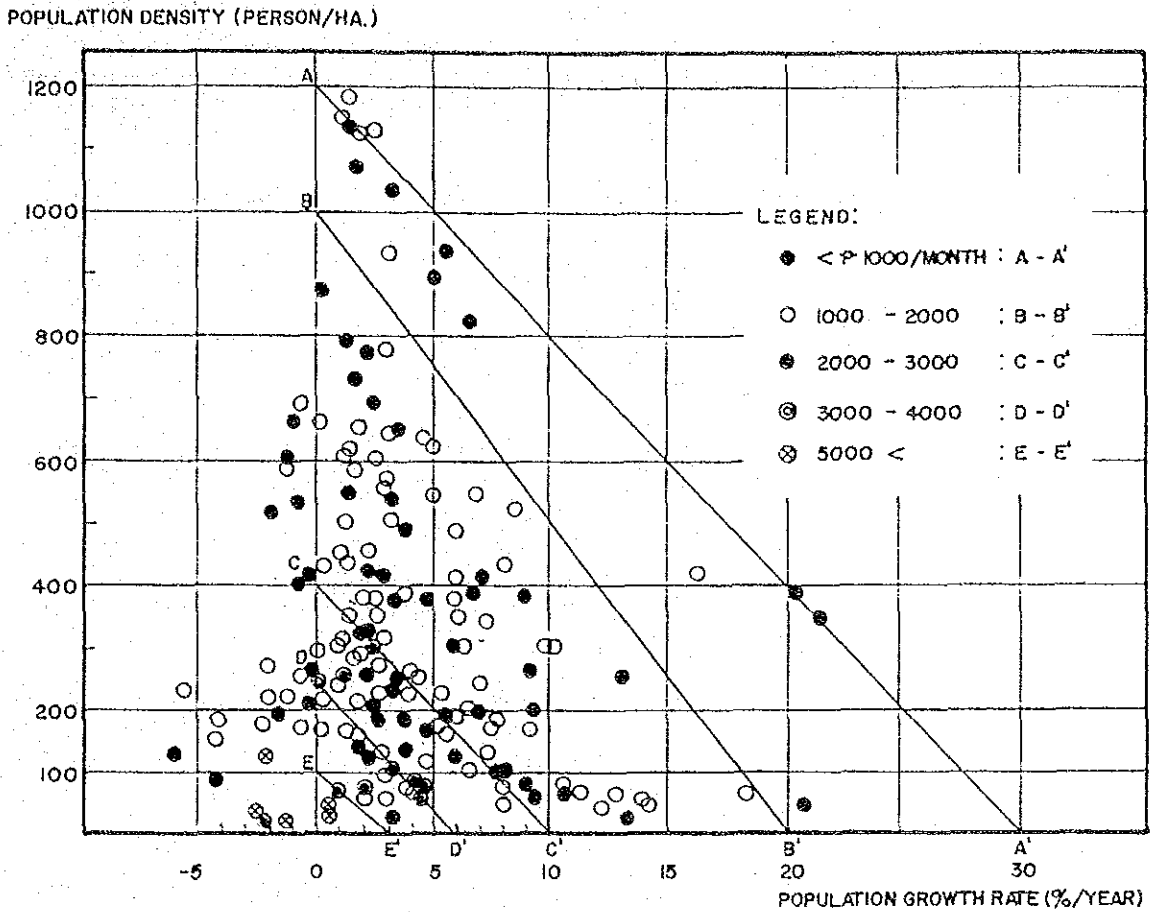
Figure 3.3
Population Growth Model1/

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

SATURATION POINT

ZONE B

ZONE A

AVERAGE HOUSEHOLD INCOME GROUP	VALUES AT SATURATION POINT	
	a.POPULATION DENSITY (PERSON/HA.)	b.POPULATION GROWTH RATE(%/YR)
LESS THAN ₱1000/MONTH	1200	30
₱1,001 - 2000	1000	20
₱2,001 - 3000	400	10
₱3,001 - 4000	250	6
MORE 5000	100	3

12
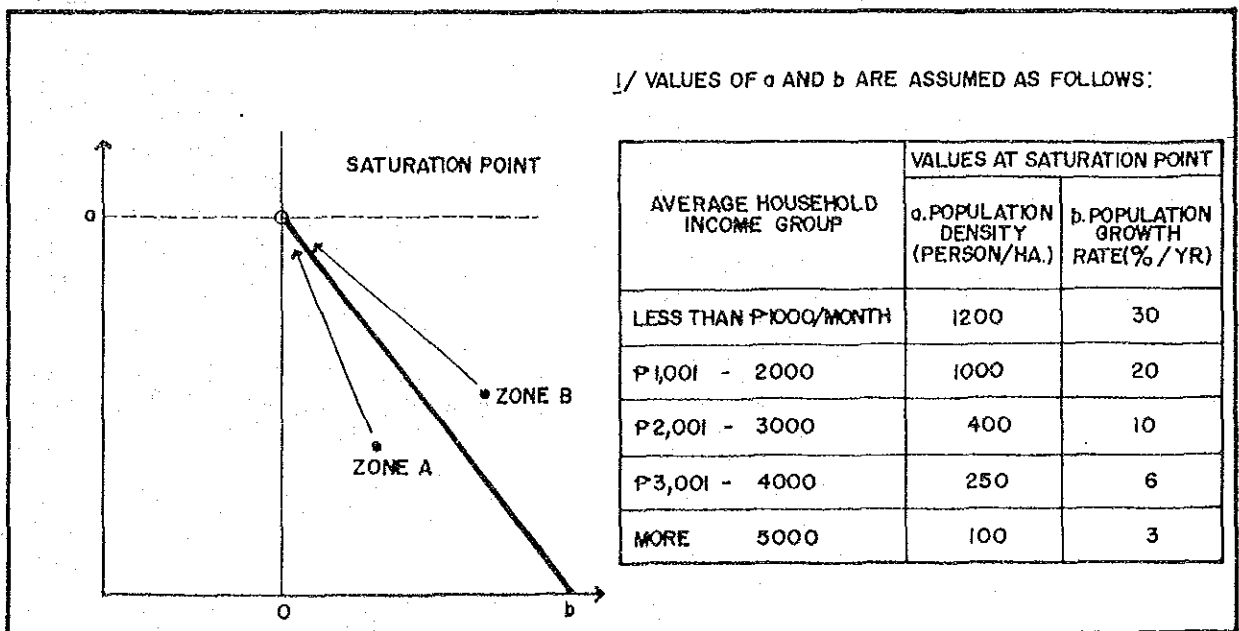
B. Employment:

1) Employment by residence was estimated by assuming that it
    will grow in proportion to population. Accordingly, the
    1990 employment by residence was obtained by multiplying
    the 1990 population with the 1980 percentage of employment
    to population.

2) Employment by workplace was estimated as follows:

    a) Primary Sector Employment: This will remain at
        current (1980) level.

    b) Secondary Sector Employment: This was estimated by
        assuming that:

        —   there will be no expected increase in the areas
            within EDSA.

        —   there will be three alternative growth rates in
            the areas outside EDSA, each dependent upon the
            ~   level of current development, accessibility, and
            employment .

            i) The zones with significant growth (150% of
                GRDP growth rate) are those in the areas of
                Quezon City II (Zones 128, 129, 133),
                Valenzuela (Zones 148, 149), Marikina
                (Zones 165, 168), Pasig (Zones 173, 174,
                175, 179), Taguig (Zones 181, 185) Para-
                ñaque (Zone 187), Las Piñas (Zone 198),
                Muntinlupa (Zone 196).

            ii) The zones with minimal growth (half of GRDP
                growth rate) are found in the areas of
                Quezon City II (Zones 127, 130, 132),
                Valenzuela (Zones 146, 147, 150, 151, 152),
                Navotas (Zones 161, 162), Malabon (Zones
                153, 154, 155, 158), Caloocan City South
                (Zones 136, 139, 142), Marikina (Zones 166,
                167, 169, 170, 171), Quezon City II (Zone
                115), Pasig (Zones 172, 176, 177, 178),
                Pateros (Zone 180), Taguig (Zones 182,
                183), Parañaque (Zones 186, 187, 192, 193),
                Las Piñas (Zones 199, 200), Muntinlupa
                (Zone 196).

            iii) The rest of the zones, notably in the areas
                 of the City of Manila, Pasay City, San Juan
                 and Makati will have zero growth rate

c) Tertiary Sector Employment: This was estimated separately for large-scale commercial/business centers and small to medium scale neighborhood commercial areas.

- the employment of large-scale commercial/business centers in Metro Manila will grow at 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 (Zones 34, 35, 36, 38, 43, 44), Makati (68, 70, 71), Greenhills (88), Cubao (177), the Reclamation Area (201, 202) and Zone 132 where the new Shoe Mart department store (with a total floor area of 14 ha.) is currently being constructed.

C.   School Attendance:

1) School attendance by residence was estimated by assuming that it will grow in proportion to population.

2) School attendance by school address was estimated separately for primary and secondary and above levels.

- Primary school attendance will grow in proportion to population.

- Secondary and above school attendance will grow in proportion to the current level.

D.   Average Household Income: This was estimated by assuming that it would be influenced by the GRDP growth rate and at the same time by the increase in household numbers.

3.3   1990 SOCIO-ECONOMIC PARAMETERS

The results of the forecast, presented in a 27-zone system, are shown in the Appendices, as follows:

Appendix 3.2 : forecasted population

Appendix 3.3 : forecasted employment by sector, by residence, and by workplace.

Appendix 3.4 : forecasted school attendance by residence and school address, and by primary and secondary and above.

Tables 3.3 and 3.4 summarize the forecasted parameters.

Table 3.3
Forecasted Population, Employment, and School Attendance of Metro Manila and Adjoining Areas (by Residence) 1/

City/Municipality	Population (000) 1980	1990	GR 2/ (%)	No. of Employment (000) 1980	1990	GR 2/ (%)	Sch. Attendance (000) 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	60	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 Rate

Table 3.4
Forecasted Employment (by Workplace) and School Attendance (by School Address) of Metro Manila and Adjoining Areas 1/

City/Municipality	No. of Employment (000) 1980	1990	GR 2/ (%)	Sch. Attendance (000) 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
Caloocan 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 Rate

15

4.0   ESTIMATE OF 1980 and 1984 OD TABLES

4.1   OBJECTIVE

The objective of this task is twofold:

a) to update the 1980 OD tables 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 included in the OD tables.

b) to estimate the current level of traffic demand in the form of 1984 OD tables where adjoining areas are also covered.

4.2   EXISTING DATA BASE

The available data for the tasks to be undertaken are briefly explained below:

A.   OD Trip Information

These include the following:

1) 1980 HIS OD Tables (MMUTIP/JUMSUT I):   These are the fundamental data for Metro Manila's OD information derived from the 1980 HIS results under MMUTIP. However, due to a lack of non-home-based trips, a 1983 HIS was conducted under JUMSUT I to supplement the gap, the results of which were expanded to represent that of 1980.

2) 1980 Cordonline OD (MMUTIP/JUMSUT I): This is the OD data of trips across the cordonline, i.e., trips between Metro Manila and its external areas.   These trips are made by residents of Metro Manila and residents outside of Metro Manila, but only the latter was considered and the former neglected since it has already been derived by the 1980 HIS OD.

3) 1984 HIS OD (JUMSUT II):   This shows the OD distribution of trips made by residents of areas adjoininng Metro Manila.   Inasmuch as the data was derived in a survey conducted in 1984, it was expanded based on the 1980 NCSO. Hence, it can somehow represent the 1980 trips of these areas to some extent.

B.   Traffic Volume Counts

These data were derived from the following:

1) 1980 Cordonline Traffic Count (MMUTIP)
2) 1980 Screenline Traffic Count (MMUTIP)

3) 1984 Cordonline Traffic Count (JUMSUT II)
4) 1984 Screenline Traffic Count (JUMSUT II)

C. Zoning System

Various zoning systems were applied to the study area to suit the purposes of analyses required. The major zoning systems used are summarized as follows:

1) Zoning system used for 1980 HIS: It consisted of 268 zones for the whole Philippines which can be broken down as follows: 202 zones for Metro Manila, 12 for the on-going reclamation areas, and 54 for areas outside of Metro Manila. There were two zone coding systems used: The HIS Zone Code and the Traffic Zone Code.

```
268 ───────┬────── 202 Metro Manila
           ├────── 12 On-going Reclamation Areas
           ├────── 19 Adjoining Provinces
           └────── 35 External Areas
```
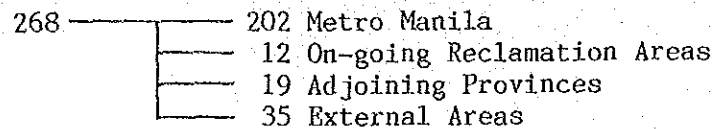
Table 4.1
1980 HIS Zoning System

	1980 HIS Zone Code	Traffic Zone Code	No. of Zones (Cumulative)	
Metro Manila	111 ~ 842[1]/	1 ~ 202	202	
On-going Reclamation Areas	843 ~ 854	203 ~ 214	12	(214)
Bulacan Province	901 ~ 906	215 ~ 220	6	(220)
Rizal Province	911 ~ 915	221 ~ 225	5	(225)
Laguna Province	921 ~ 923	226 ~ 228	3	(218)
Cavite Province	924 ~ 928	229 ~ 233	5	(233)
Other provinces in Luzon	931 ~ 975	234 ~ 261	28	(261)
Rest of the Philippines	981 ~ 984	262 ~ 268	7	(268)

1/ Not sequential

2) Zoning System used for Existing 1980 OD Tables: This system was derived from the above zoning system and applied for purposes of OD table configurations. It consisted of 217 zones with 202 zones representing Metro Manila and 15 zones (54 external zones were integrated) for all areas outside Metro Manila. The on-going reclamation areas were neglected for this purpose since they do not have any trip generation/attraction.

Table 4.2
Basic Zoning System for Existing 1980 OD Tables

Zone No.	Area	Traffic Zone Code
1 – 202	Metro Manila	1 ~ 202
203	Obando, Bulacan (B)	215, 216
204	Marilao, Meycauayan, Bocaue, Sta. Maria (B)	217, 220
205	San Jose del Monte, Norzagaray (B)	218, 219
206	Montalban, San Mateo (R)	221
207	Antipolo, Cainta, Taytay (R)	222 ~ 224
208	Rest of Rizal Province	225
209	San Pedro, Biñan, Sta. Rosa, and the rest of Laguna Province	226 228, 232
210	Bacoor, Imus, Dasmariñas, Silang	229, 231
211	Kawit, Cavite, Noveleta, Rosario, and the rest of Cavite Province	230, 233
212	Pampanga, Bataan, Zambales, Tarlac, Pangasinan, La Union, Benguet, Ilocos Sur, Mountain Prov., Abra, Ilocos Norte, Ifugao	234 ~ 237, 239 245, 248
213	Nueva Ecija, Nueva Vizcaya, Quirino, Isabela, Cagayan, Kalinga-Apayao, Aurora	238, 246, 247 252
214	Batangas, Romblon	
215	Quezon	253, 254
216	Camarines Norte, Camarines Sur, Albay, Sorsogon	257 ~ 261
217	Region VI, XII	262 ~ 268

3) Zoning System used for 1984 HIS: This pertained only to the adjoining areas of Metro Manila. The original 19 zones of the provinces bordering Metro Manila were further disintegrated into 24 zones, which represented 18 zones for the surveyed areas and 6 zones for the rest of the provinces (see Figure 4.1).

```
273 ──────┬────── 202   Metro Manila
          ├────── 12    On-going Reclamation Areas
          ├────── 24 ──┬── 18      Adjoining Areas
          │            └── 6 ┐
          │                  │     External Areas
          └────── 35 ────────┘
```
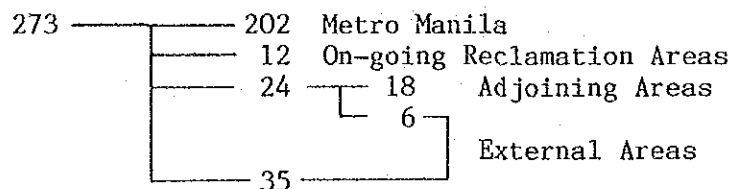
4) Zoning System used for Updated 1980 OD Tables: This system was developed in order to incorporate the 1984 HIS results into the OD tables. It consisted of 261 zones: 202 zones for Metro Manila, 18 zones for the adjoining areas, and 41 for the rest of the Philippines. However, for the OD table configuration, the 41 zones were integrated into 12 zones, which brought the total to 232 zones.

MANILA BAY

LAGUNA DE BAY

METRO MANILA
1 - 202 Zones

(221) ← 906
(222)
905
(206)
STA. MARIA
(207)
904
BOCAUE
SAN JOSE DEL MONTE
BULACAN
(204)
902
(205)
MARILAO 903
(203)
OBANDO
901
MEYCAUAYAN
(208)
MONTALBAN 911
SAN MATEO
(209)
(210)
912
(211)
CAINTA
913
ANTIPOLO
TAYTAY
(212)
914
(223)
915
ANGONO
(213)
BINANGONAN

BACOOR
CAVITE CITY
NOVELETA
ROSARIO
(217)
925
KAWIT
IMUS
(216)
924
(218)
SAN PEDRO
921
(214)
BIÑAN
DASMARIÑAS
926
927 CARMONA
(219)
(220)
(215)
922
STA. ROSA
(226)
928
CABUYAO
(224)
923
(225)

LEGEND:

▨ 1984 SUPPLEMENTAL HIS SURVEY AREA
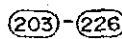
(203)-(226) 1984 SUPPLEMENTAL HIS ZONING SYSTEM

901 - 928 1980 HIS ZONING SYSTEM

Figure 4.1
Zone Conversion for
1984 HIS Survey Area

19

4.3   UPDATE OF THE 1980 OD TABLES

4.3.1   Approach

The procedure for updating the 1980 OD tables is schematically shown in Figure 4.2. The concept shows that the 1980 OD tables are divided into the internal and external trips relative to Metro Manila. Both categories undergo some adjustment and are ultimately merged to represent the updated 1980 OD tables.

Trips which comprise the updated OD tables are those made by residents of Metro Manila, the adjoining areas and other external areas. Their trips within or between respective areas and external areas can be related with existing data sources as shown in Table 4.3 and briefly explained below:

a)   Trip OD of Metro Manila Residents: This can be totally derived from the 1980 HIS.

b)   Trip OD of Adjoining Area Residents: Trips between adjoining areas and Metro Manila are covered by both 1980 cordonline OD and 1984 HIS OD, while those within and between areas and external areas, by 1984 HIS.

c)   Trip OD of External Area Residents: Only those between Metro Manila are partially covered by the 1980 HIS OD.

Table 4.3
Relevant Trips and Data Sources

Trips Made By	Trips Made Within (hatched) or To/From		
	Metro Manila	Adjoining Area	External Area
Metro Manila Residents	1980 HIS OD	1980 HIS OD	1980 HIS OD
Adjoining Area Residents	1980 Cordonline and 1984 HIS OD	1984 HIS OD	1984 HIS OD
External Area Residents	1980 HIS OD (Partial)	None	None

In order to meet the new zoning system ,Zones 906, 911, 915 and 926 were subdivided into either two or three zones, as presented in Table 4.4. The OD information obtained from the 1980 HIS OD and 1980 Cordonline OD of new zones was estimated in proportion to The population ratio of the respective disintegrated zone to total population of the original 1980 HIS zone.

Figure 4.2
Overall Procedure for Updating 1980 OD Tables
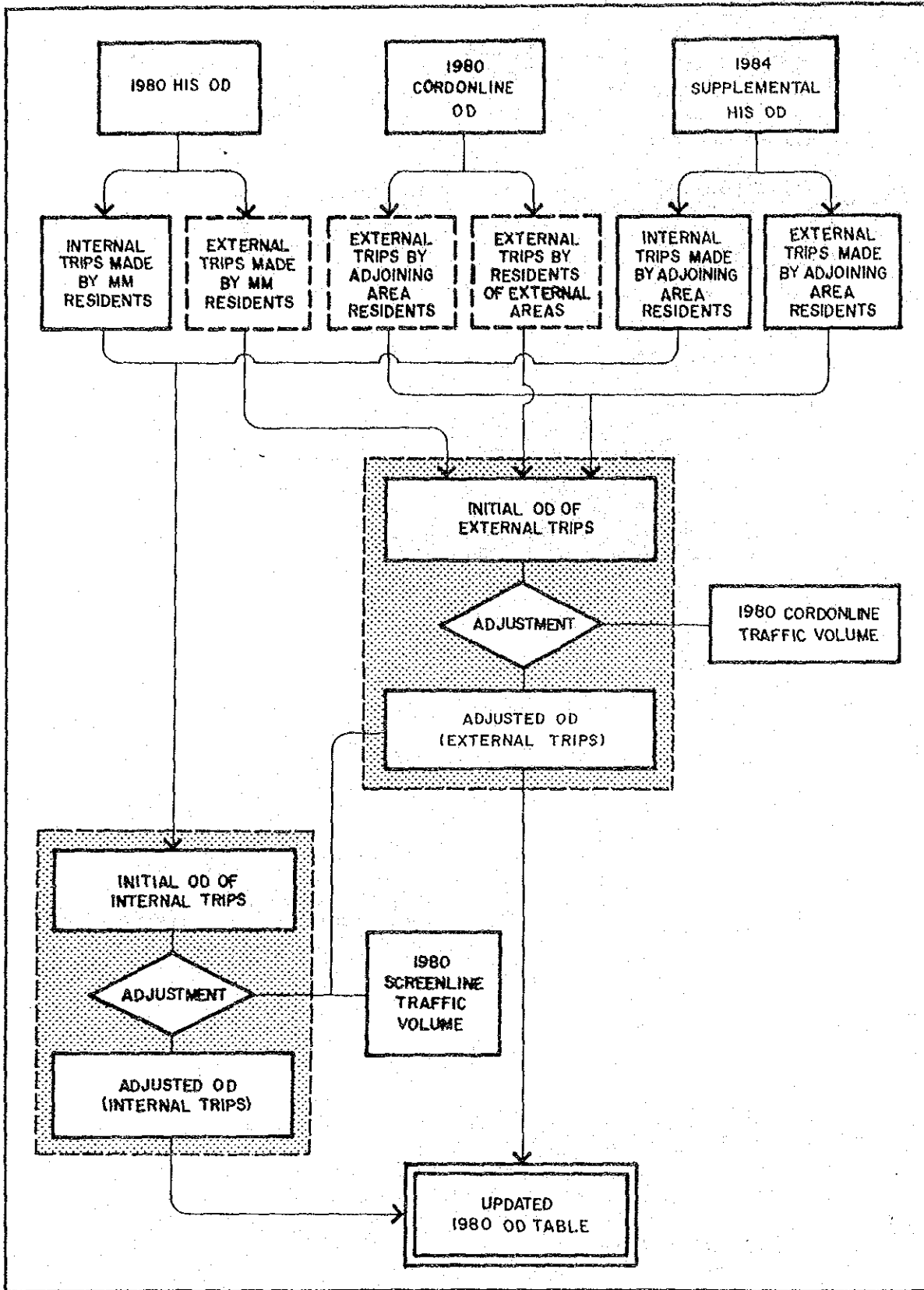
Table 4.4
Disintegration Ratios for the Zones

1980 HIS Zone Code	1984 Zone Code	Ratio of 1980 HIS Zone/ 1984 Zone Population
906 ──┬──→ 206		0.138
└──→ 221		0.862
911 ──┬──→ 208		0.446
└──→ 209		0.554
915 ──┬──→ 213		0.416
└──→ 223		0.584
926 ──┬──→ 218		0.362
├──→ 219		0.318
└──→ 225		0.320

4.3.2 Update of External Trip OD

External trips are defined as trips made between Metro Manila and its adjoining as well as external areas. These trips were adjusted according to the total number of trips observed on cordonlines. To accomplish this task, the following steps were taken:

1) Merging of the following relevant OD trips to prepare the initial external trip table:

   - external trips made by Metro Manila residents (1980 HIS OD)

   - external trips made by adjoining area residents (1980 Cordonline OD)

   - external trips made by external residents (1980 Cordonline OD)

2) Comparing the total trips across cordonlines estimated from the above mentioned OD tables with the actual observed volume obtained from the cordonline traffic count.

3) Adjusting the OD tables to coincide with the observed volume at cordonlines.

For comparison and adjustment purposes, an integrated zoning system was used comprising of four blocks for Metro Manila and three blocks for the external areas as shown in Figure 4.3. Table 4.5 shows OD pairs of external trips in relation to cordonlines which are supposed to be crossed.

The observed and estimated passenger traffic volume across cordonlines is shown in Table 4.6.

Figure 4.3
Zoning System Relative to Cordonlines
used for the Update of External OD Trips

Figure 4.3
Zoning System Relative to Cordonlines
used for the Update of External OD Trips

LEGEND:

① BLOCK NUMBER

←EW-E→ SCREENLINE

←(N)→ CORDONLINE

Source:
JUMSUT II
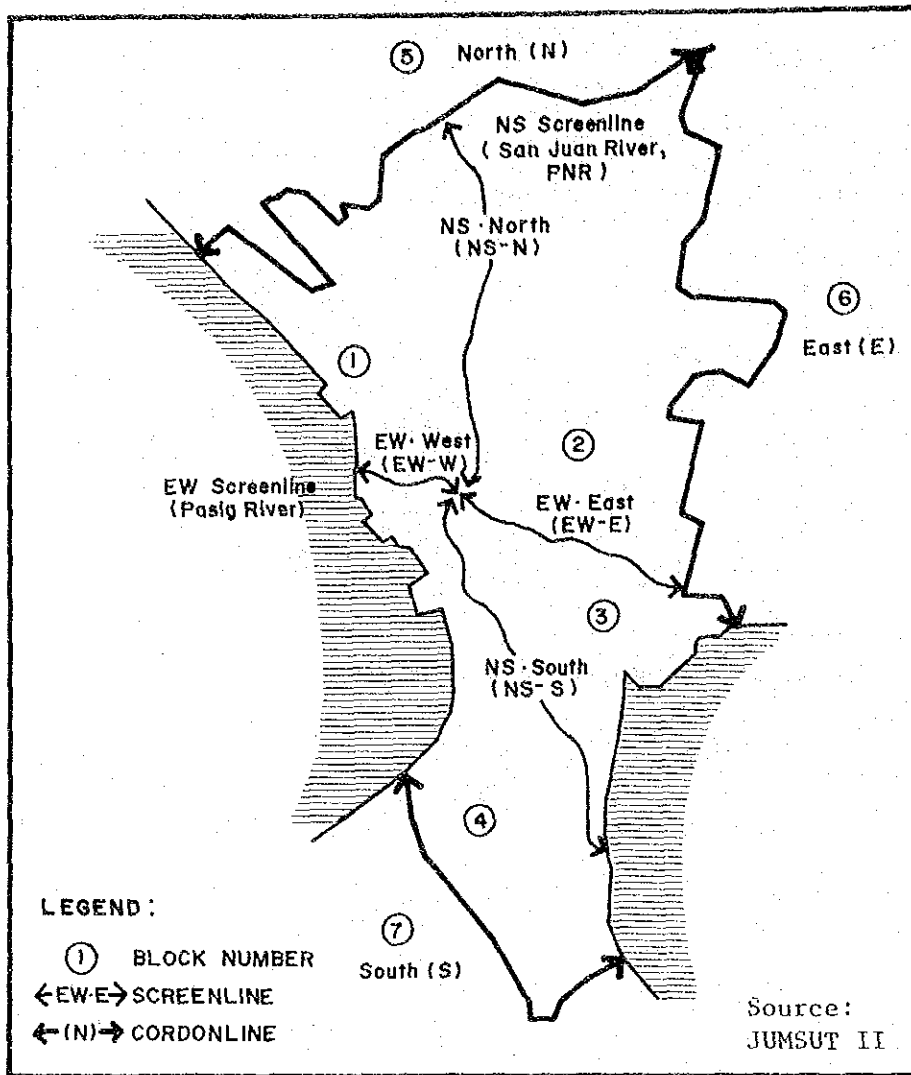
Table 4.5
Cordonlines to be Crossed by
Relevant External OD Trip Pair

D \ O	1	2	3	4	5	6	7
1	I N	–	–	–	N	E	S
2	–	T E	–	–	N	E	S
3	–	–	R N A	–	N	E	S
4	–	TRIPS	–	L –	N	E	S
5	N	N	N	N	–	N,E	N,S
6	E	E	E	E	N,E	–	E,S
7	S	S	S	S	N,S	E,S	–

23

Table 4.6
Comparison Between Observed and Estimated Passenger
Traffic Volume on Cordonlines, 1980

Cordonline Segment	Observed Volume		Estimated Volume		Observed/Estimated Volume	
	Public	Private	Public	Private	Public	Private
North (N)	326,160	98,598	264,343	66,551	1.234	1.482
East (E)	209,982	67,890	156,038	27,659	1.346	2.455
South (S)	346,049	90,948	274,095	61,564	1.263	1.477
Total	882,191	257,436	694,476	155,774	1.270	1.653

Source: JUMSUT I

After comparing both data, the tables were adjusted to coincide with the passenger traffic observed on cordonlines.

4.3.3   Update of Internal Trip OD

Internal trips are defined as those trips travelled within Metro Manila. They are mainly done by Metro Manila residents. The 1980 HIS has this information; on the other hand, 1984 HIS offers information on trips made by residents of the adjoining areas of Metro Manila to some extent.

These two OD information form the basic internal trip OD tables and these tables were integrated utilizing the 4-block zoning system, (same as Figure 4.3, with the exclusion of the 3 external blocks).

The OD tables were examined by comparing traffic volume on screenlines derived from OD trip assignment and traffic volume from actual screenline traffic count. A similar procedure for cordonline traffic comparison was used. The only difference was the due consideration taken on the possible duplication of external trips in the screenline volume observed. Therefore, before comparison was undertaken, portions of external trips across the screenlines were deleted from the volume observed.

Each necessary procedure was conducted based on the assumptions presented in Tables 4.7 and 4.8.

Table 4.7
Screenlines to be Crossed by
Relevant Internal and External OD Trips Pair

O\D	1	2	3	4	5	6	7
1	–	NS.N	NS.N, EW.W	EW.W	EW.W, N	NS.N	S
2	NS.N	–	EW.E	EW.E, NS.S	NS.N	–	EW.E, NS.S
3	NS.S EW.W	EW.W	–	NS.S	EW.E	EW.E	S
4	EW.W	N.S, EW.E	NS.S	–	EW.W	EW.E, NS.S	–
5	–	NS.N	EW.E	EW.W	–	–	EW.W
6	NS.N	–	EW.E	EW.E, NS.S	–	–	EW.E NS.S
7	EW.W	NS.S EW.E	NS.S	–	EW.W	NS.S EW.E	–

Table 4.8
Comparison Between Observed and Estimated
Passenger Traffic Volume on Screenlines, 1980

	Public Mode				
	Observed Trips/Day		Observed Internal	Assigned Internal	
Screen-line	Total	External Trip	Trips: A	Trips: B	A/B
NS. North	1,182,320	100,678	1,081,642	561,640	1.926
EW. East	531,910	85,706	446,204	300,251	1.486
NS. South	745,720	94,403	651,317	535,123	1.217
EW. West	967,660	116,937	850,723	520,766	1.634
	Private Mode				
	Observed Trips/Day		Observed Internal	Assigned Internal	
Screen-line	Total	External Trip	Trip: A	Trip: B	A/B
NS. North	431,730	38,238	393,492	93,934	4.189
EW. East	249,200	33,525	215,675	57,623	3.743
NS. South	440,930	36,026	404,904	127,540	3.175
EW. West	343,950	25,044	318,906	84,115	3.791

Source: JUMSUT I

4.3.4   The Updated 1980 OD Tables

The results of the internal and external OD tables, as explained in
Sections 4.3.2 and 4.3.3 were merged into one OD table.   This be-
came the updated 1980 OD table.   The results are presented in the
form of a 30-zone system OD table in Appendix 4.1.

Other types of OD tables prepared are as follows:

a) Person Trip OD Tables, Day and Peak Hour

    — by Mode
    — by Purpose

b) Vehicle OD Tables, Day and Peak Hour

4.3.5   Characteristics of the Updated 1980 OD Tables

For analytical purpose, the zones were further simplified according
to the following classification.

Table 4.9
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, Caloocan City North
6	East	Marikina, Pasig
7	South	Pateros, Taguig, Parañaque, Muntinlupa, Las Piñas

Table 4.10 shows the updated 1980 OD using the above-mentioned
classification (same classification is used for all succeeding OD-
related tables).

The overall OD traffic level of Metro Manila, as well as its
adjoining and external areas, is 13.1 million trips (excluding walk
trips), of which 11.0 million or 84% are those made within Metro
Manila.

The City of Manila generates/attracts the largest traffic which
accounts for almost one-third of the total Metro Manila traffic.
Similarly, the largest movement is that within the City of Manila
(19% of the total Metro Manila traffic).

26

Figure 4.4 illustrates traffic desire lines of both private and pulic modes. Major flows are observed to/from the City of Manila and those between east central (Quezon City I, III, IV, San Juan and Mandaluyong) and south central (Pasay and Makati). Significant inter-zonal movements are also observed between east central and northwest (Quezon City II and Caloocan City North) and between south central and the south (Pateros, Taguig, Parañaque, Muntinlupa, and Las Piñas).

Table 4.10
1980 Person Trip OD Distribution
(Public and Private Modes)

000

O\D	1	2	3	4	5	6	7	METRO MANILA	ADJOINING AREAS	EXTERNAL AREAS	GRAND TOTAL
1	2,066	1,055	648	557	325	165	301	5,117	189	146	5,452
	2	1,008	304	169	388	199	85	2,153	98	61	2,312
		3	569	55	68	62	314	1,068	73	42	1,183
			4	870	110	17	17	1,014	84	53	1,151
				5	410	29	27	466	35	22	523
					6	512	57	569	90	19	678
						7	585	585	108	54	747
						METRO MANILA		10,972	677	397	12,046
						ADJOINING AREAS			980	51	1,031
						EXTERNAL AREAS				15	15
						GRAND TOTAL					13,092

In terms of the modal split of inter-area traffic flow, Table 4.11 indicates the predominance of trips by pulic mode, with an overall percentage share of 74%.

Metro Manila generally exhibits a preference for public modes with a share of 72%. More than 50% of trips made to/from Metro Manila are by public mode. The share of private mode, however, is significant in trips made between northwest and south, northwest and south central, and south central, and east central, where high car-ownership areas such as Parañaque, Pateros, Las Piñas, Quezon City, Makati, Mandaluyong, and San Juan del Monte are included.

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, Novotas , Malabon
5	Quezon City (II), Caloocan City (North)
6	Marikina , Pasig
7	Pateros , Taguig , Parañaque , Muntinlupa , Las Piñas

LEGEND :

(2) ZONE NUMBER

PRIVATE ⟹ PUBLIC

(NO. OF TRIPS)

1,000,000 500,000 400,000 300,000 200,000 100,000 50,000

Figure 4.4
Desire Lines of Person
OD Traffic, 1980
(Public and Private Modes)

JUMSUT II

28

The share of public mode in the adjoining and external areas of Metro Manila also show high percentages: 89% and 67%, respectively.

Table 4.11
Share of Public Mode, 1980 (%)

O\D	1	2	3	4	5	6	7	METRO MANILA	ADJOINING AREAS	EXTERNAL AREAS	GRAND TOTAL
1	81	68	66	86	81	82	56	76	85	80	76
2		64	44	66	66	73	55	62	82	79	63
3			55	67	50	48	40	51	68	71	52
4				87	83	59	88	86	86	68	85
5					78	69	37	75	71	55	74
6						87	93	88	78	63	86
7							72	72	80	74	73
METRO MANILA								72	80	74	72
ADJOINING AREAS									89	71	88
EXTERNAL AREAS										67	67
GRAND TOTAL											74

4.4   ESTIMATE OF 1984 OD TABLES

4.4.1   Procedure

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 only difference is that these OD tables are calibrated against up-to-date (1984) screenline traffic volume instead of 1980 data. Calibration was made by integrating traffic flows into blocks as was applied in the update of external trips (see Figure 4.3). Considering the existing road network, inter-block movements across the screenlines were assumed as shown in Table 4.7. This assumed traffic flow and volume can be compared with actual observed screenline traffic volume. The procedure is shown in Figure 4.5. The comparison and adjustment process were reiterated until the difference reached within 5% all along the screenlines.

Figure 4.5
Overall Procedure of Updating OD Tables
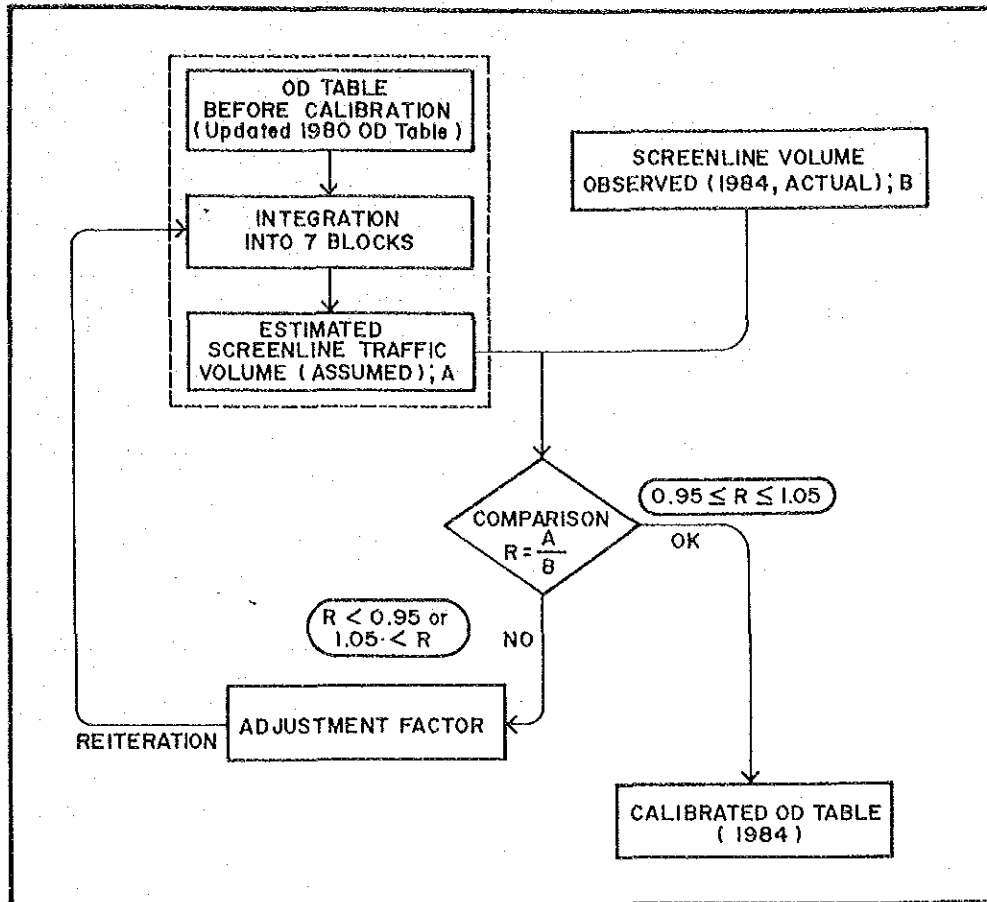
4.4.2 The 1984 OD Tables

The estimated 1984 OD tables are tabulated in a 30-zone system, as shown in Appendix 4.2 and further summarized in Table 4.12.

The total OD traffic level of Metro Manila and its adjoining and external areas is 14.8 million trips, with Metro Manila contributing the biggest share at 12.5 million trips or 85%. The shares of both adjoining and external areas are relatively small.

Table 4.13 gives the modal split of the inter-area traffic flow. A 75% share in public mode is reflected in totality. Trips made to/from Metro Manila show a high range of public modal share: 70%-90% with the exception of trips between the CBD and the south. This is due to the high car-ownership level in the south.

Table 4.12
1984 Person Trip OD Distribution
(Public and Private Modes)

000

O \ D	1	2	3	4	5	6	7	METRO MANILA	ADJOINING AREAS	EXTERNAL AREAS	GRAND TOTAL
1	2,367	1,246	733	636	392	201	335	5,910	199	157	6,266
2		1,150	323	202	442	229	94	2,440	97	65	2,602
3			616	64	75	66	323	1,144	78	47	1,269
4				993	133	20	19	1,165	90	55	1,310
5					478	34	27	539	35	22	596
6						608	75	683	87	21	791
7							653	653	119	60	832
METRO MANILA								12,534	705	427	13,666
ADJOINING AREAS									1,046	56	1,102
EXTERNAL AREAS										16	16
GRAND TOTAL											14,784

Table 4.13
Share of Public Mode, 1984 (%)

O \ D	1	2	3	4	5	6	7	METRO MANILA	ADJOINING AREAS	EXTERNAL AREAS	GRAND TOTAL
1	81	70	67	84	83	85	57	76	84	80	76
2		68	55	67	70	78	64	67	81	78	68
3			60	63	60	61	47	56	67	68	58
4				86	83	65	89	85	86	69	84
5					82	74	44	79	74	59	78
6						90	95	90	77	57	88
7							76	76	78	72	76
METRO MANILA								74	80	74	75
ADJOINING AREAS									88	68	87
EXTERNAL AREAS										69	69
GRAND TOTAL											75

31

4.4.3 Comparison Between 1984 and 1980 OD Tables

In order to determine the growth in traffic movements between 1984 and 1980, a comparison was undertaken, as shown in Table 4.14. The salient points are as follows:

a) The overall growth between 1984 and 1980 is 13%. Movements within Metro Manila registered a 14% increase, while those between Metro Manila and the adjoining and external areas have grown only by 4% and 8% respectively;

b) Inter-zonal growth within Metro Manila varies from 3% — 32%. The CBD attracts the most number of person trips, followed by the northwest and eastern portions of Metro Manila;

c) Slight increases were reflected between trips made by Metro Manila residents and the adjoining (4%) and external (7%) areas;

d) Trips made within and across adjoining and external areas are nil: 7% — 8%.

Table 4.14
1984/1980 Person Trip OD Distribution
(Pulic and Private Modes)

O \ D	1	2	3	4	5	6	7	METRO MANILA	ADJOIN-ING AREAS	EXTER-NAL AREAS	GRAND TOTAL
1	1.15	1.18	1.13	1.14	1.21	1.22	1.11	1.15	1.05	1.08	1.15
2		1.14	1.06	1.20	1.14	1.15	1.11	1.13	0.99	1.07	1.13
3			1.08	1.16	1.10	1.06	1.03	1.07	1.07	1.12	1.07
4				1.14	1.20	1.18	1.12	1.15	1.07	1.04	1.14
5					1.17	1.17	1.00	1.16	1.00	1.00	1.14
6						1.19	1.32	1.20	0.97	1.11	1.17
7							1.12	1.12	1.10	1.11	1.11
METRO MANILA								1.14	1.04	1.08	1.13
ADJOINING AREAS									1.07	1.10	1.07
EXTERNAL AREAS										1.07	1.07
GRAND TOTAL											1.13

5.0 DEVELOPMENT OF THE 1990 OD TABLES

5.1 INTRODUCTION

The 1990 OD tables may be forecasted in accordance with future development policies and other alternative plans formulated. However, the procedure for the development of 1990 OD tables described hereinafter is for the basic case; that is, an assumption that the existing condition will prevail in the future. Therefore, when the correlation between some socio-economic indices and traffic demand is found in existing conditions, future demand can be forecasted with the aid of estimated socio-economic factors.

5.2 OBJECTIVE AND METHODOLOGY

The OD tables to be created for 1990 are as follows:

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 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 approach used in forecasting demand is the development of applicable models which explain the verifiable relationship between trip demand and socio-economic parameters as can be construed in the following principal formula:

$$D = f (Xi)$$

Wherein: D : trip demand
           Xi : socio-economic parameter

Accordingly, trip demand was forecasted according to the following four (4)-step approach:

| Trip Generation | → | Modal Split | → | Trip-End by Zone | → | OD Distribution |

This analysis framework is illustrated in Figure 5.1.

5.3 ESTIMATE OF TOTAL NUMBER OF TRIPS

In estimating total number of trips, the total number of trips by purpose should first be determined. This is done by applying per capita trips, called "trip rates". This is based on a person's characteristics, such as sex, occupation, age, car ownership, and others.

For this task's analysis purpose, those characteristics related to occupation were selected for application and were then categorized as follows:

Employments ———————————— primary industry
                        ———————————— secondary industry
                        ———————————— tertiary industry

Students   ——————————— elementary (primary level)
                        ——————————— secondary and above

Housewives

Others

The trip rates determined for the study area are shown in Table 5.1.

Table 5.1
Person Trip Rates By Purpose and Category

Population Category \ Trip Purpose	To Work	To School	Private	Business	To 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

Population was estimated according to their respective categories. The results are shown in Table 5.2.

Table 5.2
Estimated Population in 1990 (000) 1/

Population Category		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/ For Metro Manila and adjoining areas and includes those 7 years old and above only.

.34

Figure 5.1
Analysis Framework for Forecasting 1990 Trip Demand

ESTIMATE OF TOTAL TRIP DEMAND	ESTIMATE OF MODAL SPLIT

POPULATION BY OCCUPATION (1980)
TRIP RATE BY OCCUPATION AND PURPOSE (1980)
-DITTO- (1990)
TRIP GENERATION MODEL
TOTAL NO. OF TRIPS OF THE STUDY AREA BY TRIP PURPOSE

INCOME DISTRIBUTION (1980)
MODAL - SPLIT BY INCOME LEVEL (1980)
-DITTO- (1980)
MODAL - SPLIT MODEL
TOTAL NO. OF TRIPS BY MODE (PRIVATE, PUBLIC) OF THE STUDY AREA

ESTIMATE OF TRIPENDS BY ZONE

SOCIO-ECONOMIC PARAMETERS BY ZONE (1980)
TRIP ENDS BY PURPOSE AND MODE IN RELATIONSHIP W/ SOCIO-ECONOMIC PARAMETERS
-DITTO- (1980)
TRIPEND MODEL
INITIAL ESTIMATE OF TRIP GENERATION / ATTRACTION BY MODE AND PURPOSE AND ZONE
CALIBRATION
TRIP GENERATION / ATTRACTION BY MODE AND PURPOSE AND ZONE

ESTIMATE OF OD DISTRIBUTION (1990)
1980 OD DISTRIBUTION PATTERN IS APPLIED

35

Finally, the number of trips was estimated by multiplying the trip rate by population. The formula used is as follows:

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

Wherein: G_i : Trip Generation by Purpose i

$RG_{i,k}$: Trip Rate by Purpose i, by person whose occupation k

P_k : Population by Occupation k

The results are shown in Table 5.3. It shows a 37% increase against the total trips in 1980.

Table 5.3
Number of Trips Generated by Purpose in 1990 (000)

Trip Purpose	No. of Trips (000)	% to Total	Ratio 1990/80
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	17,362	100.0	1.37

5.4 ESTIMATE OF MODAL SPLIT

The modal split between public modes of transport (bus, jeepney and tricycle) and private ones (car, taxi, and truck) was determined in this stage in view of the fact that the choice of modes between public and private is hardly explained by trip purpose but by car ownership/availability (or income level to which a person belongs). On the other hand, in those cities where competition exists in the choice of modes, a modal split analysis is normally done after the OD distribution of the trip demand is determined.

A close relationship between modal split and car ownership, which also bears a close relationship to household income level, was found as a result of the analysis. As such, the following formula was applied:

$$Y = \frac{1}{1 + me^{ax}} * 100$$

Y : public modal share of persons who belong
    to household income level of x

x : income level

a,m : parameter

The following figure shows the result of the analysis.

Figure 5.2
Modal Split Model

Public Modal Share (%)

Formula :

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

Y = Public Modal Share (%)
χ = Household Income Level (₱/ month)
R = Correlation Coefficient
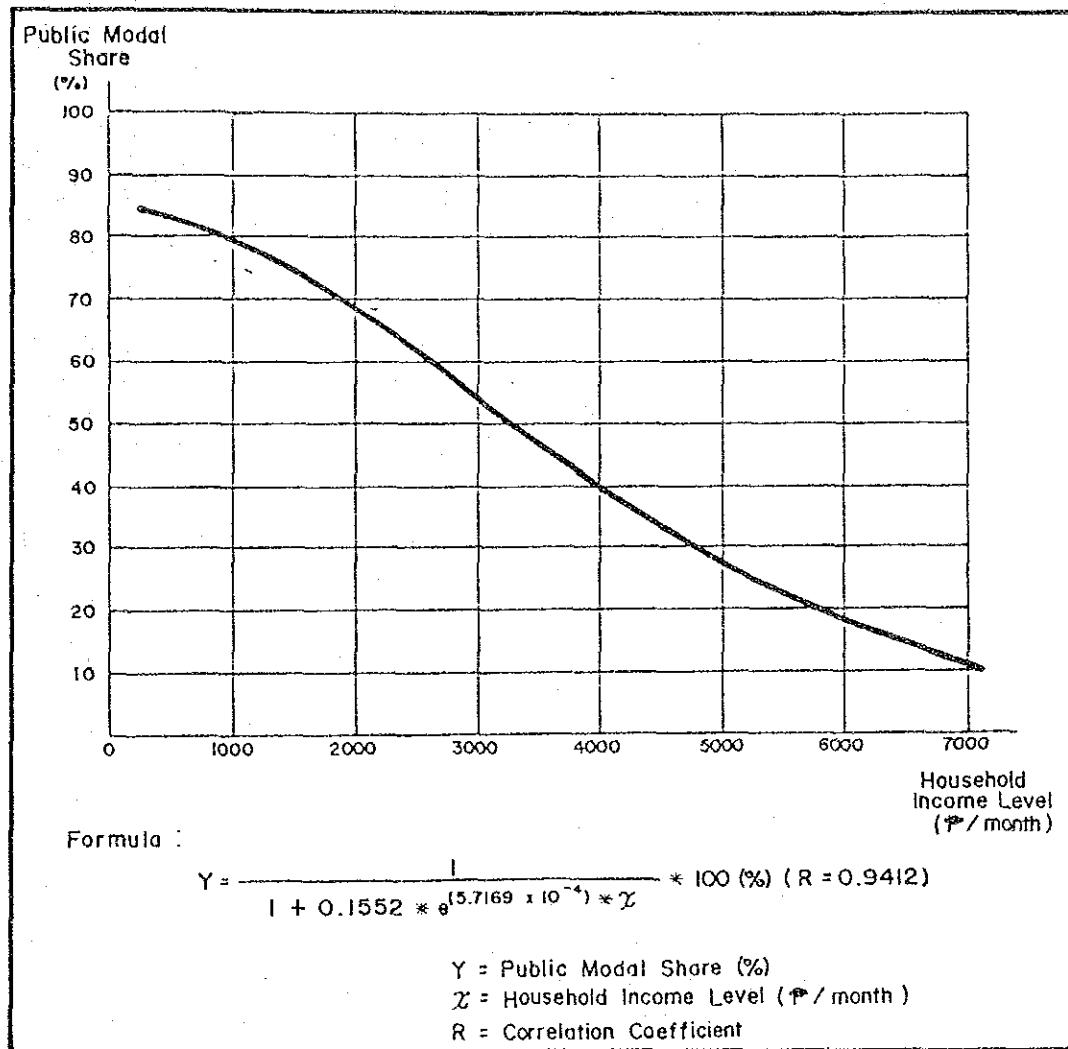
Since the future average household income was estimated in Chapter 3, the distribution of trips by household income level was also forecasted based on the analysis of existing data; the results were then applied to the model developed hereinbefore.

With the decrease in income level, it was assumed that the share of public transportation will increase from 74% to 79%.

37

5.5   ESTIMATE OF TRIP GENERATION AND ATTRACTION BY ZONE

The total number of trips concerning the study area was broken down into two types: "Generation" and "Attraction". All trips have two trip ends: Origin and Destination. Trip generation was counted at the origin, while trip attraction was counted at the destination. The trip generation/attraction depended on the magnitude of urban activities by zone, which can be explained by some socio-economic indicators of the zone concerned. After the analysis, reliable socio-economic parameters were chosen for the forecast of the respective trip demand as shown in Table 5.4.

Considerable accuracy is maintained in the models for the level of 27 zones of the study area (more or less municipality levels including the adjoining areas of Metro Manila), as shown in Table 5.5.

Breakdown of the generation and attraction from the 27 zones to 220 zones including the adjoining areas of Metro Manila was then made in proportion to the growth of the respective socio-economic parameters (shown in Table 5.4).

5.6   ESTIMATE OF TRIP OD DISTRIBUTION

The trip OD distribution is shown in the OD table (Origin-Destination Matrix); it is one of the final results of trip demand characteristics. For this step of analysis, there are two alternative ways:

1)   Apply the theoretical model of trip distribution such as "gravity model" and "opportunity model"; or

2)   Reflect the present pattern of the OD derived by existing OD tables with regard to the estimated trip generation and attraction.

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

The "present pattern" method was applied for this trip OD distribution estimate; that is, 1990 OD distribution will reflect the present pattern of the OD derived by existing OD tables with regard to the estimated trip generation and attraction by zone.

The reason for the adoption of the present pattern method was that no drastic change of land use structure was expected for Metro Manila for the period 1980 to 1990.

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

Source: JUMSUT 2

Table 5.5
Trip Generation/Attraction Model [1]

Mode	Generation/ Attraction	Trip Purpose	Formula	Correlation Coefficient
Public	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	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 5.4.

5.7   THE 1990 OD TABLES

Accordingly, 1990 OD tables were worked out according to the following: 202 zones for Metro Manila, 18 for the adjoining areas and 6 for the external areas.

More specifically, the types of OD tables prepared were:

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

By Time Period :   Morning Peak Hour and Daily

By Mode   :   Private (passenger and vehicles)
                    Public (passenger)
                    Total   (passenger)

The tabulated 1990 OD traffic flow on a city/municipality basis is shown in Appendix 5.1.

5.7.1   Characteristics of the 1990 OD Tables

Based on Table 5.6, the characteristics of the 1990 OD tables were analyzed. Its important features are as follows:

a)   The overall person trip level of Metro Manila and its adjoining and external areas is 18.0 million trips.

b)   Metro Manila registered 15.0 million trips made within (83%); and only about 0.5 million trips (3%) and 0.3 million trips (2%) across its adjoining and external areas, respectively.

c)   The number of person trips within the adjoining areas is also nil (8%); those within external areas is barely 1% of the total person trip level for 1990.

To illustrate more explicitly the volume of inter-zonal trips in Metro Manila, desire lines were drawn, as shown in Figure 5.3.

Table 5.6
1990 Person Trip OD Distribution
(Public and Private Modes)

000
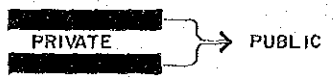
O \ D	1	2	3	4	5	6	7	METRO MANILA	ADJOINING AREAS	EXTERNAL AREAS	GRAND TOTAL
1	2,426	1,224	755	808	576	268	423	6,480	278	179	6,937
2		1,102	349	222	552	282	119	2,626	132	83	2,841
3			631	83	113	101	413	1,341	101	52	1,494
4				1,334	182	31	36	1,583	132	76	1,791
5					774	53	44	871	55	42	968
6						841	106	947	133	29	1,109
7							972	972	172	84	1,228
METRO MANILA								14,820	1,003	545	16,368
ADJOINING AREAS									1,486	68	1,554
EXTERNAL AREAS										18	18
GRAND TOTAL											17,940
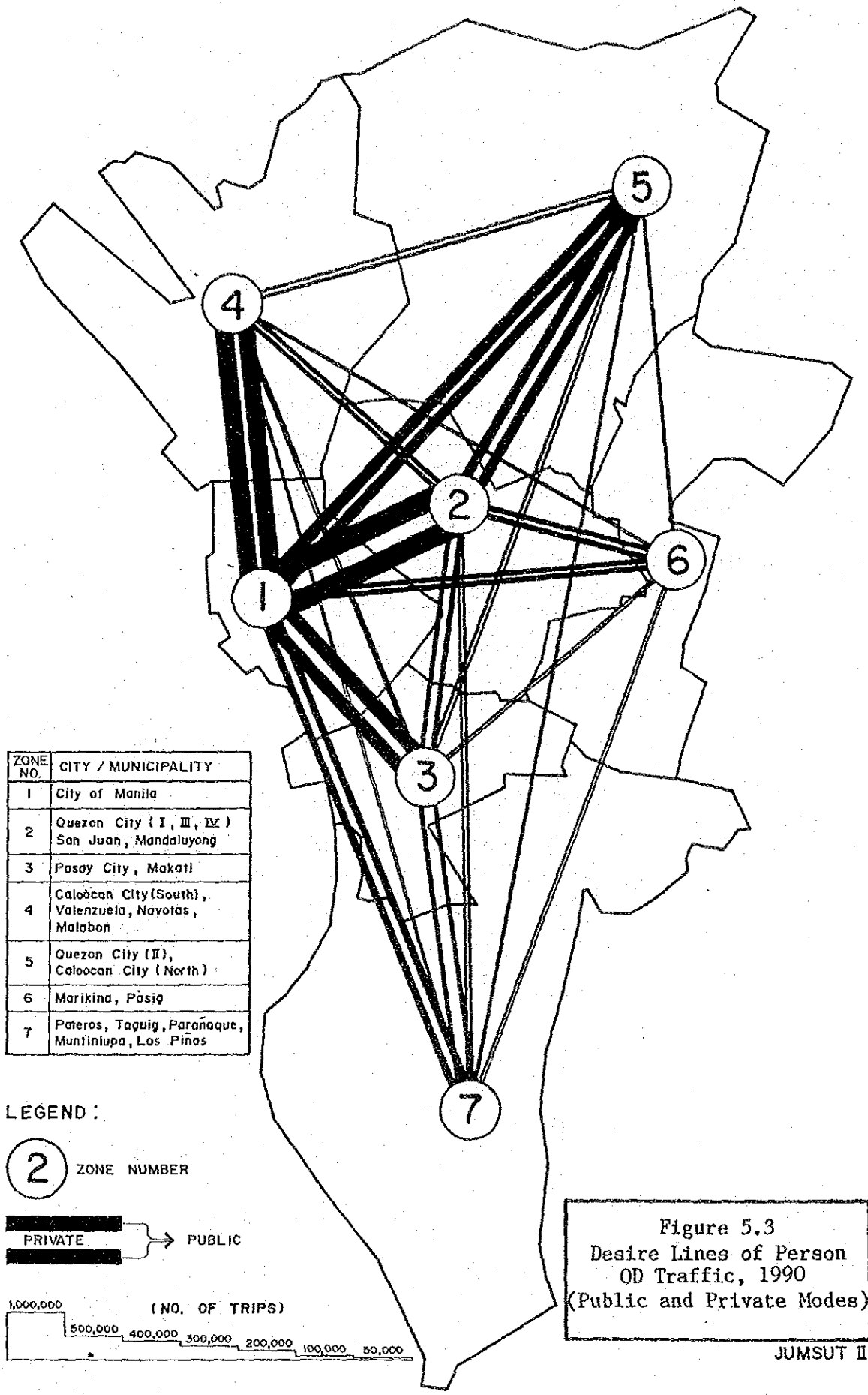
ZONE NO.	CITY / MUNICIPALITY
1	City of Manila
2	Quezon City (I , III , IV) San Juan , Mandaluyong
3	Pasay City , Makati
4	Caloocan City (South) , Valenzuela, Navotas , Malabon
5	Quezon City (II) , Caloocan City (North)
6	Marikina , Pasig
7	Pateros, Taguig , Parañaque, Muntinlupa, Los Piños

LEGEND :

2 ZONE NUMBER

PRIVATE → PUBLIC

1,000,000   (NO. OF TRIPS)
500,000 400,000 300,000 200,000 100,000 50,000
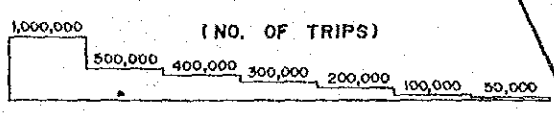
Figure 5.3
Desire Lines of Person
OD Traffic, 1990
(Public and Private Modes)

JUMSUT II

42

Public modal share for 1990 shows a 79% share as against a mere 21% for private mode. For Metro Manila, the overall share of public mode is 78%. It should be noted that trips to/from and within east central, south central, northwest and the south, show relatively high or equal public modal share as against private modes. This definitely shows a marked preference for the use of public mode, in spite of the high car-ownership level in these areas.

Table 5.7
Share of Public Mode, 1990 (%)

O / D	1	2	3	4	5	6	7	ADJOIN- METRO MANILA	EXTER- ING AREAS	NAL AREAS	GRAND TOTAL
1	84	75	72	88	85	86	68	81	87	81	81
2		72	54	69	72	78	66	70	83	48	71
3			64	67	60	51	51	59	71	71	60
4				89	85	68	86	88	86	66	87
5					82	70	50	80	73	48	78
6						89	92	90	79	55	87
7							78	78	80	74	78
METRO MANILA								78	82	72	78
ADJOINING AREAS									92	71	91
EXTERNAL AREAS										72	72
GRAND TOTAL											79

5.7.2   Comparison Between the 1990 and 1980 OD Tables

In terms of generated/attracted trips by mode, shown in Table 5.8, there will be a 35% increase in 1990 over 1980. Trips by public mode was estimated to rise by 45%; while trips by private mode showed a slight increase of 7%.

Table 5.8

1990/1980 Trip Generation/Attraction
by Mode (000)

		1980	1990	1990/1980
Public	Generation	9,472	13,751	1.45
	Attraction	9,471	13,751	1.45
Private	Generation	3,382	3,610	1.07
	Attraction	3,379	3,610	1.07
Total	Generation	12,854	17,361	1.35
	Attraction	12,850	17,361	1.35

Almost all trip purposes of the 1990 OD increased, both by public and private mode, as shown in Table 5.9. A favorable increase has been forecasted for private business trip (59%) and "to work" (15%).

Table 5.9
1990/1980 Total Number of Trips
by Mode and by Purpose

Trip Purpose	1980 (000 trips)			1990 (000 trips)			1990/1980		
	Public	Private	Total	Public	Private	Total	Pub.	Priv.	Total
To Work	1,676	643	2,319	2,427	739	3,166	1.45	1.15	1.37
To School	1,698	378	2,076	2,404	344	2,748	1.42	0.91	1.32
Private	1,278	534	1,812	2,055	568	2,623	1.61	1.06	1.45
Business	326	306	632	396	485	881	1.22	1.59	1.39
To Home	4,671	1,582	6,253	6,894	1,628	8,522	1.48	1.03	1.36
Total	9,649	3,443	13,092	14,176	3,764	17,940	1.47	1.09	1.37

The comparison undertaken between 1990 and 1980 modal split resulted in the conclusion that the share of public transport as against the total showed only a slight increase of 7%. This is attributed to the fact that business purpose trips decreased by 13%. The reverse pattern was forecasted for business purpose trips by private mode which was expected to incur a 14% increase. Table 5.10 records these changes.

Table 5.10
1990/1980 Modal Split 1/

	1980 (%)		1990 (%)	
	Pub.	Priv.	Pub.	Priv.
To Work	72.27	27.73	76.66	23.34
To School	81.79	18.21	87.48	12.52
Private	70.51	29.47	78.35	21.65
Business	51.58	48.42	44.95	55.05
To Home	74.70	25.30	80.90	19.10
Total	73.70	26.30	79.02	20.98

1/ Percentage to Total Trips

The overall 1990 OD person trip distribution in comparison with 1980 is tabulated in Table 5.11.

Table 5.11
1990/1980 Person Trip OD Distribution
(Public and Private Modes)

O \ D	1	2	3	4	5	6	7	METRO MANILA	ADJOINING AREAS	EXTERNAL AREAS	GRAND TOTAL
1	1.17	1.16	1.17	1.45	1.77	1.62	1.41	1.27	1.47	1.23	1.27
2		1.09	1.15	1.31	1.42	1.42	1.40	1.22	1.35	1.36	1.23
3			1.11	1.51	1.66	1.63	1.32	1.26	1.38	1.24	1.38
4				1.53	1.65	1.82	2.12	1.56	1.57	1.43	1.56
5					1.89	1.83	1.63	1.87	1.57	1.91	1.85
6						1.64	1.86	1.66	1.48	1.53	1.96
7							1.66	1.66	1.59	1.56	1.64
METRO MANILA								1.35	1.48	1.37	1.36
ADJOINING AREAS									1.52	1.33	1.51
EXTERNAL AREAS										1.20	1.20
GRAND TOTAL											1.37

Significant findings include the following:

a) The overall increase recorded for 1990 is 37%, with Metro Manila registering a 35% increase; the adjoining areas a high 52% and the external areas a slight 20%

b) Trips to/from and within the CBD, east central, and south central show a close 9% to 17% increase. For the rest of the areas, inter-zonal movements increased at varying degrees. Notable is that between the north central and the south whose trip interaction recorded more than a 100% increase.

c) Trip interaction between Metro Manila and the adjoining and external areas has become very active with a 47% and 38% increase, respectively.

APPENDICES

Appendix 2.1
Area by Land Use (Ha.)

City/Municipality	Residential				Commercial			Industrial	Institutional	Utilities	Sub-total	Open Space								GRAND TOTAL
	R₁	R₂	R₃	Sub-total	C₂	C₃	Sub-total					Vacant Area	Agri-cultural	Fishponds	Park/Cemetery	Racetrack	Water Surface	Mountains/Hills	Sub-total	
1. Manila I	-	-	656	656	3	10	13	41	29	51	121	7	5	-	2	-	-	-	14	804
2. Manila II	-	1	159	160	15	207	222	14	51	1	66	122	-	-	9	38	-	-	169	618
3. Manila III	34	21	620	675	47	3	50	58	121	-	179	6	-	-	21	-	2	-	29	933
4. Manila IV	1	15	693	709	130	77	207	148	172	67	387	9	-	-	132	-	82	-	222	1,525
5. Pasay	27	120	286	433	212	89	301	46	103	663	812	179	-	-	9	-	-	-	188	1,734
6. Makati	503	464	131	1,098	33	168	201	86	232	-	318	59	-	-	41	119	30	-	249	1,866
7. Mandaluyong	144	270	223	637	5	3	8	166	91	6	263	105	18	-	147	-	21	-	291	1,199
8. San Juan	181	36	138	355	151	21	172	18	45	-	63	24	-	-	-	-	-	-	24	614
9. Quezon City I	483	395	198	1,076	74	1	75	227	62	-	289	50	-	-	10	-	-	-	60	1,500
10. Quezon City II	3,634	707	22	4,363	52	-	52	42	475	1	517	2,248	-	-	694	-	133	4,358	7,433	12,365
11. Quezon City III	15	380	207	602	10	37	47	98	218	-	317	315	-	-	65	-	6	-	386	1,352
12. Quezon City IV	577	405	222	1,204	78	6	84	40	181	-	221	26	-	-	6	-	-	-	32	1,541
13. Caloocan (S)	63	298	335	696	119	1	120	77	70	20	167	122	18	-	132	-	-	-	272	1,255
14. Caloocan (N)	413	221	13	647	-	-	-	124	123	-	247	2,337	963	-	-	-	31	-	3,331	4,225
15. Valenzuela	1,336	73	65	1,474	44	-	44	621	6	2	629	76	1,864	414	-	-	52	-	2,406	4,553
16. Malabon	297	280	120	697	24	-	24	185	29	-	214	183	129	387	-	20	119	-	838	1,773
17. Navotas	63	188	69	320	-	45	45	54	11	-	65	82	-	529	-	-	80	-	691	1,121
18. Marikina	1,100	10	-	1,110	162	-	162	266	49	-	315	164	127	-	30	3	56	348	728	2,315
19. Pasig	696	246	139	1,081	114	-	114	433	31	-	464	216	1,550	-	8	-	103	-	1,877	3,536
20. Pateros	-	109	5	114	10	-	10	-	6	18	6	14	63	-	-	-	-	-	77	207
21. Taguig	-	85	358	443	3	-	3	93	804	-	915	320	821	-	-	-	66	1,568	2,775	4,136
22. Parañaque	1,403	121	86	1,610	41	-	41	80	18	30	128	400	713	216	80	-	78	1,025	2,512	4,291
23. Muntinlupa	936	122	27	1,085	43	-	43	74	196	-	270	507	419	-	34	-	11	1,290	2,261	13,659
24. Las Piñas	1,396	73	15	1,484	27	-	27	17	10	-	27	990	241	189	3	-	74	829	2,326	3,864
GRAND TOTAL	13,302	4,640	4,787	22,729	1,397	668	2,065	3,008	3,133	859	7,000	8,561	6,931	1,735	1,423	180	943	9,418	29,191	60,985

Source: JUMSUT II

47

Appendix 3.1
Sources of Existing 1990 Socio-Economic
Framework for Metro Manila

Source	1980 Population (000)	Projected 1990 Figures			
		Popu-lation (000)	Employ-ment Rate (%)	School Attendance Rate (%)	Car-Owning Rate (%)
• Sewerage and Sanitation Masterplan (1979, MWSS)	6,250	9,342	--	--	--
• Manila Water Supply II (1982, MWSS)	5,943	8,498	--	--	--
• MMETROPLAN (1977, DPWTC)	6,092	8,281	33.5	27.0 (vs. Pop.)	37.9
• Metro Manila Solid Waste Management Study (1982, Adhoc Committee, LOI 809)	5,925	8,650	--	--	--
• R10 and Related Roads Project (1982, MPWH)	6,092	8,281	--	--	--
• Feasibility Study for Manila Bataan Coastal Roads and Its Related Roads (C5-C6) Project (1980, MPWH)	6,136	8,405	--	--	--
• Manila MetroRail Network	5,910	8,281	38.2	31.7 (vs. Pop.)	--
• 1975 and 1980 Census of Population by Province, Municipality and Barangay and Forecasts (1982, NCSO/NEDA)	5,926	7,867	--	--	--
• Northern Package (1983, MPWH)	5,926	7,867	40.0	--	30.0
• Southern Package (1982, MPWH)	5,926	7,899	37.9	--	33.0
• Regional Development Framework Plan 1983-1992 (1982, MMC)	5,926	7,847	44.2	Elementary 91.0 Secondary 87.0 (vs. School Age Pop.)	

Source: MMC

Appendix 3.2
1990 Forecasted Population
by a 27-Zone System

City/Municipality/ Province	Population		Annual Average Growth Rate (%)
	1980	1990	
Manila 1	565,319	642,178	1.3
Manila 2	218,175	226,248	0.4
Manila 3	428,361	495,389	1.5
Manila 4	418,630	485,186	1.5
City of Manila	1,630,490	1,849,000	1.3
Pasay	287,770	363,854	2.4
Makati	372,631	432,733	1.5
Mandaluyong	205,366	247,105	1.9
San Juan	130,088	142,738	0.9
Quezon 1	271,416	314,674	1.5
Quezon 2	472,154	848,718	6.1
Quezon 3	189,295	206,699	0.9
Quezon 4	233,000	300,598	2.6
Quezon City	1,165,860	1,670,690	3.7
Caloocan (South)	395,082	523,483	2.9
Caloocan (North)	72,734	128,995	5.9
Caloocan City	467,816	652,478	3.9
Valenzuela	212,363	343,567	4.9
Malabon	191,001	280,801	3.9
Navotas	126,146	200,277	4.7
Marikina	211,613	305,696	3.7
Pasig	268,570	427,526	4.8
Pateros	40,288	54,449	3.1
Taguig	134,137	224,712	5.3
Parañaque	208,552	297,733	3.6
Muntinlupa	136,679	239,862	5.8
Las Piñas	136,514	240,781	5.8
MMANILA TOTAL	5,925,880	7,974,002	3.0
Bulacan	392,359	566,853	3.7
Rizal	404,585	602,457	4.1
Laguna	268,851	396,737	4.0
Cavite	441,181	647,315	3.9
ADJOINING AREAS TOTAL	1,506,980	2,213,360	3.9
GRAND TOTAL	7,432,860	10,187,362	3.2

Source: JUMSUT II

49

Appendix 3.3
1990 Forecasted Employment
by a 27-Zone System

City/Munici-pality Province	by Residence				by Working Place			
	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total
Manila 1	6,002	55,873	137,626	199,501	2,987	28,747	85,150	116,884
Manila 2	4,684	16,127	55,256	76,067	2,671	27,022	183,333	213,026
Manila 3	6,422	31,688	111,007	149,117	1,290	14,387	87,263	102,940
Manila 4	4,000	40,123	105,065	149,188	4,883	34,268	245,094	284,245
City of Manila	21,108	143,811	408,954	573,873	11,831	104,424	600,840	717,095
Pasay	1,777	22,627	81,155	105,559	4,066	15,211	82,837	102,114
Makati	1,106	35,821	102,383	139,310	9,607	51,432	232,194	293,233
Mandaluyong	3,777	29,487	51,837	85,101	2,527	32,191	52,577	87,295
San Juan	0	11,373	33,366	44,739	553	8,135	25,188	33,876
Quezon 1	4,198	28,833	72,648	105,679	1,671	26,362	60,690	88,723
Quezon 2	8,804	85,280	176,017	270,101	5,712	90,542	124,383	220,637
Quezon 3	1,040	18,712	51,674	71,426	2,434	20,061	80,104	102,599
Quezon 4	7,264	22,545	67,582	97,391	2,119	16,515	64,963	83,597
Quezon City	21,306	155,370	367,921	544,597	11,936	153,480	330,140	495,556
Caloocan (S)	1,763	46,447	106,192	154,402	658	42,562	75,540	118,760
Caloocan (N)	5,764	18,218	18,653	42,635	5,764	2,059	5,921	13,744
Caloocan City	7,527	64,665	124,845	197,037	6,422	44,621	81,461	132,504
Valenzuela	15,713	37,793	52,804	106,310	21,015	54,297	38,030	113,342
Malabon	5,658	28,655	52,336	86,649	5,000	22,468	29,449	56,917
Navotas	17,476	13,718	40,453	71,647	21,793	10,521	22,161	54,475
Marikina	6,712	48,379	50,493	105,584	8,132	62,672	32,830	103,634
Pasig	9,277	65,962	70,417	145,656	10,461	100,720	61,739	172,920
Pateros	0	4,129	12,374	16,503	0	2,041	7,526	9,567
Taguig	4,895	31,191	37,822	73,908	3,921	47,386	26,394	77,701
Parañaque	1,619	34,259	65,958	101,836	553	40,974	40,172	81,699
Muntinlupa	2,422	35,271	39,795	77,488	5,462	53,194	32,916	91,572
Las Piñas	2,250	29,107	48,388	79,745	2,250	27,821	25,274	55,345
MMANILA TOTAL	122,623	791,618	1,641,300	2,555,540	125,529	831,588	1,721,730	2,678,840
Bulacan	43,239	43,668	55,798	142,696	37,357	30,138	34,657	102,152
Rizal	27,867	59,799	57,478	145,144	23,448	41,233	38,094	102,775
Laguna	32,462	29,165	41,428	103,055	27,535	20,711	30,062	78,308
Cavite	45,901	32,488	70,641	149,030	39,996	18,478	40,297	98,771
ADJOINING AREAS TOTAL	149,469	165,120	225,336	539,925	128,336	110,560	143,110	382,006
GRAND TOTAL	272,092	956,783	1,866,636	3,095,465	253,865	942,148	1,864,840	3,060,846

Source: JUMSUT II

Appendix 3.4
1990 Forecasted School Attendance
by a 27-Zone System

City/Munici-pality Province	by Residence			by School Address		
	Elementary	Secondary & Above	Total	Elementary	Secondary & Above	Total
Manila 1	82,213	87,847	170,060	77,498	49,204	126,702
Manila 2	29,518	33,252	62,770	42,621	141,639	184,260
Manila 3	57,566	92,499	150,065	66,112	327,046	393,158
Manila 4	61,732	78,342	140,074	76,260	170,488	246,748
City of Manila	231,029	291,940	522,969	262,491	688,377	950,868
Pasay	45,989	49,325	95,314	39,869	35,951	75,820
Makati	54,464	61,803	116,267	49,518	32,700	82,218
Mandaluyong	33,626	31,668	65,294	32,632	33,514	66,146
San Juan	16,292	20,815	37,107	15,130	11,136	26,266
Quezon 1	37,993	48,374	86,367	33,276	25,466	58,742
Quezon 2	105,078	122,148	227,226	108,142	64,542	172,684
Quezon 3	26,478	34,305	60,783	22,942	30,945	53,887
Quezon 4	36,909	46,150	83,059	37,603	36,947	74,550
Quezon City	206,458	250,977	457,435	201,963	157,900	359,863
Caloocan (S)	68,548	69,799	138,347	61,291	51,773	113,064
Caloocan (N)	16,396	15,075	31,471	13,763	6,030	19,793
Caloocan City	84,944	84,874	169,818	75,054	57,803	132,857
Valenzuela	46,310	46,239	92,549	46,382	22,443	68,825
Malabon	37,885	36,268	74,153	40,124	31,496	71,620
Navotas	29,743	24,653	54,396	27,529	6,494	34,023
Marikina	40,398	44,086	84,484	42,480	29,449	71,929
Pasig	59,576	58,099	117,675	57,471	33,843	91,314
Pateros	5,396	8,504	13,900	7,990	7,059	15,049
Taguig	33,570	22,832	56,402	33,783	6,780	40,563
Parañaque	38,850	42,324	81,174	32,473	13,006	45,479
Muntinlupa	33,109	27,205	60,314	40,110	14,392	54,502
Las Piñas	32,561	28,288	60,849	29,001	10,057	39,058
MMANILA TOTAL	1,030,200	1,129,900	2,160,100	1,034,000	1,192,400	2,226,400
Bulacan	85,028	76,320	161,348	82,811	47,175	129,986
Rizal	87,959	82,878	170,837	81,075	41,337	122,412
Laguna	59,511	45,038	104,549	59,152	38,755	97,907
Cavite	95,803	87,724	183,527	92,914	61,396	154,310
ADJOINING AREAS TOTAL	328,301	291,960	620,261	315,952	188,663	504,615
GRAND TOTAL	1,358,501	1,421,860	2,780,361	1,349,952	1,381,063	2,731,015

Source: JUMSUT II

51

A. PUBLIC

ORIGIN \ DESTINATION	1 MANILA 1ST	2 MANILA 2ND	3 MANILA 3RD	4 MANILA 4TH	5 PASAY	6 MAKATI	7 MANDALUYONG	8 SAN JUAN DEL MONTE	9 QUEZON I	10 QUEZON II	11 QUEZON III	12 QUEZON IV	13 CALOOCAN SOUTH	14 CALOOCAN NORTH	15 VALENZUELA	16 MALABON	17 NAVOTAS	18 MARIKINA	19 PASIG	20 PATEROS	21 TAGUIG	22 PARAÑAQUE	23 MUNTINLUPA	24 LAS PIÑAS
1. City of Manila 1st	205,877	154,002	49,982	49,683	8,624	12,822	4,079	1,521	7,789	13,377	5,725	7,374	36,538	2,958	2,136	4,174	8,494	2,459	4,379	286	1,130	3,759	1,337	174
2. City of Manila 2nd	135,945	115,997	83,495	60,709	16,923	22,089	13,574	8,921	38,066	35,824	13,502	17,917	56,657	3,012	7,759	10,291	10,468	6,445	8,584	2,094	2,698	5,814	4,287	3,571
3. City of Manila 3rd	55,797	83,798	213,268	71,109	18,580	26,263	23,572	21,727	45,122	59,195	37,972	51,637	56,553	1,632	9,087	9,661	8,640	13,607	23,855	1,860	6,664	6,759	2,000	2,725
4. City of Manila 4th	40,626	62,804	64,099	234,832	36,556	60,222	15,267	4,052	14,588	17,058	10,046	8,744	36,553	1,632	4,874	3,871	4,518	2,580	6,544	455	4,252	12,894	7,979	8,019
5. Pasay	8,657	18,539	21,635	44,600	122,177	21,438	2,650	822	2,545	3,131	1,626	2,110	18,832	1,095	4,874	3,871	4,518	2,580	6,544	455	4,252	12,894	7,979	8,019
6. Makati	14,288	25,253	27,335	62,384	21,317	146,613	17,304	5,399	7,918	13,251	13,847	10,552	4,798	0	261	552	1,667	920	1,189	87	6,039	16,696	4,546	5,358
7. Mandaluyong	3,710	14,822	25,458	15,734	3,038	17,973	125,632	5,799	2,456	5,172	6,870	5,437	7,780	327	962	1,268	2,088	5,417	8,668	5,902	11,385	8,264	3,216	2,475
8. San Juan del Monte	2,147	9,666	23,402	4,813	1,885	7,045	5,662	39,808	1,844	4,118	10,385	7,779	2,872	153	601	1,231	739	1,856	23,965	2,335	3,625	1,377	356	566
9. Quezon I	7,471	44,039	44,846	20,165	2,614	9,427	2,689	1,829	106,968	49,116	10,402	17,705	1,872	0	197	515	227	743	2,639	14	1,125	974	989	124
10. Quezon II	10,661	37,372	53,740	21,744	3,153	13,654	5,073	3,262	46,632	241,646	46,452	26,461	17,837	1,136	790	2,767	1,446	1,085	1,362	739	976	2,484	841	164
11. Quezon III	6,797	16,839	40,367	11,048	1,863	15,612	5,660	9,425	10,948	42,756	118,468	34,510	28,693	28,391	2,159	4,362	2,459	4,655	6,096	494	1,051	1,458	801	172
12. Quezon IV	4,353	18,289	48,361	8,682	1,280	9,679	4,590	7,362	14,888	22,523	34,446	51,123	10,389	389	1,233	2,408	1,390	32,129	7,565	622	2,191	546	913	505
13. Caloocan South	37,536	67,075	28,575	22,441	3,335	7,844	2,474	1,592	20,024	27,835	9,736	7,070	5,554	0	593	1,131	755	3,002	3,611	286	700	1,359	631	111
14. Caloocan North	455	2,985	1,227	1,029	0	274	140	0	1,154	34,709	212	0	260,621	4,305	24,272	43,812	11,880	417	2,706	0	665	2,193	3,583	197
15. Valenzuela	2,240	6,957	7,973	5,642	177	838	561	197	616	1,953	742	593	4,774	16,467	2,222	686	647	0	110	0	0	105	0	0
16. Malabon	4,869	11,228	10,364	5,921	506	2,019	1,580	502	2,448	6,013	2,194	1,653	16,738	2,442	110,590	8,995	306	275	192	0	35	83	0	0
17. Navotas	5,392	14,692	7,146	5,942	1,166	1,445	688	595	1,113	2,663	1,984	647	38,984	208	11,140	82,181	21,095	325	198	0	296	408	263	263
18. Marikina	890	10,388	13,424	2,684	1,481	4,010	2,440	503	1,226	4,195	26,607	3,680	7,808	0	493	21,749	92,511	0	854	0	105	67	0	0
19. Pasig	4,535	8,940	20,236	6,715	860	7,709	19,644	2,868	1,147	4,991	6,145	4,022	1,056	0	277	250	0	153,415	4,996	0	261	224	215	0
20. Pateros	102	822	870	295	40	5,519	1,748	100	277	235	190	176	2,644	105	0	143	840	5,937	281,444	2,780	18,863	736	629	563
21. Taguig	951	3,911	5,059	3,573	4,052	10,922	3,356	742	653	761	1,797	767	589	0	0	0	0	299	22,024	16,664	50,857	5,302	3,772	300
22. Parañaque	5,817	8,652	10,239	19,399	17,563	10,044	2,067	1,012	2,809	2,695	1,229	876	2,260	0	50	515	123	363	851	135	7,902	63,020	19,221	10,637
23. Muntinlupa	2,527	3,666	2,408	8,865	4,242	3,416	463	299	916	1,283	681	659	2,736	187	71	244	0	393	944	0	4,383	13,647	127,888	6,046
24. Las Piñas	147	4,337	1,841	7,034	4,135	3,318	633	89	107	195	896	103	88	0	0	147	0	0	455	0	265	10,750	9,200	62,309
25. Sub-total Metro Manila	561,790	745,073	805,350	695,043	275,567	420,195	261,546	118,426	332,254	594,695	362,154	261,595	566,673	62,807	179,767	201,173	170,457	236,322	416,519	38,343	130,941	158,907	192,750	104,279
26. Adjoining Bulacan	3,543	5,989	10,601	4,656	1,427	2,395	803	657	2,820	4,386	2,665	1,027	13,620	228	14,751	6,423	712	661	859	0	37	730	198	250
27. Adjoining Rizal	954	3,914	10,412	4,835	2,053	6,623	8,489	975	1,381	6,355	11,379	4,360	1,305	0	139	104	0	17,324	15,058	0	1,167	536	420	198
28. Adjoining Cavite & Laguna	1,621	5,507	8,351	20,009	5,056	8,393	1,940	365	795	1,947	1,744	836	1,697	0	0	124	462	196	2,487	363	4,182	9,658	15,158	12,205
29. Sub-total Adjoining Areas	6,118	15,410	29,364	29,500	8,536	17,411	11,232	1,997	4,996	12,688	15,788	6,223	16,622	228	14,890	6,651	1,174	18,181	18,404	363	5,386	10,924	15,776	12,653
30. External North	4,991	12,013	8,374	5,806	1,567	3,862	1,851	538	3,567	5,856	8,702	4,051	8,567	0	4,053	1,125	411	924	1,515	0	343	617	583	393
31. External East	43	346	1,066	382	215	308	1,179	89	43	88	748	205	218	0	0	0	0	129	1,225	0	0	85	44	43
32. External South	622	4,743	6,656	8,098	4,452	4,225	619	204	1,373	1,628	1,489	1,640	876	0	74	481	0	356	1,509	148	1,134	8,861	3,590	7,102
33. Sub-total External Areas	5,656	17,102	16,096	14,286	6,234	8,395	3,649	831	4,983	7,572	10,939	5,896	9,661	0	4,127	1,606	411	1,409	4,249	148	1,562	9,522	4,216	7,609
34. GRAND TOTAL	573,564	777,585	850,810	738,829	290,337	446,001	276,427	121,254	342,233	614,955	388,881	273,714	592,956	63,035	198,784	209,430	172,042	255,912	439,172	38,854	137,889	179,353	212,742	124,541

B. PRIVATE

ORIGIN \ DESTINATION	1 MANILA 1ST	2 MANILA 2ND	3 MANILA 3RD	4 MANILA 4TH	5 PASAY	6 MAKATI	7 MANDALUYONG	8 SAN JUAN DEL MONTE	9 QUEZON I	10 QUEZON II	11 QUEZON III	12 QUEZON IV	13 CALOOCAN SOUTH	14 CALOOCAN NORTH	15 VALENZUELA	16 MALABON	17 NAVOTAS	18 MARIKINA	19 PASIG	20 PATEROS	21 TAGUIG	22 PARAÑAQUE	23 MUNTINLUPA	24 LAS PIÑAS
1. City of Manila 1st	28,434	17,241	6,357	19,602	2,358	8,080	3,183	753	6,572	1,964	3,058	1,188	3,090	0	693	1,213	2,496	205	548	0	0	1,338	615	303
2. City of Manila 2nd	23,250	27,380	17,433	14,064	6,738	7,722	4,588	3,640	25,329	4,471	5,191	6,561	6,431	854	1,192	3,333	2,764	105	830	1,190	712	4,996	512	2,120
3. City of Manial 3rd	4,835	15,651	58,927	21,890	5,695	14,632	10,579	10,918	27,401	8,645	7,733	18,549	4,526	1,249	1,890	634	329	779	8,450	580	751	5,411	257	1,844
4. City of Manila 4th	11,361	17,752	21,614	67,652	16,436	52,003	8,291	7,195	8,569	6,175	5,457	7,164	7,320	864	408	2,283	1,766	940	2,686	175	3,181	35,416	434	10,602
5. Pasay	1,296	7,068	8,864	13,157	28,246	17,885	2,047	384	2,133	2,371	1,869	1,287	2,276	451	0	148	0	140	804	0	4,381	19,113	723	5,034
6. Makati	7,228	7,215	20,952	43,955	20,985	190,627	18,518	13,724	12,799	10,386	14,877	10,247	3,597	127	121	2,744	1,338	4,742	7,614	4,361	5,271	41,388	2,526	13,164
7. Mandaluyong	1,273	5,607	9,415	12,654	1,723	22,700	26,973	9,100	5,915	2,700	6,467	6,085	382	0	235	725	239	261	8,010	1,575	165	3,642	556	295
8. San Juan del Monte	1,467	3,880	9,813	5,896	828	15,797	11,052	39,153	2,557	3,407	5,922	5,646	5,207	0	1,814	348	0	1,082	3,368	0	0	3,377	0	368
9. Quezon I	5,679	18,904	18,321	7,602	3,372	9,347	3,474	2,691	60,414	24,870	17,892	9,853	7,752	0	783	1,776	527	713	2,414	1,168	412	1,319	362	0
10. Quezon II	2,019	5,290	18,055	9,150	2,382	18,207	3,880	5,767	23,102	66,306	22,298	10,862	5,288	10,081	2,035	1,265	172	1,591	2,816	812	2,287	6,540	0	1,518
11. Quezon III	4,306	2,730	11,913	7,444	914	18,539	6,376	6,778	14,529	21,891	33,414	16,591	2,945	652	71	934	4,373	3,279	4,467	2,163	0	886	216	0
12. Quezon IV	4,079	6,879	15,913	6,900	701	16,386	2,243	5,200	11,103	13,310	17,673	37,830	1,448	148	1,765	691	251	402	1,612	0	1,014	3,047	400	0
13. Caloocan South	2,511	6,197	3,893	3,374	1,334	2,161	306	3,791	6,794	4,075	553	5,214	40,702	1,466	4,274	2,718	147	599	471	0	0	591	0	0
14. Caloocan North	0	1,063	1,173	864	524	172	0	0	0	11,031	369	167	1,241	1,586	281	0	0	0	0	0	0	175	0	0
15. Valenzuela	2,056	2,060	5,561	2,190	0	417	545	503	2,985	1,244	105	172	7,864	306	29,177	1,988	0	502	1,517	0	0	0	0	917
16. Malabon	1,095	2,607	2,785	1,715	356	3,055	801	155	1,121	1,199	482	808	3,720	0	548	5,775	2,654	0	331	0	0	0	99	0
17. Navotas	1,128	934	899	1,430	0	580	96	0	234	419	126	862	641	0	182	3,174	12,380	0	943	0	216	0	0	0
18. Marikina	423	1,395	2,385	1,476	352	8,018	268	293	941	3,505	5,902	1,146	531	0	398	0	0	38,494	1,864	8	140	0	0	0
19. Pasig	318	794	5,432	1,781	1,714	8,034	10,402	1,664	2,636	1,558	2,450	0	531	0	398	172	0	1,955	24,194	0	696	359	0	336
20. Pateros	0	288	193	660	0	6,324	906	0	157	973	49	303	0	0	0	0	0	0	195	5,878	340	0	0	0
21. Taguig	121	136	429	660	1,547	6,796	2,264	0	1,580	3,959	295	1,734	0	0	0	0	0	0	329	1,400	4,204	578	0	590
22. Parañaque	1,376	6,894	4,076	23,840	19,641	32,995	3,720	3,258	272	0	156	397	0	105	0	0	167	38	765	0	6,487	31,244	11,610	2,815
23. Muntinlupa	587	140	1,190	609	1,123	3,010	885	0	0	874	0	0	558	0	0	34	0	0	934	0	20,349	18,354	3,044	42,335
24. Las Piñas	318	4,080	2,627	13,607	6,456	12,811	254	0	874	0	0	0	0	0	0	0	0	0	793	0	1,187	8,079	2,646	42,335
25. Sub-total Metro Manila	115,160	162,185	248,220	281,506	123,425	476,298	121,651	115,129	217,190	195,638	152,766	142,792	106,815	17,889	46,445	29,955	29,603	55,827	75,626	18,639	29,646	192,167	40,247	85,285
26. Adjoining Bulacan	151	546	1,257	221	26	1,704	13	508	326	2,124	946	56	2,667	13	2,595	1,419	322	10	1,079	0	19	24	164	9
27. Adjoining Rizal	690	1,363	1,245	1,269	1,138	2,472	4,139	430	738	2,103	2,703	237	0	0	28	0	17	4,466	3,144	0	0	2,723	194	0
28. Adjoining Cavite & Laguna	562	589	1,215	5,182	2,931	3,717	29	0	30	626	352	136	0	0	0	0	0	185	198	247	1,588	2,671	1,259	3,128
29. Sub-total Adjoining Areas	1,403	2,498	3,717	6,672	4,095	7,893	4,181	938	1,094	4,853	4,001	429	2,667	13	2,623	1,419	339	4,661	4,421	247	1,607	5,418	1,617	3,137
30. External North	1,970	3,196	4,040	593	283	1,522	115	241	386	3,435	1,863	1,486	1,955	30	3,415	1,647	172	1,055	1,156	0	230	488	174	50
31. External East	243	355	71	148	44	203	120	0	0	118	297	331	0	0	0	0	0	27	39	0	0	194	0	0
32. External South	471	1,590	918	1,801	979	2,272	149	316	125	221	827	30	558	0	179	41	133	142	1,316	59	356	2,216	2,118	1,037
33. Sub-total External Areas	2,684	5,141	5,029	2,542	1,306	3,997	384	557	511	3,774	2,987	1,847	2,513	30	3,594	1,688	332	1,236	3,044	59	586	2,898	2,292	1,087
34. GRAND TOTAL	119,247	169,824	256,966	290,720	128,826	488,188	126,216	116,624	218,795	204,265	159,754	145,068	111,995	17,932	52,662	33,062	30,274	61,724	83,091	18,945	31,839	200,483	44,156	89,509

Appendix 4.1
Updated 1980 OD Tables

10 QUEZON II	11 QUEZON III	12 QUEZON IV	13 CALOOCAN SOUTH	14 CALOOCAN NORTH	15 VALENZUELA	16 MALABON	17 NAVOTAS	18 MARIKINA	19 PASIG	20 PATEROS	21 TAGUIG	22 PARAÑAQUE	23 MUNTINLUPA	24 LAS PIÑAS	25 SUB-TOTAL METRO MANILA	26 ADJOINING BULACAN	27 ADJOINING RIZAL	28 ADJOINING CAVITE & LAGUNA	29 SUB-TOTAL ADJOINING AREAS	30 EXTERNAL NORTH	31 EXTERNAL EAST	32 EXTERNAL SOUTH	33 SUB-TOTAL EXTERNAL AREAS	34 GRAND TOTAL
13,377	5,725	7,374	36,538	2,958	2,136	4,174	8,494	2,459	4,379	286	1,130	3,759	1,337	174	588,679	3,117	611	1,780	5,508	5,128	0	1,611	6,739	600,926
35,824	13,502	17,917	56,657	3,012	7,759	10,291	10,468	6,445	8,584	2,094	2,698	5,814	4,287	3,571	684,642	7,760	3,466	5,105	16,331	13,021	530	6,824	20,375	721,348
59,195	37,972	51,637	36,553	1,632	9,087	9,661	8,640	13,607	23,855	1,860	6,664	6,759	2,000	2,725	831,083	11,114	9,905	8,290	29,309	9,469	873	7,507	17,849	878,241
17,058	10,046	8,744	18,832	1,095	4,874	3,871	4,518	2,580	6,544	455	4,252	12,894	7,979	8,019	644,807	4,000	4,148	20,934	29,082	7,158	365	11,803	19,326	693,215
3,131	1,626	2,110	4,798	0	261	552	1,667	920	1,189	87	6,039	16,696	4,546	5,358	292,043	1,122	1,848	4,839	7,809	2,008	177	4,533	6,718	306,570
13,251	13,847	10,552	7,780	327	962	1,268	2,088	5,417	8,668	5,902	11,385	8,264	3,216	2,475	423,213	2,366	6,044	7,902	16,312	2,785	673	5,112	8,570	448,095
5,172	6,870	5,437	2,872	153	601	1,231	739	1,856	23,965	2,335	3,625	1,377	356	566	217,777	46	8,618	1,791	10,455	1,265	1,528	756	3,549	285,781
4,118	10,385	7,779	1,872	0	197	515	227	743	2,639	14	1,125	974	989	124	127,973	778	1,057	386	2,221	286	73	662	1,021	131,215
49,116	10,402	17,705	17,837	1,136	790	2,767	1,446	1,085	1,362	739	976	2,484	841	164	348,898	2,966	1,192	920	5,078	2,529	0	1,625	4,154	358,130
41,646	46,452	26,461	28,693	28,391	2,159	4,362	2,459	4,655	6,096	494	1,051	1,458	801	172	590,641	3,865	5,866	2,134	11,865	3,836	0	913	4,749	607,255
42,756	118,468	34,510	10,389	389	1,233	2,408	1,390	32,129	7,565	622	2,191	546	913	505	374,573	2,549	10,809	2,088	15,446	4,441	319	3,662	8,422	398,441
22,523	34,446	51,123	5,554	0	593	1,131	755	3,002	3,611	286	700	1,359	631	111	243,309	1,331	4,337	800	6,468	2,747	0	1,592	4,339	254,116
27,835	9,736	7,070	260,621	4,305	24,272	43,812	11,880	417	2,706	0	665	2,193	3,583	197	590,188	12,198	536	1,480	14,214	10,568	0	2,001	12,569	616,971
34,709	212	0	4,774	16,467	2,222	686	647	0	110	0	0	105	0	0	67,196	235	0	0	235	160	0	0	160	67,591
1,953	742	593	16,738	2,442	110,590	8,995	306	275	192	0	0	35	83	0	168,145	11,036	139	0	11,175	4,138	0	381	4,519	183,839
6,013	2,194	1,653	38,984	208	11,140	82,181	21,095	325	198	0	296	408	263	263	204,658	6,609	138	124	6,871	2,334	47	279	2,660	214,189
2,663	1,984	647	7,808	0	493	21,749	92,511	0	854	0	105	67	0	0	167,060	349	0	123	472	219	0	81	300	167,832
4,195	26,607	3,680	1,056	0	277	250	0	153,415	4,996	0	261	224	215	0	232,222	769	15,668	323	16,760	554	160	342	1,056	250,038
4,991	6,145	4,022	2,644	105	0	143	840	5,937	281,444	2,780	18,863	736	629	563	402,496	828	13,284	2,370	16,482	1,554	1,797	1,555	4,906	423,884
235	190	176	0	0	0	0	0	0	3,288	16,664	5,508	36	0	0	35,870	0	0	685	685	0	0	98	98	36,653
761	1,797	767	589	0	0	220	164	299	22,024	3,590	50,857	5,302	3,772	300	123,661	18	1,073	3,996	5,087	270	77	861	1,208	129,956
2,695	1,229	876	2,260	187	50	515	123	363	851	135	7,902	63,020	19,221	10,637	187,666	575	725	9,367	10,667	1,056	106	7,204	8,366	206,699
1,283	681	659	2,736	0	71	244	0	393	944	0	4,383	13,647	127,888	6,046	185,777	0	487	13,573	14,060	503	0	4,370	4,873	204,710
195	896	103	88	0	0	147	0	0	455	0	265	10,750	9,200	62,309	106,049	0	295	10,558	10,853	327	0	2,129	2,456	119,358
94,695	362,154	261,595	566,673	62,807	179,767	201,173	170,457	236,322	416,519	38,343	130,941	158,907	192,750	104,279	7,892,626	73,631	90,246	99,568	263,445	76,356	6,725	65,901	148,982	8,305,053
4,386	2,665	1,027	13,620	228	14,751	6,423	712	661	859	0	37	730	198	250	79,438	221,626	1,081	323	223,030	3,137	105	848	4,090	306,558
6,355	11,379	5,540	1,305	0	139	104	0	17,324	15,058	0	1,167	536	420	198	97,981	846	178,829	889	180,564	580	2,237	1,060	3,877	282,422
1,947	1,744	836	1,697	0	0	124	462	196	2,487	363	4,182	9,658	15,158	12,205	103,096	815	863	465,760	467,438	1,453	6	2,764	4,223	579,757
12,688	15,788	6,223	16,622	228	14,890	6,651	1,174	18,181	18,404	363	5,386	10,924	15,776	12,653	280,515	223,287	180,773	466,972	871,032	5,170	2,348	9,672	17,190	1,168,737
5,856	8,702	4,051	8,567	0	4,053	1,125	411	924	1,515	0	343	617	583	393	79,709	2,319	986	2,432	5,737	1,586	199	2,967	4,752	90,198
887	748	205	218	0	0	0	0	129	1,225	0	85	44	43	0	6,570	85	2,321	3	2,409	103	0	101	204	9,183
1,628	1,489	1,640	876	0	74	481	0	356	1,509	148	1,134	8,861	3,590	7,102	59,880	1,037	1,089	8,656	10,782	3,506	76	1,786	5,368	76,030
7,572	10,939	5,896	9,661	0	4,127	1,606	411	1,409	4,249	148	1,562	9,522	4,216	7,609	146,159	3,441	4,396	11,091	18,928	5,195	275	4,854	10,324	175,411
14,955	388,881	273,714	592,956	63,035	198,784	209,430	172,042	255,912	439,172	38,854	137,889	179,353	212,742	124,541	8,319,300	300,359	275,415	577,631	1,153,405	86,721	9,348	80,427	176,496	9,649,201

10 QUEZON II	11 QUEZON III	12 QUEZON IV	13 CALOOCAN SOUTH	14 CALOOCAN NORTH	15 VALENZUELA	16 MALABON	17 NAVOTAS	18 MARIKINA	19 PASIG	20 PATEROS	21 TAGUIG	22 PARAÑAQUE	23 MUNTINLUPA	24 LAS PIÑAS	25 SUB-TOTAL METRO MANILA	26 ADJOINING BULACAN	27 ADJOINING RIZAL	28 ADJOINING CAVITE & LAGUNA	29 SUB-TOTAL ADJOINING AREAS	30 EXTERNAL NORTH	31 EXTERNAL EAST	32 EXTERNAL SOUTH	33 SUB-TOTAL EXTERNAL AREAS	34 GRAND TOTAL
1,964	3,058	1,188	3,090	0	693	1,213	2,496	205	548	0	0	1,338	615	303	119,291	92	582	155	829	1,191	83	284	1,558	121,678
4,471	5,191	6,561	6,431	854	1,192	3,333	2,764	105	830	1,190	712	4,996	512	2,120	171,406	466	1,809	1,235	3,510	2,222	566	2,136	4,924	179,840
8,645	7,733	18,549	4,526	1,249	1,890	634	329	779	8,450	580	751	5,411	257	1,844	232,155	1,230	1,155	1,460	3,845	3,199	113	575	3,887	239,887
6,175	5,457	7,164	7,320	864	408	2,283	1,766	940	2,686	175	3,181	35,416	434	10,602	295,744	225	1,252	4,108	5,585	987	232	1,191	2,410	303,739
2,371	1,869	1,287	2,276	451	0	148	0	140	804	0	4,381	19,113	723	5,034	119,677	42	1,274	2,555	3,871	762	72	2,343	3,177	126,725
10,386	14,877	10,247	3,597	127	121	2,744	1,338	4,742	7,614	4,361	5,271	41,388	2,526	13,164	458,506	817	2,800	3,417	7,034	1,288	241	2,139	3,668	469,208
2,700	6,467	6,085	382	0	235	725	239	261	8,010	1,575	165	3,642	556	295	126,697	46	2,896	25	2,967	411	302	331	1,044	130,708
3,407	5,922	5,646	5,207	0	1,814	348	0	1,082	3,368	0	0	3,377	0	368	120,932	492	288	0	780	61	34	66	161	121,873
24,870	17,892	9,853	7,752	0	783	1,776	527	713	2,414	1,168	412	1,319	362	0	199,645	230	266	19	515	892	34	381	1,307	201,467
66,306	22,298	10,862	5,288	10,081	2,035	1,265	172	1,591	2,816	812	2,287	6,540	0	1,518	221,723	2,853	1,500	522	4,875	5,633	0	363	5,996	232,594
21,891	33,414	16,591	2,945	652	71	934	4,373	3,279	4,467	2,163	153	886	216	0	165,564	768	1,913	359	3,040	1,302	137	703	2,142	170,746
13,310	17,673	37,830	1,448	148	1,765	691	251	402	1,612	0	1,014	3,047	400	0	148,995	16	226	161	403	1,527	319	119	1,965	151,363
4,075	553	5,214	40,702	1,466	4,274	2,718	147	599	471	0	0	591	0	0	91,171	2,146	5	62	2,213	2,721	5	240	2,966	96,350
11,031	369	167	1,241	1,586	281	0	0	0	0	0	0	175	0	0	18,646	64	0	0	64	393	0	0	393	19,103
1,244	105	172	7,864	306	29,177	1,988	0	502	1,517	0	0	0	0	917	60,109	2,596	0	0	2,596	4,367	0	106	4,473	67,178
1,199	482	808	3,720	0	548	5,775	2,654	0	331	0	0	0	99	0	29,306	769	0	0	769	1,183	0	137	1,320	32,395
234	419	126	1,854	0	182	3,174	12,380	0	943	0	0	216	0	0	24,595	165	0	2	167	57	0	1	58	24,820
3,505	5,902	862	641	0	578	0	0	38,494	1,864	0	0	140	0	0	67,537	128	4,716	185	5,029	545	86	337	968	73,534
1,558	2,450	1,146	531	0	398	172	0	1,955	24,194	408	0	696	359	336	66,978	1,083	4,653	182	5,918	352	995	1,119	2,466	75,362
490	135	0	0	0	0	0	0	0	195	5,878	340	0	0	0	15,074	0	0	295	295	0	0	0	0	15,369
973	49	303	0	0	0	0	0	0	0	329	1,800	4,204	578	590	20,936	0	594	623	1,217	53	39	141	233	22,386
3,959	295	1,734	0	105	0	0	167	38	765	0	6,487	31,244	11,610	2,815	156,599	16	1,240	2,044	3,300	845	22	3,123	3,990	163,889
0	156	397	0	0	0	34	0	0	934	0	1,505	20,349	18,354	3,044	52,589	159	0	1,419	1,578	61	0	1,288	1,355	55,522
874	0	0	0	0	0	0	0	0	793	0	1,187	8,079	2,646	42,335	96,229	359	7	3,130	3,496	0	12	1,029	1,041	100,766
95,638	152,766	142,792	106,815	17,889	46,445	29,955	29,603	55,827	75,626	18,639	29,646	192,167	40,247	85,285	3,080,104	14,762	27,176	21,958	63,896	30,058	3,292	18,152	51,502	3,195,502
2,124	946	56	2,667	13	2,595	1,419	322	10	1,079	0	19	24	164	9	16,199	22,208	99	305	22,612	2,215	27	172	2,414	41,225
2,103	2,703	237	0	0	0	17	0	4,466	3,144	0	0	2,723	194	0	29,071	20	27,394	0	27,414	439	371	508	1,318	57,803
626	352	136	0	0	28	0	0	185	198	247	1,588	2,671	1,259	3,128	24,673	288	487	57,810	58,585	2,255	81	1,872	4,208	87,466
4,853	4,001	429	2,667	13	2,623	1,419	339	4,661	4,421	247	1,607	5,418	1,617	3,137	69,943	22,516	27,980	58,115	108,611	4,909	479	2,552	7,940	186,494
3,435	1,863	1,486	1,955	30	3,415	1,647	172	1,055	1,156	0	230	488	174	50	29,502	1,750	1,092	1,050	3,892	948	214	1,370	2,532	35,926
118	297	331	0	0	0	0	27	39	572	0	0	194	0	0	2,762	8	328	0	336	212	0	63	275	3,373
221	827	30	558	0	179	41	133	142	1,316	59	356	2,216	2,118	1,037	17,854	202	1,407	797	2,406	841	101	602	1,544	21,804
3,774	2,987	1,847	2,513	30	3,594	1,688	332	1,236	3,044	59	586	2,898	2,292	1,087	50,118	1,960	2,827	1,847	6,634	2,001	315	2,035	4,351	61,103
04,265	159,754	145,068	111,995	17,932	52,662	33,062	30,274	61,724	83,091	18,945	31,839	200,483	44,156	89,509	3,200,165	39,238	57,983	81,920	179,141	36,968	4,086	22,739	63,793	3,443,099