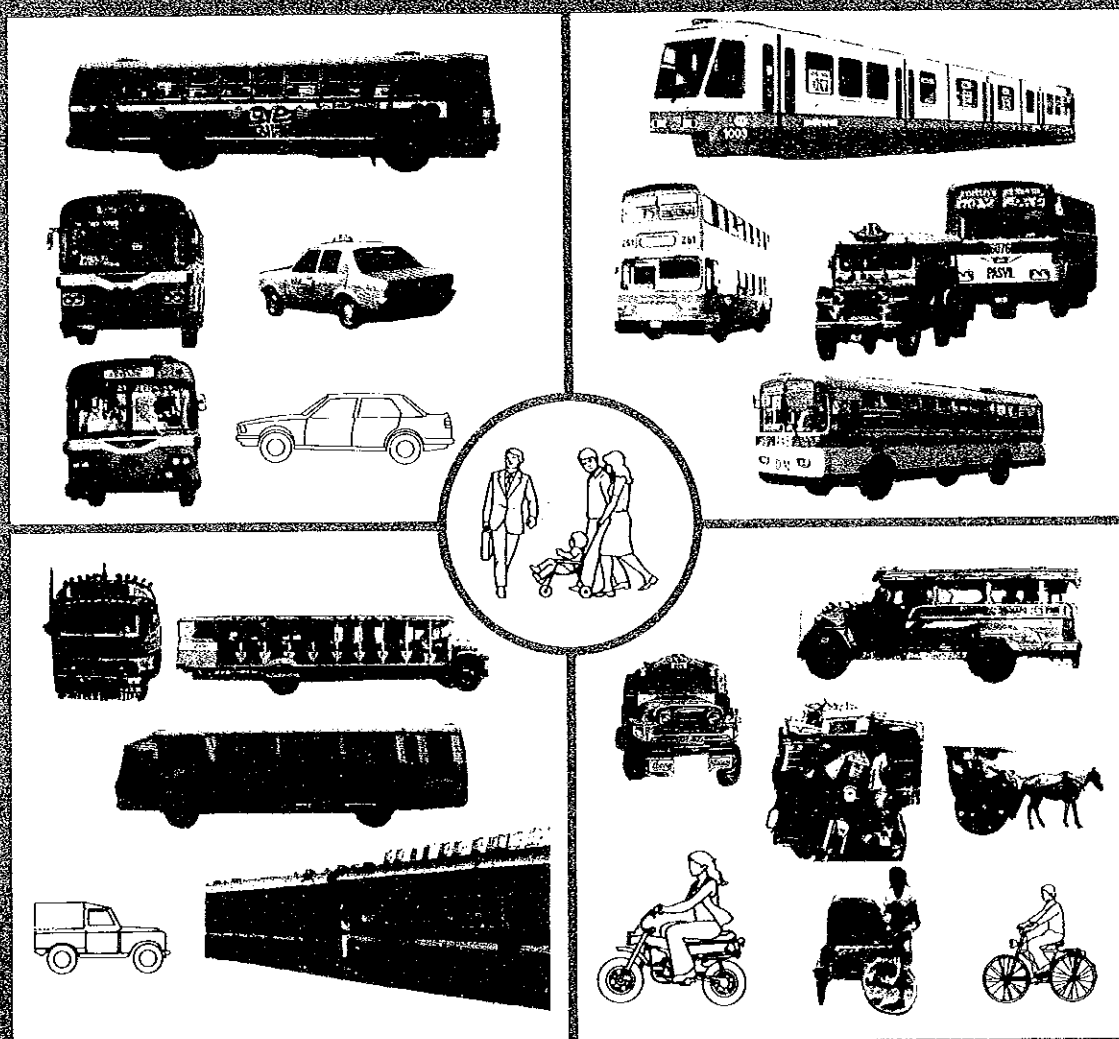


THE METRO MANILA
TRANSPORTATION PLANNING STUDY
(JUMSUT)

FINAL REPORT

MAIN TEXT

PART V : Home Interview Survey (HIS)



March 1984

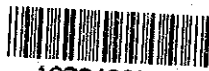
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(JUMSUT)**

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Chapter 16. HIS SURVEY AND ANALYSIS

CHAPTER 16 HIS SURVEY AND ANALYSIS

16.1 OBJECTIVE AND FRAMEWORK OF HIS ANALYSIS

16.1.1 General

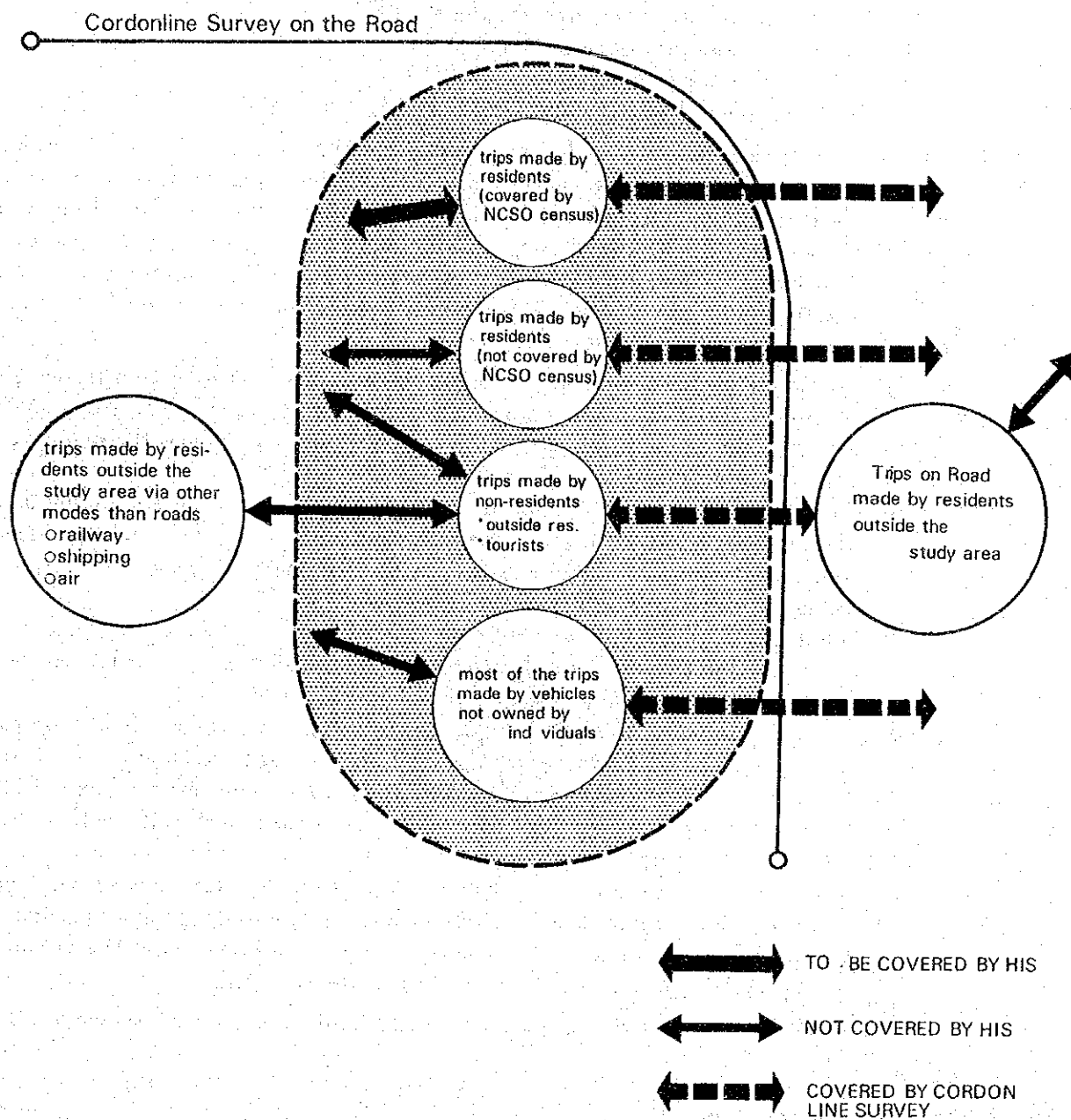
- The purpose of the Home Interview Survey is to obtain detailed information on travel characteristics of residents of an area. The survey normally covers the movement of a person in terms of trip purpose, travel mode, origin and destination of a trip, time, etc. It also covers the socio-economic characteristics of the person including sex, age, occupation, income and car-ownership. Consequently, analysis of the data collected would enable clarification of the following:
 - a) Trip generation/attraction level and characteristics
 - b) Distribution and flow of person trips
 - c) Modal split of traffic demand
 - d) Socio-economic characteristics of residents and transport users.
- The Home Interview Survey is only one of the primary components of the total survey required to obtain the above-mentioned information. This is mainly because the movement of persons within a city is made by different types of people, i.e., those who live in the city, those who live outside the city and the tourists. Therefore, it should be noted that the conduct and analysis of HIS alone would not give a total picture of the urban transport travel characteristics unless it is supported by reliable socio-economic indicators and other supplemental surveys described as follows:
 - a) Cordonline Survey : intends to survey the movement made by non-residents of the survey area. These are the people crossing the cordonline, which is set along the boundary of the survey area. The survey is done by stopping the vehicles and interviewing the passengers.
 - b) Mass Transport Survey : intends to survey the movement made by non-residents who use mass transit such as the train (PNR for Metro Manila). On-board survey at the cordonline or interview survey with alighting passengers at the stations within the survey area is carried out.
 - c) Commercial Vehicle Survey : supplements a particular area of the movement made by empty taxis and commercial trucks which is normally difficult for HIS to cover. This survey is conducted through interviews at selected offices.
 - d) Screenline Survey : intends to survey traffic volume across screenline (imaginary line crossing or cutting the survey area). It also checks the accuracy of the traffic data obtained from the HIS by comparing the calculated traffic volume of HIS, which is supposed to cross the screenline, against the actual traffic volume from the screenline survey.
 - e) Socio-economic Indicators' Survey : intends to collect various socio-economic indicators which are needed for traffic analysis. This includes population, employment and school attendance both by work place and home, industrial output or activity level, income, etc. Area by land use is also surveyed.

A conceptual illustration of the coverage of HIS and Cordonline Survey is shown in Figure 16.1.

16.1.2 Background and Objectives

- The 1980 HIS was designed and implemented by the MOTC. It covered 2.5 percent of the total Metro Manila population — approximately 150,000 persons or 25,000 households. The survey was conducted between August and December 1980. The collected interview

Figure 16.1
Conceptual Illustration of the Coverage
of HIS and Cordonline Survey



sheets were checked and edited both manually and by computer. The data were then initially expanded on the basis of the provisional figures of the 1980 population census. Further analysis was suspended and the data were stored in magnetic tapes.

- Parallel to the HIS, a cordonline survey and a screenline survey were conducted by the MOTC. The former intended to supplement the trip data of Metro Manila non-residents at the periphery of Metro Manila, while the latter was to provide a basis for the verification of traffic level of the HIS OD table as against the actual flow. The data from these surveys were completely processed and stored in magnetic tapes.
- The major thrust of this chapter is to present the steps and methodologies undertaken in the further analysis of the 1980 HIS. In order to complete the processing and analysis of the 1980 HIS data, the following tasks were undertaken:
 - a) Further review and analysis of the original 1980 HIS and Cordon/Screenline data.
 - b) Conduct of supplemental surveys
 - c) Completion of the 1980 HIS data

The results of the analysis and findings derived are presented separately.

16.1.3 Analysis Framework

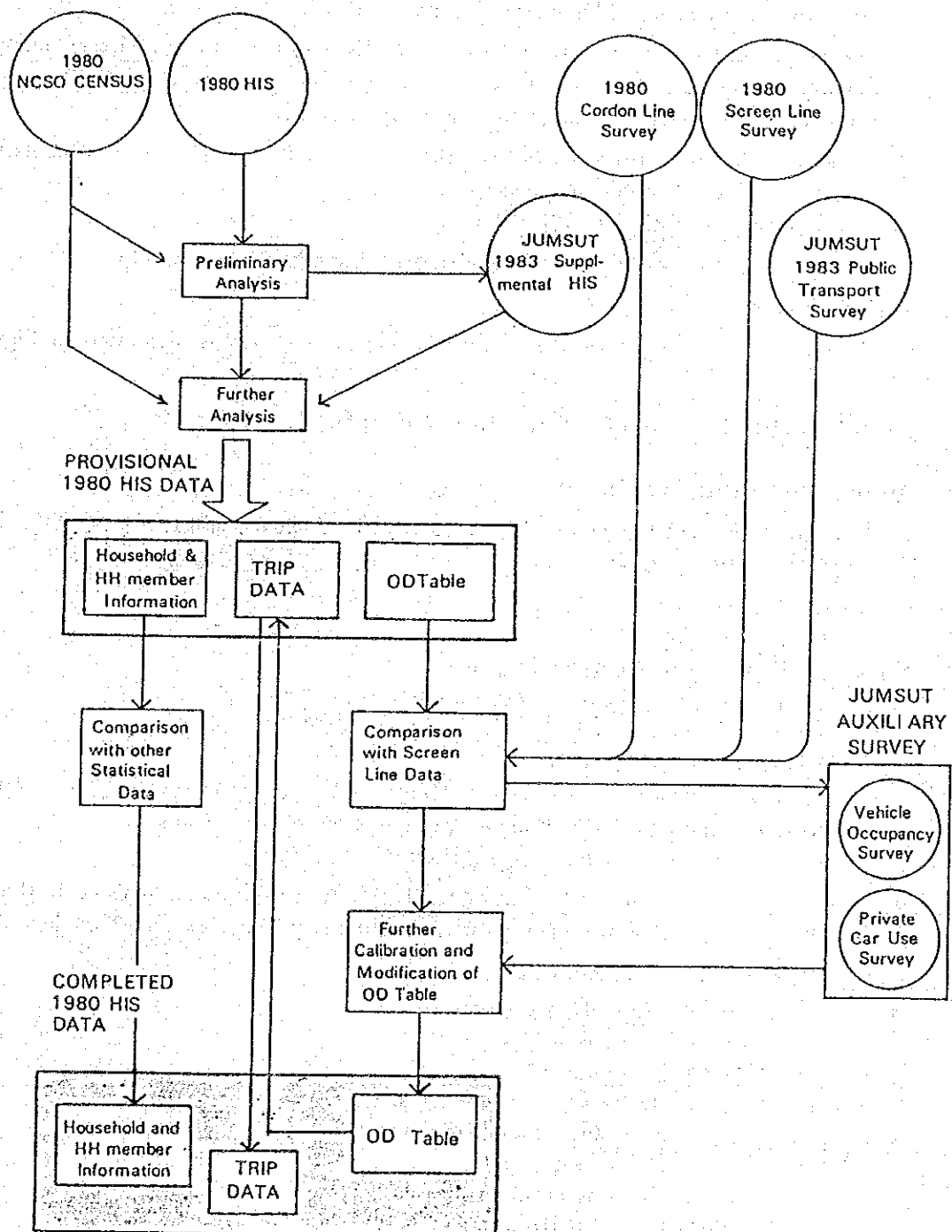
- The overall framework of the analysis made in JUMSUT is illustrated in Figure 16.2.

16.2 REVIEW AND ANALYSIS OF THE ORIGINAL 1980 HIS

16.2.1 Analysis Undertaken in MMUTIP

- Data processing of the 1980 HIS was done from August 1980 to April 1981. The work consisted of the following steps:
 - a) Manual data check
 - b) Data coding for EDP
 - c) Data entry into magnetic tape
 - d) Data check and editing by computer
 - e) Sample master tape
 - f) Tabulation of samples
 - g) Determination of expansion factors based on provisional 1980 census figures
 - h) Development of a preliminary expanded sample master tape
 - i) Preliminary tabulation of the 1980 HIS
- The output tables derived by the MMUTIP Study were limited, as listed in the MMUTIP A-6 Report, since they were made for the preliminary analysis stage. They include:
 - a) Population characteristics
 - by sex and age group
 - by occupation
 - b) Outing and Trip Rates
 - outing rate by sex and age group
 - trip rate by sex and age group
 - trip rate by occupation
 - trip rate by municipality
 - c) Traffic Generation/Attraction
 - travel mode composition

Figure 16.2
Analysis Framework of Completing
1980 HIS Data



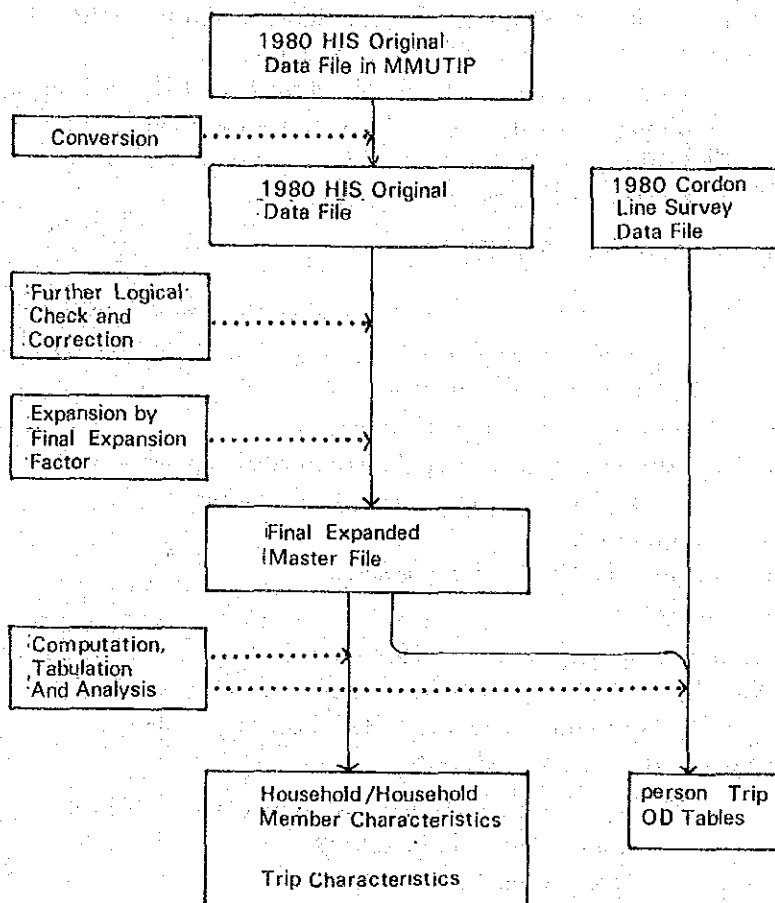
- percentage of intra-municipality trips
 - travel mode by purpose
 - travel mode by municipality
- Each of the above-mentioned steps was reviewed and it was found that methodologies taken in the preliminary analysis were sound. However, the following points need to be considered in the further analysis stage:
 - a) Further logical checks are needed in different aspects to increase data accuracy.
 - b) As there were some uncertainties in the revision of error data, detailed review and check is necessary.
 - c) Expansion factors, both for population and household, should be revised according to the final results of the 1980 NCSO census.
 - d) The socio-economic data, obtained from the 1980 HIS analysis, should be examined in comparison with those of relevant government statistics on the same categories.
 - e) The results of the Cordonline Survey should be considered in the further analysis stage, especially in developing OD tables.

16.2.2 Analysis Undertaken in JUMSUT

- The work flow of this task is shown in Figure 16.3. It comprises the following subtasks:
 - a) Conversion of the 1980 HIS original data file before expansion from ASCII used in MMUTIP to EDCDIC in JUMSUT.
 - b) Conduct of further logical check.
 - c) Expansion of original data based on final expansion factor.
 - d) Development of expanded sample master tapes.
 - e) Computation and tabulation.
 - f) Merging the Cordonline Survey.
 - g) Analysis.
- The four files prepared for the 1980 HIS analysis are: 1) Expanded household information file, 2) Expanded household member information file, 3) Expanded trip information file, and 4) Cordonline data file. Based on these, further review and analysis was made with the following data produced:
 - a) Socio-economic characteristics of Metro Manila in 1980
 - Population and Household
 - Occupation
 - Employment
 - Income Level
 - Car Ownership
 - b) Trip characteristics of Metro Manila residents
 - Trip Rate
 - Trip Generation and Attraction
 - OD Pattern
 - Other Trip Characteristics
 - c) Person Trip Flow movement in Metro Manila
 - Average Daily Traffic (ADT)
 - Peak Hour Traffic

- Among the items above, results on socio-economic characteristics were considered fairly stable. Other results, which were related to trips (particularly trip purposes), were also carefully looked into. The tables were compiled based on the MMUTIP 202 Zones and municipalities.

Figure 16.3
Work Flow of 1980 HIS Analysis



- 1) Further logical checks of the 1980 HIS original data: These were conducted in order to diminish the error for the following combinations of items:
 - a) Work address and employment sector (for example: there is an entry for work address, a blank column for employment sector, or vice versa).
 - b) Occupation and employment sector (for example: student for occupation and school/university for employment sector)
 - c) Trip purpose and institution (for example: "to home" trip purpose but the institution is not home)
 - d) Extremely long travel time (say, more than 4 hours)

It was discovered that the percentage of errors was roughly 2 to 3 percent for the first two items (work address and employment sector, occupation and employment sector). These items were corrected manually.

- 2) **Expansion by Final Expansion Factor:** Both the number of households and population by sex as well as by age group were selected as expansion factors. The same was done for the 1980 HIS preliminary analysis of MMUTIP.

The final NCSO census figures were used and the expansion factors were derived as follows:

- a) Expansion factor for household information:

$$HR(i) = \frac{H(i)}{SH(i)}$$

wherein:

- HR(i) : Expansion factor of household in zone i
- i : 1 – 202 (zone)
- H(i) : Number of households by NCSO census in zone i
- SH(i) : Number of sample households in zone i

- b) Expansion factor for household members' information and trip information:

$$PR(i,j,k) = \frac{P(i,j,k)}{SP(i,j,k)}$$

wherein:

- PR(i,j,k) : Expansion factors of population in zone i, age group j, sex k
- P(i,j,k) : Number of population in zone i, age group j, sex k
- SP(i,j,k) : Number of sample population in zone i, age group j, sex k

In "P(i,j,k)", the number of population by NCSO census was tabulated only by municipality level in terms of age group, so the following estimations were applied:

$$P(i,j,k) = P(i,k) \times AG(m,j,k)$$

wherein:

- P(i,j,k) : Number of population in zone i, age group j, sex k
- P(i,k) : Number of population in zone i, sex k
- AG(m,j,k) : Composition rate of population with age group j and sex k in municipality m where zone i is located.

In "age group-j", classification was made into 11 groups as follows:

7-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-49, 50-59, 60-69, 70-above.

The results on the population expansion factor were slightly different from that in MMUTIP due to the discrepancy of age group structure between the years 1975 and 1980.

The male composition by age group in 1980 was almost the same as that in 1975. The female composition by age group was different between the ages of 5 to 19 years old. Further details are given in Appendix 16.1.

- c) Computation and Tabulation

The revised expanded master files were developed and prepared. They consist of the expanded household file, expanded household members file, and expanded

trip file. The file layouts are presented in Appendix 16.2.

Based on these expanded master files, computations and tabulations were made for those items shown in Appendix 16.2 .

16.2.3 Findings of 1980 HIS Analysis

- Based on the review and further analysis of the 1980 HIS, the following findings were made:
 - 1) **Socio-economic indicators:** The 1980 HIS was able to provide fairly extensive socio-economic data on Metro Manila residents. Although they were estimated based on the sample survey, cross-check with other best available statistics and data revealed that the results are considered reasonably accurate. The 1980 HIS not only produced some new socio-economic indicators but also provided data on their spatial distribution for the first time. The data obtained were:
 - a) Population by age group/sex
 - b) Household size
 - c) Occupation
 - d) Student by residence/school address
 - e) Employment by residence/work place
 - f) Household/individual income level
 - g) Car-owning household
 - 2) **Trip Data:** It was found out that trip data obtained from the 1980 HIS involved some inaccuracy in certain types of trips. As it had been already pointed out in the MMUTIP report, trips with "private" "business" or "at work" purposes were not sufficiently covered by the survey. As shown in Table 16.1, comparisons with other available HIS results indicate that trip rates for the above purpose trips estimated from the 1980 HIS for Metro Manila are extremely low.

Table 16.1
Comparison of Trip Rates in Different Cities

Trip Purpose	Metro Manila		Cebu		Davao
	UTSMMA ^{1/}		MCLUTS ^{2/}	DCUTCLUS ^{3/}	
	1980 HIS	1971	1979	1980	
	All Mode	Excl. Walk	Excl. Walk	Excl. Walk	Excl. Walk
to work	0.27	0.22	0.27	0.18	0.13
to school	0.36	0.19	0.27	0.23	0.14
private	0.08	0.06	0.23	0.33	0.26
business	0.00	0.00	0.22		0.13
to home	0.70	0.46	0.73	0.51	0.40
Total	1.41	0.93	1.72	1.25	1.06

^{1/} UTSMMA : Urban Transport Study in Metro Manila Area

^{2/} MCLUTS : Metro Cebu Land Use and Transport Study

^{3/} DCUTCLUS: Davao City Urban Transport Cum Land Use Study

On the other hand, "to work" and "to school" trip rates are found reasonable as shown in Table 16.2.

Table 16.2
Comparison of Trip Rates^{1/}

	<u>Metro Manila</u> 1980 HIS	<u>Cebu</u> MCLUTS	<u>Davao</u> DCUTCLUS
'to work' trip against total employment	0.58	0.66	0.47
'to school' trip against total no. of students	0.54	0.74	0.50

^{1/} excluding walk trips

- 3) **Peak Hour Ratio:** The 1980 HIS analysis also reveals a high morning peak-hour ratio of trip generation. It shows an 18.1% ratio to total motorized trips for one hour (7:00-8:00 a.m.) or 12.2% for an average of two hours (7:00-9:00 a.m.).
- 4) **Modal Split:** Although the modal split differs from one city to another, the percentage share of private mode in the 1980 HIS seems to be considerably low. This may be attributed to the missing portion of "business" ("at work") and "private" trips which constitute a large share of private mode trips. An overview on modal split in terms of "public transport vs. private" is shown in Table 16.3.

Table 16.3
Modal Split (%)

Mode	<u>Metro Manila</u> 1980 HIS	<u>UTSMMA</u>	<u>Cebu</u> MCLUTS	<u>Davao</u> DCUTCLUS
Public	89.5	56.3	80.6	67.1
Private ^{1/}	10.5	43.7	19.4	32.9
Total	100.0	100.0	100.0	100.0

^{1/} Excluding the mode of "others" and "unknown"

16.3 CONDUCT OF SUPPLEMENTAL HIS

16.3.1 Background and Objective

- In order to supplement the lack of information on "private" and "business" trips in the 1980 HIS data, different alternative methods were considered and compared. It was decided that JUMSUT undertake a new but limited HIS, adopting basically the same methods as that of the 1980 HIS for the following reasons:
 - a) All "private" and "business" trips could be covered probably at a lesser cost compared with other methods, such as interviews at offices or work places.
 - b) Most of the existing EDP programs prepared for the 1980 HIS could be used with only minor changes.
 - c) The results could be compared with those of the 1980 HIS which provides comparative data and information on socio-economic and travel characteristics.
- The objectives of the supplemental HIS were as follows:
 - a) To obtain household members' trip information with particular regard to the "private" and "business" purpose trips. Most of the business trips and some of the private trips are usually non-home based and are linked directly with other purpose trips such as "to work", "to school", etc. Thus, the interviews covered not only these particular trips but also all other trips so that they could be examined as one whole trip chain.
 - b) To get the actual percentage of "business" and "private" purpose trips in the total number of trips and distribution pattern for comparison.
 - c) To obtain more data on various aspects of travel characteristics in relation to trip purpose.
- By conducting the supplemental HIS, the following additional information, though not the direct objectives, can be obtained:
 - a) Historical changes in socio-economic characteristics which have occurred between 1980 and 1983.
 - b) Complete and consistent data package of 1983 on a smaller sample size.

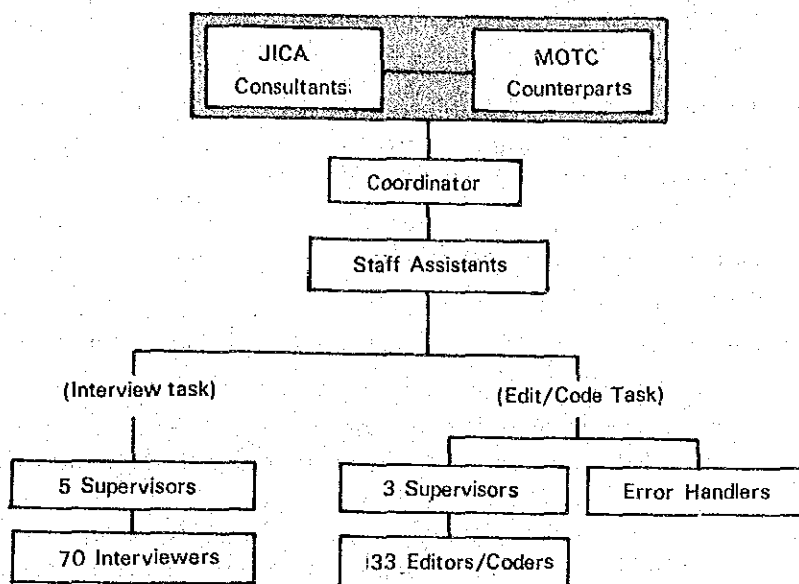
16.3.2 Interview Survey Conducted

1) Approach and Methodology:

- In order to optimize the use of available resources and to secure significant results, the same sampling method and questionnaire as that of the 1980 HIS were used. Then, suitable programs and analysis were applied.
- One of the reasons for the data discrepancy in "private" and "business" trips found in the 1980 HIS was traced to the interview method adopted. Hence, alternative methods were tested through the pilot survey and the following improvements were made:
 - a) The distribution of questionnaires and the interview of sampled household members were carried out together.
 - b) Homes were visited in the evenings from Tuesday to Sunday in order to conduct direct interviews.
 - c) An extensive training of surveyors was conducted during the pilot survey period.

- d) Frequent progress reports were written on the interview work.
- e) Revisions were made on various manuals for surveyors, coders and editors.
- The organization of the survey teams is shown in Figure 16.4

Figure 16.4
Organization of 1983 Supplemental HIS



2) Conduct of Pilot Survey

- A small-scale pilot survey, with a sample of 150 households, was conducted to test various interview methods and to determine the most effective means of obtaining data. In summary, the methods tried out were as follows:
 - a) Interview Method:
 - i) Direct interview of household members
 - ii) Distribution and collection of Interview forms
 - b) Interview Schedule:
 - i) Daytime at 8:00 a.m. to 5:00 p.m.
 - ii) Evening at 3:00 p.m. to 9:00 p.m.
 - iii) Saturdays and Sundays at 8:00 a.m. to 1:00 p.m.
 - c) Interviewers' Grouping
 - i) Boy-Boy pair interviewers
 - ii) Girl-Girl pair interviewers
 - iii) Girl-Boy pair interviewers
 - iv) Single interviewer
- The following measures were found appropriate and were applied during the actual survey:
 - a) Direct Interview

- b) Interview schedule of 3:00 to 9:00 p.m. from Tuesday to Friday and 8:00 a.m. to 1:00 p.m. on Saturday and Sunday.
- c) A boy-girl interview team.

3) Sampling

- The MMUTIP 202 zoning classification was, likewise, adopted for the HIS. However, these zones were further grouped into 37 zones and the external areas were integrated into 7 zones. This zoning system was proposed only for the 1983 supplemental HIS as judged from the correlation between sample size, zone numbers and analysis level. Figure 16.5 shows the Zoning Map used for sampling.
- The sample size of the supplemental HIS was statistically determined. It was based on the probability of trip generation and the degree of reliability of data, considering the relationship between zone system and sample size.
- The number of samples required to cover the OD trips in the proposed zone system, with an estimated accuracy of 90 to 95 percent, was approximately 3,000 households involving 12,000 to 15,000 persons.
- Sampling for the 1983 supplemental HIS was done according to the following:
 - a) The sample household number was calculated by basic zone (37 zones) at the average sample rate of 0.3%.
 - b) The samples were randomly picked out from the existing sampling list used in the '80 HIS.
 - c) For coverage within one zone, the chosen samples were limited to 10 households per barangay. Thus, several barangays within a zone were randomly sampled.
- The proposed samples reached 3,300 households and were distributed as shown in Table 16.4.

Table 16.4
1983 Supplemental HIS Sampling Zones
and Distributed Number of Samples

Supplemental HIS Sampling Zone No.	MMUTIP Traffic Zone	No. of Zones	No. of Proposed Samples	Supplemental HIS Sampling Zone No.	MMUTIP Traffic Zone	No. of Zones	No. of Proposed Samples
1	1-5, 7-9	(8)	290	20	122-126	(5)	70
2	6, 10-16	(8)	110	21	129-133	(5)	130
3	17, 18, 32, 33	(4)	40	22	127, 128	(2)	50
4	19-27	(9)	170	23	87-91	(5)	90
5	28, 29, 31	(3)	40	24	79-86	(8)	120
6	34-36, 38	(4)	40	25	164-171	(8)	120
7	37, 39-41, 47, 49	(6)	60	26	172-179	(8)	150
8	42-45	(4)	50	27	66, 67, 73	(3)	70
9	30, 46, 48, 50-52	(6)	120	28	64, 65, 68-72	(7)	100
10	134-142	(9)	200	29	74-78	(5)	90
11	143, 144	(2)	30	30	53-59	(7)	80
12	160-163	(4)	80	31	60-63	(4)	60
13	153-159	(7)	110	32	181-185	(5)	80
14	145-152	(8)	110	33	180	(1)	20
15	95-101	(7)	90	34	186-193	(8)	110
16	102-105	(4)	60	35	197-200	(4)	70
17	92-94	(3)	40	36	194-196	(3)	60
18	106-113	(8)	90	37	201, 202	(2)	—
19	114-121	(8)	100	Total		(202)	3,300

FIGURE 16.5 ZONING MAP (202 ZONES)



SOURCE: 1980HIS

4) Questionnaire Forms

- Generally, the same questionnaire format was adopted as shown in Appendix 16.3. This was to make easy the correlation of the acquired supplemental data to that already obtained in the 1980 HIS.
- Notable changes made on the questionnaire forms are as follows:
 - a) A specific example on how to accomplish the forms has been included.
 - b) In Form No. 2, the information on places visited during the survey day has been incorporated as a check on the trip information given.
 - c) The format has been altered a little to facilitate filling out of forms.
- As an integral part of the questionnaire forms a letter to the household from the Ministry of Transportation and Communications was included as previously done in the former HIS survey. However, a second letter, this one addressed to the Barangay Captains from the Minister, was used for the supplemental survey. Favorable repercussions were experienced due to this measure. They are the following:
 - a) The Barangay Captains indicated their confirmation and support for the survey by assigning barangay representatives (tanods) to some interviewing groups as guides during their task.
 - b) The barangay members, which were the household samples, were more receptive to the interviewers.
 - c) Interviewers were able to continue their interviewing task at night as late as 10:00 p.m.

5) Interview Task

- A total of seventy (70) interviewers were employed for the interview task. They were grouped into five teams of fourteen interviewers and one supervisor each. All the interviewers were subjected to two days of training and orientation. Short written tests were given to gauge their understanding of the task. They were sent on a two-day field work with their respective supervisors for the actual interview — one pair per barangay.
- Various progress forms were used to monitor the interview task during the survey. The manuals used for the supervisors and interviewers are shown in one of the JUMSUT manuals entitled "HIS Survey Manuals".
- A quota of two households per day per interviewer was set for Tuesday to Friday and a total of seven households for both Saturday and Sunday. The work progress of the interview task is shown in Table 16.5

Table 16.5
Work Progress of the Interview Task

		January		February		Total
		24-31	1-6	7-13	14-20	
1)	No. of Interviewers :	35	65	70	70	
2)	Quota :	490	910	980	980	3,360
3)	No. of Samples Collected					
	o During the week :	430	860	1,320	690	100
	o Accumulated :	—	1,290	2,610	3,300	3,400
4)	% of Completion :	13%	38%	78%	100%	103%

- Based on the reports submitted by the interviewers, it was found out that some difficulties were encountered on the field. These are presented in Table 16.6.

Table 16.6
Difficulties Encountered on the Field

	No. of Samples	
Initially proposed no. of samples	3,300	
Not Interviewed	823	(25%) ^{1/}
– refused		320 (39%) ^{2/}
– transferred		406 (49%)
– unable to locate		97 (12%)
Replaced Samples	829	
Additional collected samples	94	
ACTUAL COLLECTED SAMPLES	3,400	

^{1/} percentage to the proposed initial samples

^{2/} enclosed percentage indicates the composition
for non-interview

6) Editing/Coding Tasks

- Editing and coding of data were originally meant to be independent tasks. However, since there was a difficulty in regulating the output of the editing and coding groups when transmitting data for keypunching, both tasks were merged to increase efficiency.
- Ten editors and twenty-three (23) coders were recruited, followed by a two-day training and orientation process. The training was for both editing and coding work. Thus, no re-orientation was deemed necessary when both teams were merged.
- Transmittal sheets were used to transfer coded forms from coders to computer data encoders on a daily basis. The manuals used for training and orienting of editors and coders are shown in the JUMSUT Supporting Document entitled "HIS Survey Manuals".
- The staff assistant designated for this task regulates all internal activities. He also coordinates with the computer data encoders, whose services were contracted from an outside firm. Progress forms were used to monitor this task.
- The coded output was transferred to punched cards, after which the computer reveals the errors made on coding. These errors were passed on to the "error handlers" for correction and verification.
- A quota of approximately 200 to 250 households per day for processing was set. The work flow progress is shown in Table 16.7.

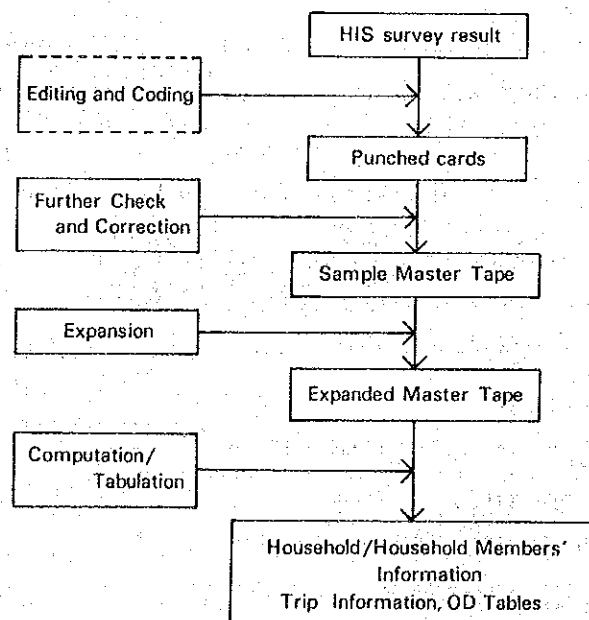
Table 16.7
HIS Data Processing Work Progress

		February 1983				
Tasks		1-6	7-13	14-20	21-27	Total
A. Editing:						
1)	No. of Editors	:	10	10	10	10
2)	Quota	:	410	980	980	930
3)	No. of Samples Edited					
	o During the week	:	410	962	980	1,048
	o Accumulated	:	—	1,372	2,352	3,400
4)	% of Completion	:	12%	42%	71%	103%
B. Coding:						
1)	No. of Coders	:	23	23	23	23
2)	Quota	:	410	980	980	930
3)	No. of Samples Coded	:				
	o During the week	:	240	1,132	980	1,048
	o Accumulated	:	—	1,372	2,352	3,400
	% of Completion	:	7%	42%	71%	103%

16.3.3 Data Processing

- The survey data were edited and coded manually according to the 202 zoning system. The same was done in the 1980 HIS data processing. The data processing of the Supplemental HIS can be summarized as shown in Figure 16.6.

Figure 16.6
Overall Procedure of Data Processing



1) Data Entry

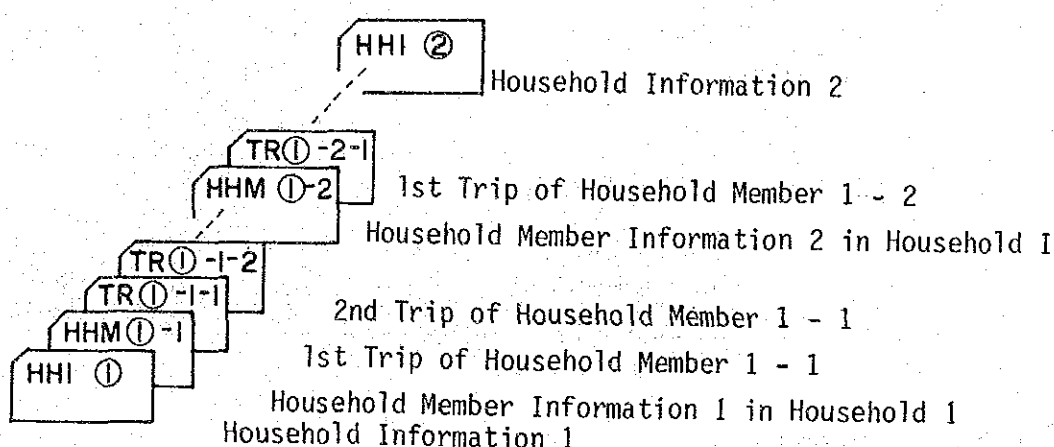
- The survey data consists of:

Form 1 – Household Information

Form 2 – Household Member Information

Form 3 – Trip Information

Each data was entered into punched cards of different formats. These formats of records, shown in Appendix 16.4, were arranged as follows:



2) Data Check

- The principal purpose of the data check is to ensure that all the values of each record/data are located in the specified columns.
- The list of items and specified code numbers used in the data check process are attached in Appendix 16.5. Errors were printed out according to the check list. As shown in Figure 16.7, the mark “*” is printed under the item which was regarded as an error.
- Faulty records were compared with the original survey sheet and corrected manually. A data check was repeated after the correction of error cards.

Figure 16.7
Illustration of an Error List of Samples

HOME INTERVIEW SURVEY RANGE CHECK ERROR LISTING AS OF FEBRUARY 14, 1983								REMARKS
RECORD NO.	1	2	3	4	5	6	7	
76	622	010104	121	622	08	004	24	H-HOLD MEM INFO ERROR
284	713	003802	713010730083003624010204P				34	TRIP-INFO ERROR
554	712	000104	201	712	03	0406401	24	H-HOLD MEM INFO ERROR
555	712	000104	712011630163009712010201				34	TRIP-INFO ERROR
556	712	000104	712092355120001712020101				44	TRIP-INFO ERROR
558	712	000201	331	920	12	0405401	24	H-HOLD MEM INFO ERROR
559	712	000201	712010800092011620010205P83208P				34	TRIP-INFO ERROR

3) Developing the Sample File

- After all the records were checked, the sample master tape was developed. Every survey item, except the transport modes, was coded exactly the same as that in the 1980 HIS. As such, the programs used in the 1980 HIS data processing were also applied for the 1983 Supplemental HIS.
- The codes of transport modes were converted into the same codes used in the 1980 HIS. This was to facilitate the matching of both 1980 and 1983 codes.

4) Expansion of Sample Data

- The sample size of the 1983 Supplemental HIS is 3,400 households which is relatively fewer compared to that of the 1980 HIS with 24,469 household samples. The main purpose of the recent HIS is to supplement the lack of data in the previous HIS. Hence, the data derived from the 1983 HIS was expanded based on the population of Metro Manila in 1980.
- The expansion of the 1983 HIS data was done with the assumption that generally the same transport behavior of Metro Manila residents prevailed for both 1980 and 1983, in spite of changes which occurred in the transportation condition. Concomitant to this, the volume of trips derived from the data expansion was made to represent that of 1980.
- The expansion factors for the 1983 HIS data were based on the 37 sampling zone system as unlike the 1980 HIS which was based on the 202-zone system. The latter's expansion factors are discussed in section 16.2.2 of this report.

Household Information

- Expansion Factor $HR(i) = \frac{H(i)}{SH(i)}$

wherein:

- $HR(i)$: Expansion factor of household in zone i.
- $H(i)$: Number of households by NCSO Census in zone i.
- $SH(i)$: Number of sample household in zone i.
- i : 1 - 37 zones

Household Members/Trip Information

- Expansion Factor $PR(i, k) = \frac{P(i, k)}{SP(i, k)}$

wherein:

- $PR(i, k)$: Expansion factor of population in zone i, sex k
- $P(i, k)$: Number of population by NCSO Census in zone i, sex k.
- $SP(i, k)$: Number of sample population in zone i, sex k.

- The results from the expansion factors for households and household members are shown as Appendix 16.6.

5) Developing the Expanded Sample Master Tape

- This process was achieved by expanding the samples of each zone based on the above expansion factors.

6) Computation and Tabulation

- Based on the expanded master tapes, tabulations were made on the municipality level

for the same items as in 1980 HIS analysis. This is to facilitate direct comparison of the results of both HIS. They include the following:

- a) **Population:**
 - Population by sex, by age group
 - Population by occupation
 - Population by income level
- b) **Household:**
 - Household by household size
 - Household by number of employed persons/average number of employed persons
 - Household by income level/average income level
 - Household by vehicle ownership/average number of vehicles
- c) **Vehicles:**
 - Number of vehicles by type
- d) **Travelled Person Rate:**
 - By age/by sex
 - By occupation/by sex
- e) **Trip Rates:**
 - Trip rate by trip purpose/by occupation
 - Trip rate by trip purpose/by car ownership
 - Trip rate by trip purpose/by age group
- f) **Trip Generation/Attraction:**
 - By trip Purpose
 - By mode
 - By institution
 - By time period and purpose
 - By time period and mode
- g) **OD Traffic Tables:**
 - Private mode by purpose (5 purposes)
 - Public mode by purpose (5 purposes)

16.3.4 Comparative Analysis of the 1980 HIS and 1983 Supplemental HIS

- After the expansion and tabulation of the Supplemental HIS data, the major characteristics of household and household members were compared with the original results of the 1980 HIS. This was done in order to integrate all similar results found in both HIS such as household size, number of employment by household, occupation composition and employment by sector. This is presented in Figures 16.8 to 16.11.
- The results of the tabulation and analysis of the 1983 Supplemental HIS are presented as compiled computer output forms. These data mainly serve to complete the 1980 HIS data. Despite its low sampling rate, as compared to 1980 HIS, the 1983 Supplemental HIS provides various useful data on trip characteristics.
- Major findings gathered from the 1983 Supplemental HIS analysis are as follows:
 - 1) The total number of trips made by Metro Manila residents increased from 6,785 thousand to 7,982 thousand for all transportation modes; 4,014 thousand to 4,917 thousand for the public mode and 469 thousand to 799 thousand for the private mode.

Figure 16.8
Household Size

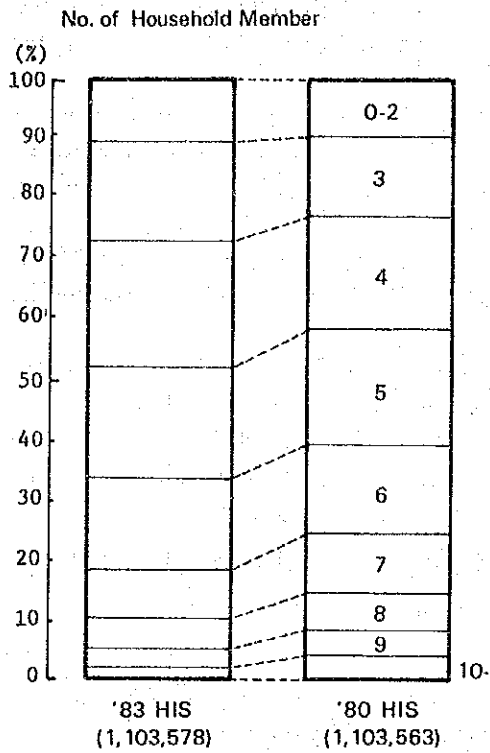


Figure 16.9
Employment by Household

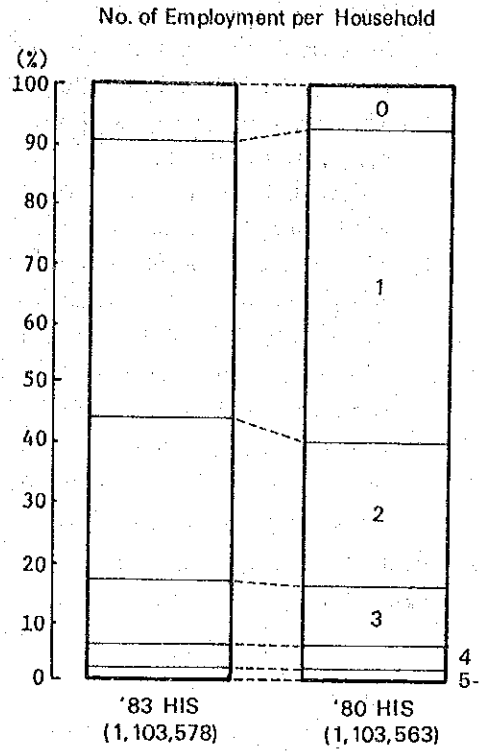


Figure 16.10
Population by Occupation

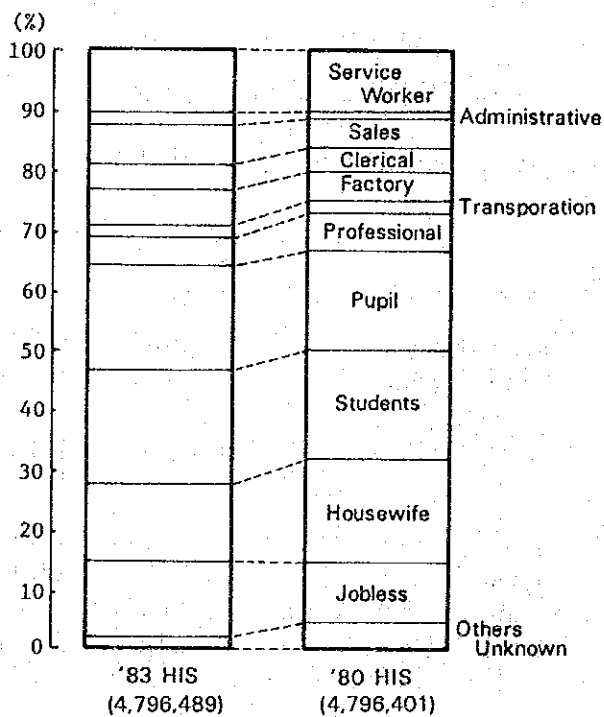
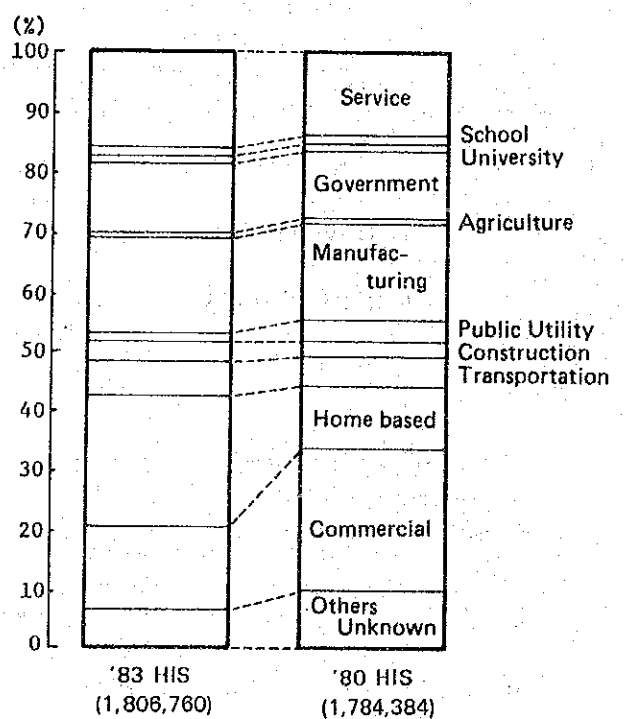


Figure 16.11
Employment by Sector



- 2) A significant difference appeared in the "private/business" purpose trips. There were 420,000 trips recorded for 1980 HIS and 1,252,000 for 1983 HIS. Accordingly, the increase of the "private/business" trips brought about an increase of "to home" trips; from 3,362,000 to 3,824,000 trips.
 - 3) The trip rate by trip purpose in 1983 HIS revealed some discrepancies, e.g., those of the "private/business" and "to home" became 0.26 and 0.80 trips/person in comparison with 0.08 and 0.70 trips/person in 1980 HIS, respectively. The trip rates of "to work" and "to school" are similar in both HIS.
 - 4) The mode composition, public versus the private, has slightly changed from 90% for the public mode as against 10% for the private in 1980 HIS to 86% for the public against 14% for the private in the 1983 HIS.
 - 5) The hourly trip fluctuation, peak hour ratio, shows that there is quite a difference between the 1980 and 1983 HIS. For the public mode, morning peak hour ratio, in terms of trip generation, was 17.4% in 1980 and 11.2% in 1983 HIS. For the private mode, it was 23.7% in 1980 and 13.5% in 1983 HIS. The 1983 HIS results seem to be more adequate compared with other available data, such as the UTSMMA.
- Table 16.8 shows the results on some areas of comparison done between the 1980 and 1983 HIS data.

Table 16.8
Summarized Comparison of 1980 HIS and 1983 Supplemental HIS

Item	1980 HIS	1983 HIS
1. <u>Survey period</u>	Aug. – Nov., 1980	Jan. – Feb., 1983
2. <u>[Samples]</u>		
No. of Sample Households	24,469	3,400
– sample ratio	2.2%	0.3%
No. of Sample Household Members	105,057	13,409
– sample ratio	2.2%	0.3%
No. of Sample Trips	151,329	22,191
[Expanded Results]		
3. <u>No. of Trips (Generation)</u>		
1) <u>By mode :</u>	(000) Trips (%)	(000) Trips (%)
Public	4,014 (59.2)	4,917 (61.6)
Private	469 (6.9)	799 (10.0)
Others	2,303 (33.9)	2,266 (28.4)
Total	6,785 (100.0)	7,982 (100.0)
2) <u>By purpose :</u>		
Work	1,296 (19.1)	1,185 (14.8)
School	1,706 (25.1)	1,723 (21.6)
Private/Business	420 (6.2)	1,251 (15.9)
Home	3,362 (49.6)	3,824 (47.9)
Total	6,785 (100.0)	7,982 (100.0)

(Table 16.8 Cont'd.)

4. Trip rate

1) By purpose :	No. of Trips/person	No. of Trips/person
Work	0.27	0.25
School	0.36	0.36
Private/Business	0.08	0.26
Home	0.70	0.80
Total	1.41	1.66

2) By occupation :	No. of Trips/person	No. of Trips/person
Service worker	1.42	1.50
Administration	1.98	2.14
Sales worker	1.39	1.77
Clerical	2.01	2.09
Factory	1.87	2.02
Transport	1.79	1.92
Professional	1.95	2.18
Student (E)	1.99	1.96
Student (H/U)	1.98	2.09
Housewife	0.49	1.14
Jobless	0.21	0.67
Others	1.23	1.65
Unknown	0.44	0.00

5. Hourly Fluctuation (peak hour ratio)

		Genera- tion	Attrac- tion	Genera- tion	Attrac- tion
Public	(morning peak 7:00- 8:00)	17.4%	17.7%	11.2%	12.9%
	(evening peak-17:00-18:00)	15.7	11.9	12.0	9.7
Private	(morning peak- 7:00- 8:00)	23.7	19.4	13.5	12.0
	(evening peak- 17:00-18:00)	19.2	13.5	11.7	8.7
Total	(morning peak- 7:00- 8:00)	18.1	17.9	11.5	12.8
	(evening peak- 17:00-18:00)	16.1	12.1	11.9	9.6

16.4 COMPLETION OF THE 1980 HIS DATA

16.4.1 Methodology

- The major outputs of this task include the completion of the following data:
 - a) Household/Household Member characteristics
 - b) Person Trip characteristics
 - c) OD tables (trip matrix)
- Analysis of both 1980 HIS and 1983 Supplemental HIS reveals that the data on the socio-economic characteristics of household/household members retain a reasonable level of accuracy. However, the data regarding the trips require some adjustments on the following major areas:
 - 1) Supplement lack of trips with particular regard to "business", ("at work"), "private" and "to home" trips.
 - 2) Expansion of trips obtained from HIS in comparison to the actual level of trips across the screenlines.

3) Development of 1980 HIS OD tables.

The overall analysis framework of this task is illustrated in Figure 16.12.

- The first step for adjusting the data gap can be summarized as follows:
 - a) Overall trip rate was considered to be fairly low. This was particularly due to the lack of “business” and “private” purpose trips as compared to the actual level.
 - b) The “to work” and “to school” trips were considered to be well covered by 1980 HIS. Therefore, the 1980 HIS results were fully utilized.
 - c) The “private” purpose trips were adjusted by:
 - i) applying trips of private purpose obtained from the 1983 supplemental HIS on a 37-zone basis.
 - ii) applying the distribution pattern of 1980 HIS
 - d) The “business” purpose trips were completely replaced by the result obtained from the 1983 supplemental HIS.
 - e) The “to home” purpose trips were adjusted by:
 - i) Applying trip purpose correlation matrices provided in the 1983 supplemental HIS to other purpose trips already revealed.
 - ii) Applying the distribution pattern of the 1980 HIS
- The second step for expanding the adjusted trips can be summarized as follows:
 - a) Verification of the adjusted HIS data against screenline traffic was conducted. It was done for all purpose trips of 24 hours, both for public mode and private mode.
 - b) It was found that the expansion of adjusted HIS was necessary to cope with the existing traffic volume. The average expansion rate was comparatively small in public mode rather than in private mode.
 - c) The adjusted HIS data were expanded by zone pair (within Metro Manila) according to the result of verification.

16.4.2 Supplement of “private”, “business” and “to home” trips

- The procedures taken for adjusting the trips with “private”, “business” and “to home” purposes are explained as follows:
 - 1) “Private” Trip:
 - Although the total number of trips was smaller in 1980 HIS than in 1983 HIS (after expansion), the absolute number of obtained samples was larger in the former than that in the latter. Hence, in creating the OD tables, the 1983 total trip generation/attraction in a 37-zone system and the 1980 trip distribution pattern was used as shown in Figure 16.13.
 - 2) “Business” Trip:
 - The “Business” purpose trips were hardly captured in the 1980 HIS. Hence, the 1983 HIS was entirely depended upon. However, due to the limited accuracy, several models were introduced for creating the OD tables as shown in Figure 16.14.
 - The total number of trips was obtained from the 1983 HIS. The models, such as generation/attraction model and intrazonal trip ratio model, were developed on a 37-zone basis. It was then applied to the 202 zone system.

Analysis Framework of Completing 1980 HIS Trip Data

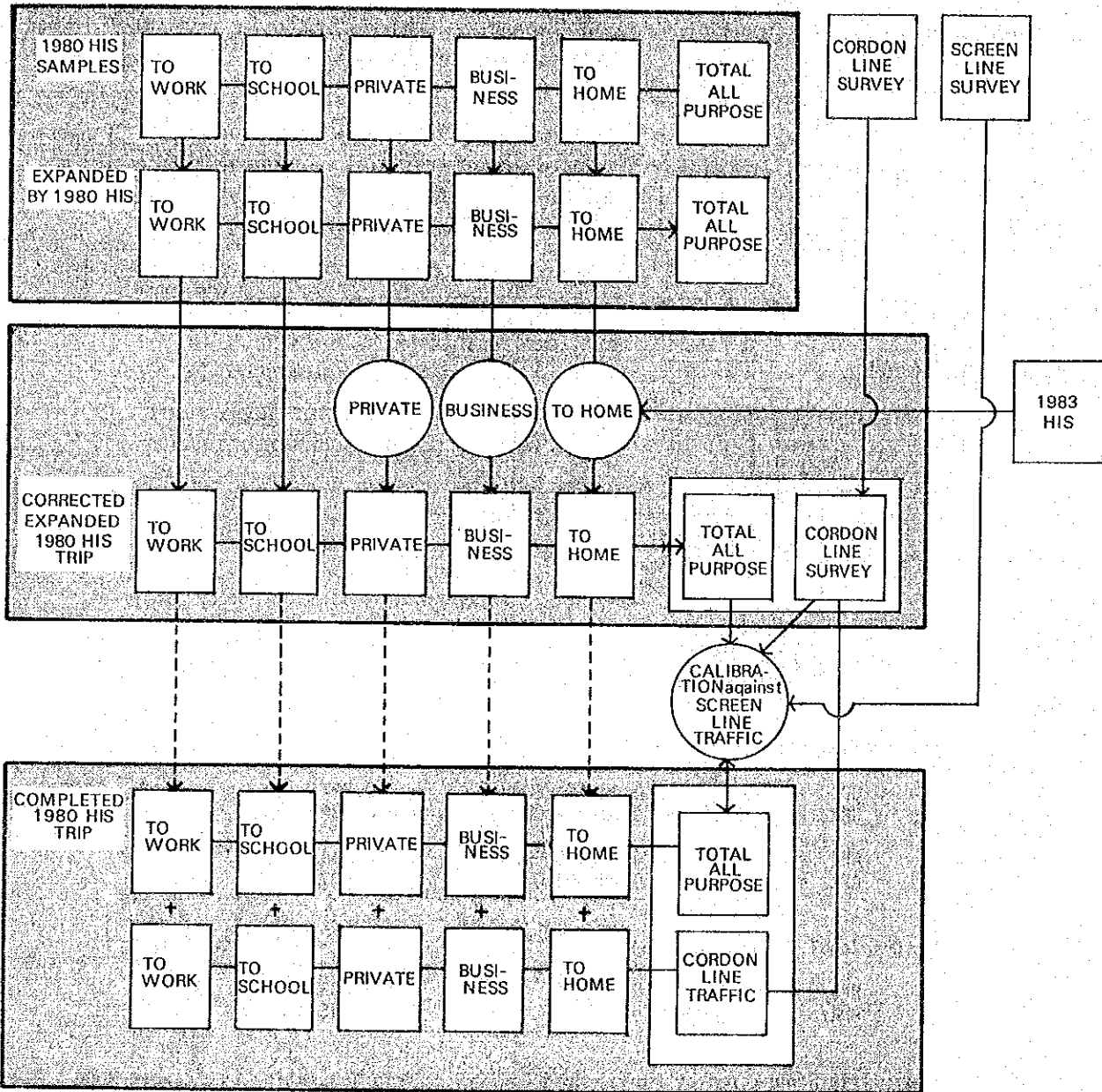
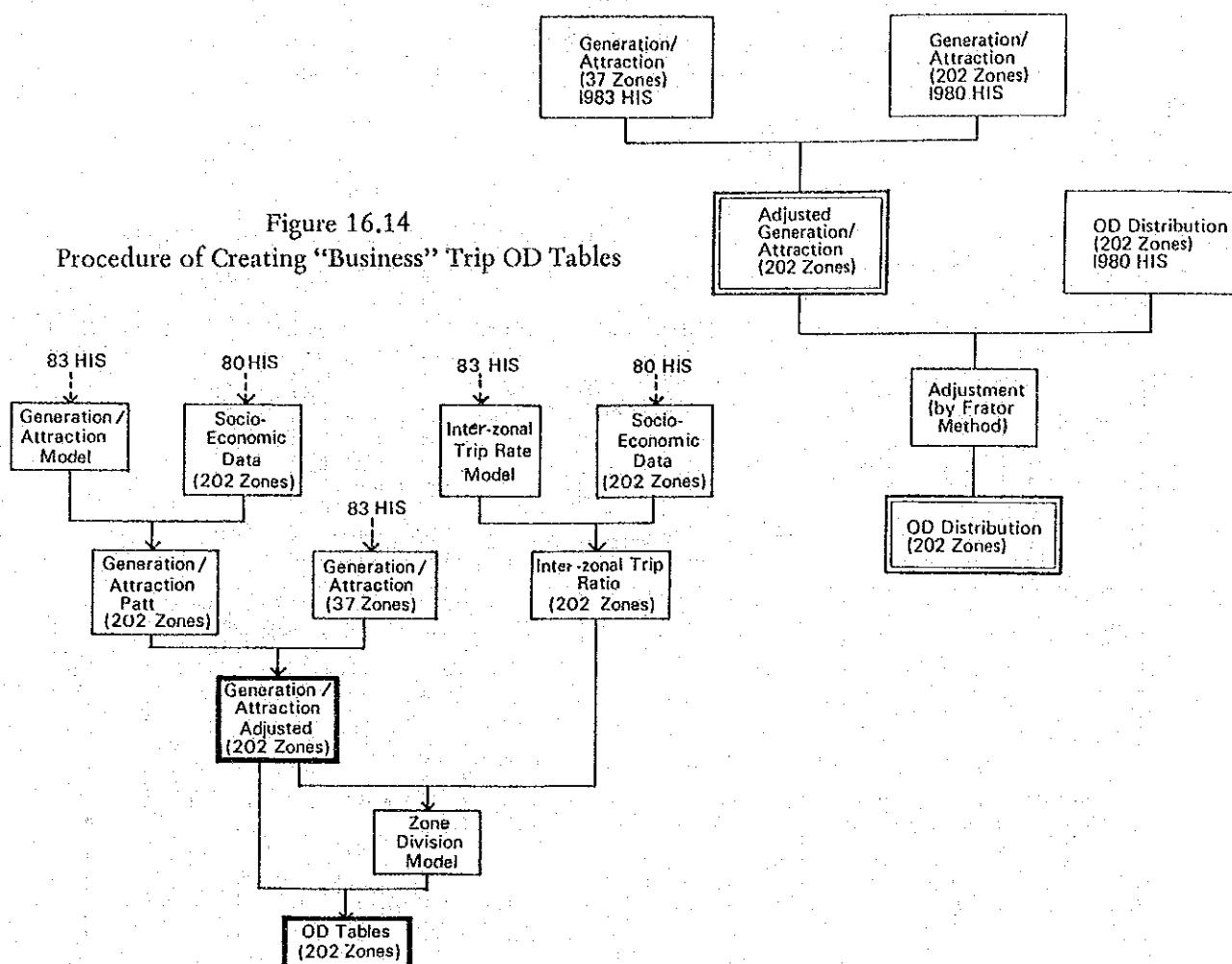


Figure 16.13
Procedure of Creating "Private" Trip OD Tables

Figure 16.14
Procedure of Creating "Business" Trip OD Tables



[Generation/Attraction Model]

$$\begin{aligned} \text{GPB} &= -552.7 + 0.086907 \text{ EMPH} & R &= 0.797 \\ \text{GPR} &= 133.0 + 0.039212 \text{ GWW} & R &= 0.729 \end{aligned}$$

$$\begin{aligned} \text{APB} &= -549.5 + 0.086905 \text{ EMPW} & R &= 0.844 \\ \text{APR} &= -643.9 + 0.054803 \text{ GWW} & R &= 0.807 \end{aligned}$$

[Intra-Zonal Trip Ratio Model]

$$\begin{aligned} \text{RPB/S} &= 0.00154 \text{ D } 0.6531 & R &= 0.833 \\ \text{RPR/S} &= 0.00025 \text{ D } 0.5743 & R &= 0.845 \end{aligned}$$

GPB : Trip Generation by Public Mode
APB : Trip Attraction by Public Mode
RPB : Intra-Zonal Rate by Public Mode
EMPW : Employment by Working Place
GWW : Gainful Worker by Working Place

GPR : Trip Generation by Private Mode
APR : Trip Attraction by Private Mode
RPR : Intra-Zonal Rate by Private Mode
EMPW : Employment by Home Zone
S : Area
D : GWW/S Density of Gainful Worker

3) "To Home" Trip:

- The total generation of "to home" trips was estimated by comparing the generation of "to work", "to school", "private" and "business" trips with that of "to home" trips using purpose correlation matrices. This, eventually, turned out to be almost the same as the result of the 1983 HIS. Therefore, the methodology adopted was the same as that of the "private" trip OD tables.

16.4.3. Expansion of the HIS Data

- Expansion of the adjusted HIS data was done in such a way that they will match the existing traffic level and flow. Procedures taken were as follows:

1) Verification of the adjusted HIS data: This was done as follows:

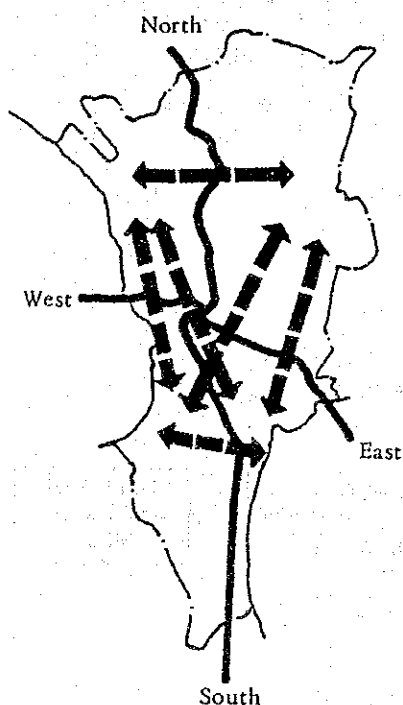
- comparison of traffic volume of screenline survey with the adjusted HIS
- comparison of total unlinked trips of the JUMSUT Public Transport Survey with the adjusted HIS
- comparative analysis of the 1980 Cordonline Survey with the adjusted HIS

The major results of verification are summarized as follows:

- comparison at screenlines as shown in Table 16.9
- comparison of total unlinked trips as shown in Table 16.10.
- comparison of external trips by Metro Manila residents as shown in Table 16.11

The coverage of HIS in terms of volume seemed approximately between 60 to 70 percent for the public mode and only 40 percent for the private mode.

Table 16.9
Comparison of Screenline
Traffic Volume (000)



	Public	Private	Total
W-E (Pasig) Screen			
West Portion			
Observed ^{1/}	968	343	1,311
OD Table ^{2/}	634	108	742
Discrepancy	334	235	568
2/ / 1/	0.655	0.315	0.566
East Portion			
Observed ^{1/}	532	249	780
OD Table ^{2/}	318	118	435
Discrepancy	214	131	345
2/ / 1/	0.597	0.473	0.558
N-S (PNR) Screen			
North Portion			
Observed ^{1/}	1,182	431	1,613
OD Table ^{2/}	663	121	784
Discrepancy	519	310	829
2/ / 1/	0.561	0.280	0.486
South Portion			
Observed ^{1/}	746	440	1,186
OD Table ^{2/}	702	197	898
Discrepancy	44	243	287
2/ / 1/	0.941	0.447	0.758

^{1/} Derived from Screenline Survey.

^{2/} Assigned volume from OD Table

Table 16.10
Unlinked Trips in Terms of Passenger Volume

Unlinked Trips (000)		
From HIS	6,220	(1.00)
MMUTIP ^{1/}	9,840	(1.58)
P.T. in JUMSUT ^{2/}	10,769	(1.73)

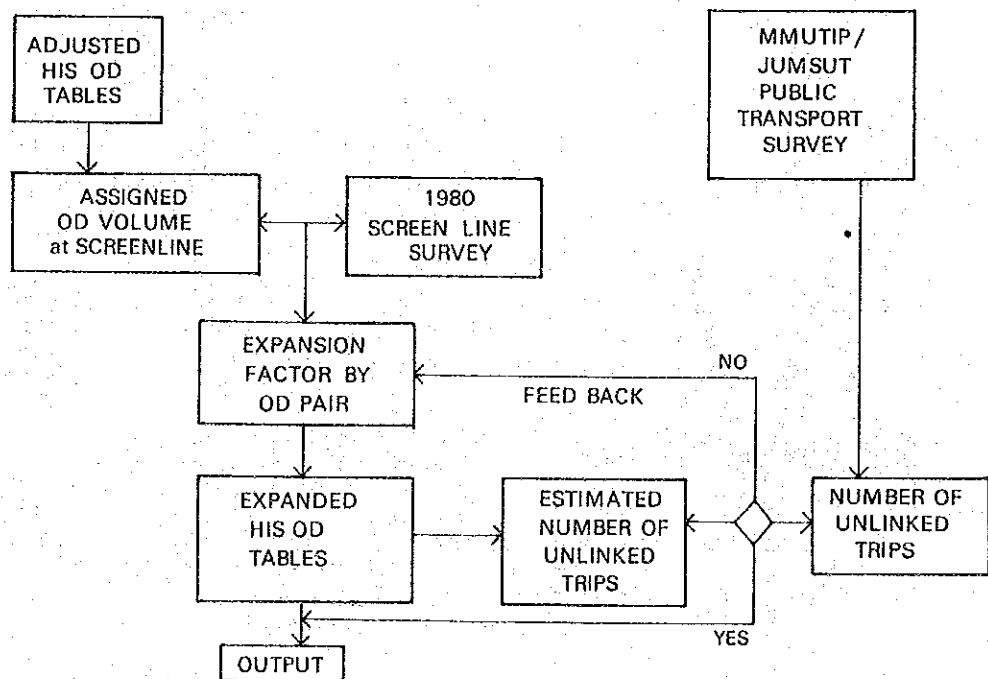
^{1/} results of public transport survey conducted by MMUTIP
^{2/} results of public transport survey conducted by JUMSUT

Table 16.11
Comparison of External Trips by Metro Manila Residents

Trips made by		Trips		Public Mode	Private Mode	
		Internal	External			
Metro Manila residents		HIS	HIS and Cordon	Results from HIS (A)	76	27
				Total Cordonline traffic	882	247
External residents			Cordon	- by External residents	767	177
				- by Metro Manila residents (B)	115	70
				A	0.66	0.39
				B		

- 2) Expansion of OD Trip Data: Expansion of OD trips to the existing transport demand level which was represented by the screenline volume, was undertaken as shown in Figure 16.15.

Figure 16.15
Outline Methodology for Expanding the Adjusted HIS OD Tables



Expansion of public mode and private mode were examined separately. That of the public mode was done in terms of all modes, while the private mode was done by vehicle type e.g., car, taxi and truck/others. The average expansion rates are 1.69 for public, 2.75 for car, 4.95 for taxi and 4.59 for truck/others, respectively. The expansion factors obtained above were applied for the adjusted HIS OD trips by each corresponding OD pair trip volume.

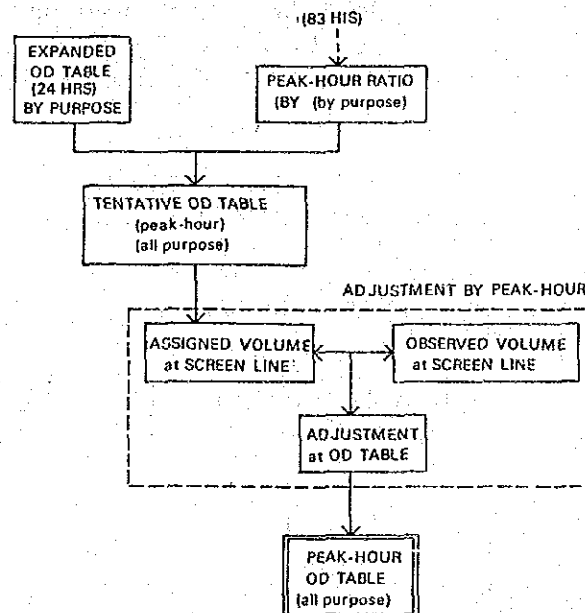
Expanded OD trips are tabulated in terms of person trips by mode (public and private) and by purpose ("to work", "to school", "private", "business", "to home", and "all purpose") for 24 hours' volume. Finally the complete 1980 HIS OD trips were determined by adding the Cordonline OD volume to the expanded HIS OD volume.

The results are tabulated in the form of OD tables for different zoning systems, although they are stored in magnetic tapes. Examples on 27-zone basis (24 internal and 3 external zones) are presented in Tables 17.67 to 17.77 of Chapter 17.

16.4.4 Development of OD Tables

- Apart from the OD tables derived from the analysis explained in the preceding section (16.4.3), the following OD tables were further created for JUMSUT planning purposes:
 - a) peak hour person trip OD tables
 - b) vehicle OD tables, day and peak hour
- 1) Peak Hour Person Trip OD Table:
 - Procedures taken are shown in Figure 16.16.

Figure 16.16
Flow Chart for Peak-Hour OD Table Development



- Judging from the result on hourly fluctuation of trip generation/attraction in the 1983 HIS, the peak hours are from 7:00 to 8:00 in the morning and from 17:00 to 18:00 in the evening. The results of the peak-hour OD tables indicate the following peak hour ratio as shown in Table 16.12.

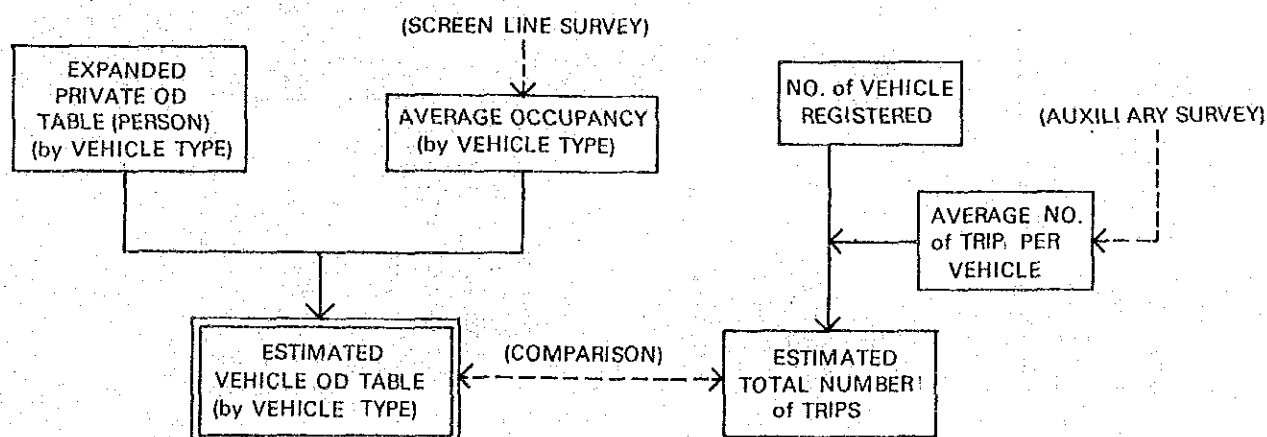
Table 16.12
Number of Trips in Peak-Hours (000)

Mode	Morning Peak (7:00 – 8:00) (% to 000 Day)	Evening Peak (17:00–18:00) (% to 000 Day)	Day (24 hrs.)
Public	714 (8.7%)	619 (7.6%)	8,187
Private	178 (6.2)	210 (7.3)	2,879
Total	892 (8.1)	829 (7.5)	11,066

2) Vehicle OD Tables:

- The vehicle OD tables were developed for road facility improvement or traffic management planning. Since person trip OD tables are the base information of HIS, vehicle OD tables were estimated based on these. The movement of public transport vehicles, such as buses and jeepneys, does not tally with the movement of person trips by public mode. The reason is that vehicles operate along the route fixed by schedule and not by person trip demand, while the movement of private vehicle exactly reflects the demand of person trip by private mode. Therefore, only private vehicle OD tables can be estimated from person trip OD table. The procedure of private vehicle OD table development is shown in Figure 16.17.

Figure 16.17
Vehicle OD Table Development



- The applied average occupancy by vehicle type which was estimated using the result of Screenline Survey, is shown in Table 16.13.

Table 16.13
Average Occupancy by Vehicle Type

Vehicle Type	Occupancy (pass./vehicle)
Car/Jeep	1.93
Taxi ^{1/}	1.00
Van/Truck	3.33
^{1/} Does not include driver	

- The vehicle OD tables obtained are tabulated in computer output format. The total number of vehicle trips is shown in Table 16.14.

Table 16.14
Total Number of Vehicle Trips

Vehicle Type	No. of Total Vehicle Trips (000)		No. of Vehicle Trips estimated by ancillary survey (000) (C)	Comparison	
	(A) ^{1/}	(B) ^{2/}		A/C	B/C
Car/Jeep	883	932	816	1.08	1.14
Taxi	174	177	223	0.78	0.79
Van/Truck	256	271	478	0.54	0.57

^{1/}without cordon line volume

^{2/}with cordon line volume

