3. Supporting Reports

SUPPORTING REPORTS-3.1

ZONAL BREAKDOWN OF FUTURE POPULATION FRAMEWORK

Future population framework is interrelated with future land use concept and with various urban activities, and, therefore, they are reviewed together, and the result of this review provides an important data input for the formulation of a comprehensive transport system for Davao City.

Here, land use in the years 1990 and 2000 will be first conceived of, and forecast based on this concept will be the totals and breakdowns (workers, students) of day population and night population. This forecast will be accomplished in two steps:

i) Population Framework by Block

ii) Population Framework by C Zone (Barangay)

(1) Future Population Framework (Year 2000)

a. Future Land Use Concept

Davao City, located in the southeast part of Mindanao Island, is presently the largest city on the island and is the third largest in the nation, only after Metro Manila and Cebu. Because this City is conceived of as the center of Mindanao Island continuously in the future, urbanization will further advance in this City with a heavy population concentration particularly in the central part of the City, or the Project Area. It will, therefore, be essential that employment opportunities be expanded through sound economic development and that the allocation of urban facilities be governed by safety, rationality, and amenity. Davao will increasingly become an industrial city, as the introduction of large scale industries will be essential for the acceleration of economic development. As the center of Mindanao Island, the Project Area will become the central site of administrative organizations and public service facilities, while it will function as the center of culture/education, as well as of commercial activities.

In other words, the Project Area will be characterized

as a city centering around administrative, economic, and cultural activities, while industry will increase in its importance as a factor supporting the city. Then, future land use concept will be designed for the Project Area under such fundamental characteristics of Davao City. In the first place, the feature of each block in the Project Area is defined as follows:

Block I	- Industrial area, chiefly of coastal industries
Block II	- Industrial area, chiefly of both inland and coastal industries
Block III-A	- Administrative, commercial, and business center of Mindanao Island
Block III-B	- Chiefly residential area
Block IV	- A satellite town of Block III-A

The Airport, Port and Harbor, Industrial Estate, Subdivision, Public Organizations Building, Cemetery, and Ecoland Projects and other existing projects for the Project Area are to be taken into consideration in the formulation of the land use concept. Plans for residential, industrial, commercial and other land are summarized as follows:

i) Residential District

Plan for residential district will take into consideration the feature of each block discussed in the above, and the structure of each group of inhabitants as grouped in Table A.

Table A. Criteria for Residential District

Income Level	Area per Lot (Square Meter)	Gross Population (Person/Hectare)	Composition of (%) Families
High	450	80	10
Middle	300	140	30
Low	150	280	60

ii) Industrial District

Industrial District is to be planned for the types of industries indicated below for each block and based on the existing projects.

Table B. Industrial Type By Block

Block	Type of Industrial	Type of Site	Central Location
I	Heavy Industry	Estate	Bunawan
II	Heavy and Light Industry	Estate	Panacan
III-A	Light Industry	Semi-industrial area	Poblacion
III-B	Light Industry	Semi-industrial area	Vicinity of Poblacion
IV	Light Industry	Estate	Toril

iii) Commercial District

As for commercial district, the center of each block will be made a commercial core and the center of each Barangay, a sub-center.

iv) Other Districts

Considering that Davao City will become an education and cultural center, the universities to be constructed in the future should be geographically distributed under a fixed plan. Academic towns are to be developed in Blocks II and III-B, where not only universities but also relevant research institutes, athletic grounds, student dormitories, faculty housing, and other service facilities will be established. Public organizations' buildings are to be constructed in Block III-B for the improvement of public services. Green belts are to be created in the vicinity of the airport and heavy industry sites for buffer effects. Also, efforts are to be made to preserve, with a minimum of development, the coastal areas, the vicinity of rivers, and the fringes of the Project Area.

b. Night Population

i) Night Population by Block

Night population was estimated firstly by block. However, Block III is large in area size and, therefore, the population of this Block is divided into two; Poblacion, Agdao, and Bucana will make up Block III-A and the remainder, Block III-B. The Population of each of these blocks is to be forecasted taking into consideration the future land use concept and population density.

Table C. Night Population by Block

Block	Night Population
I	110,000
II	130,000
III-A	250,000
III-B	290,000
IV	120,000
TOTAL	900,000

Source: DCUTCLUS Team

ii) Night Population by C zone

Forecast for night population by C zone will take into consideration the future land-use concept and population density, with the block's night population as the control total. The result of this forecast is presented in Fig. A and Fig.B.

c. Night Population of Workers

i) Night Population of Workers by Block

Night population of workers by block is forecast by applying the participation ratio to the total night population of each block. The result of this forecast is given in the table below.

FIG. A NIGHT POPULATION, 1979 and 2000

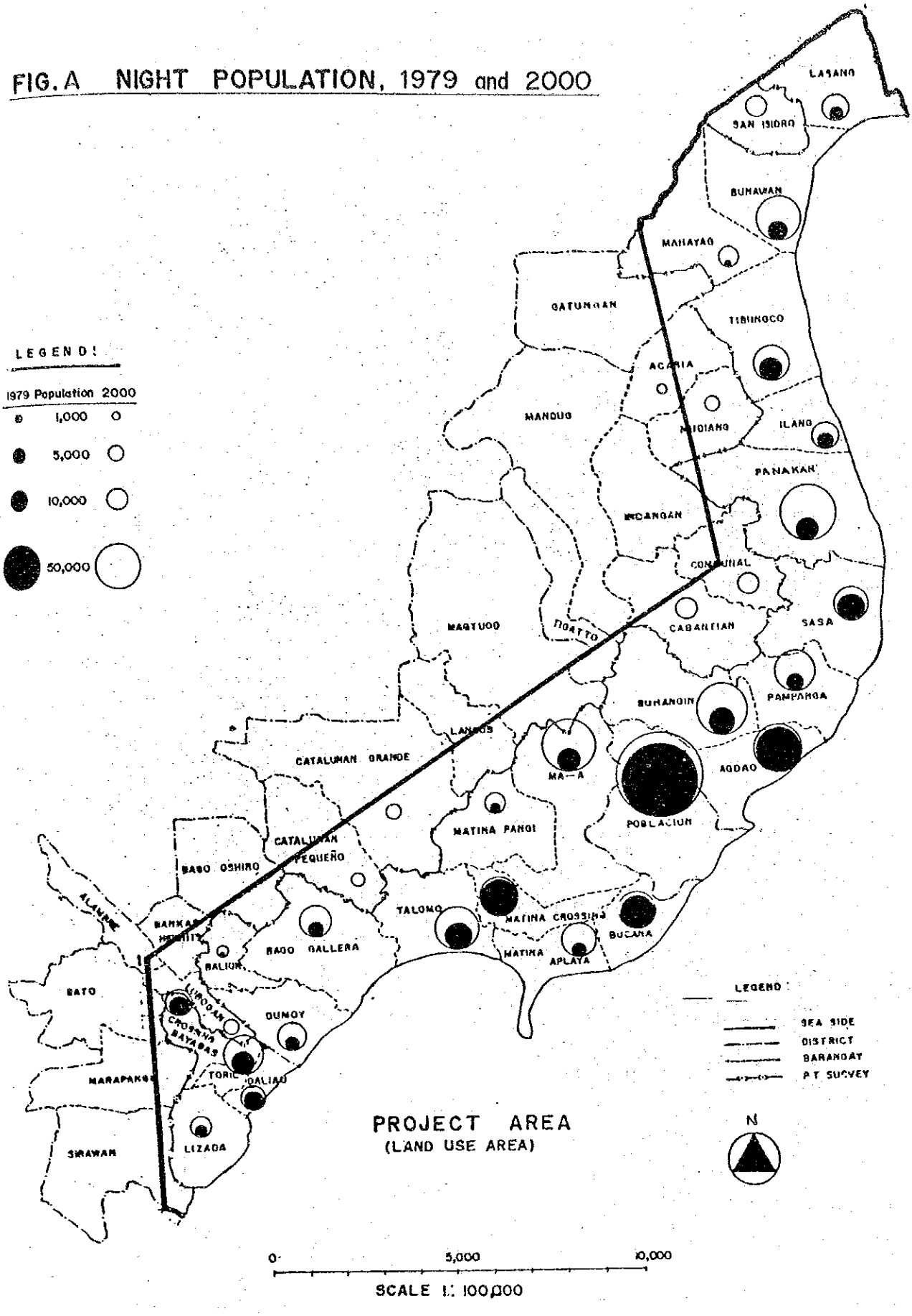


FIG. B POPULATION DENSITY, 2000

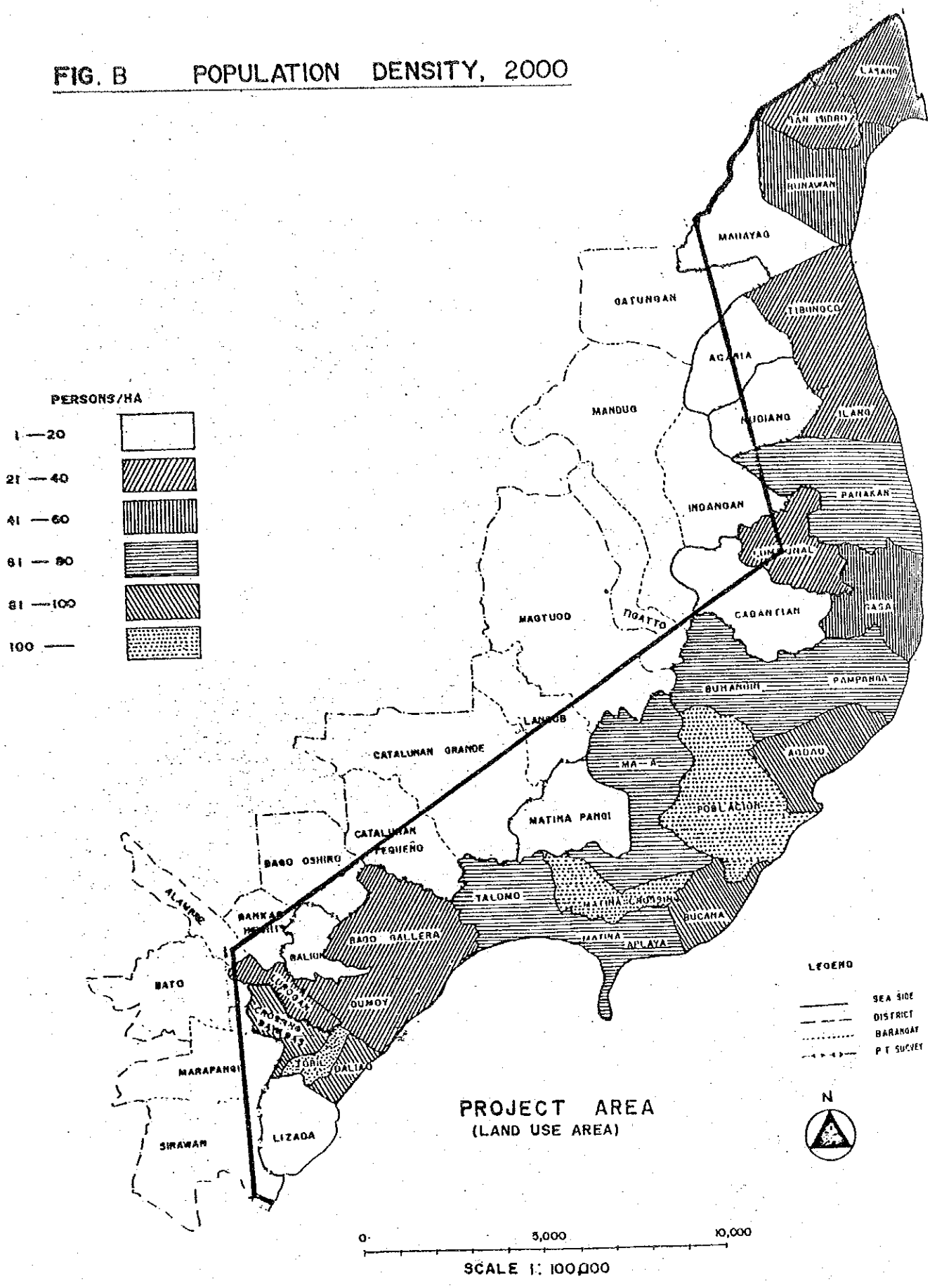


Table D. Night Population of Workers by Block

Block	Workers
I	39,500
II	47,000
III-A	90,000
III-B	104,500
IV	43,000
TOTAL	324,000

ii) Night Population of Workers by C-Zone

Night population of workers by C zone is forecast through the application of workers to population ratio to the total night population of each C zone.

iii) Night Population of Workers by Industry

Primary Industry: Forecast for Night population of workers in the primary industry take into account the area of agricultural land as according to the future land use concept and fishery base development. The result of forecast is shown in Table E.

Secondary and Tertiary Industry: Forecast for Night population of workers in the secondary and tertiary industry, take into consideration the present ratios of workers in the secondary and tertiary industry. The result of this forecast is shown in Table E.

The industrial structure of the night population of workers by C-zone is estimated in similar and adjusted, with the number of workers for each block as the control total.

Table E. Workers by Residence and by Block

Block	Primary	Secondary	Tertiary	Total
I	2,000	15,800	21,700	39,500
II	1,000	14, 600	31,400	47,000
III-A	0	20,500	69,500	90,000
III-B	2,000	28,300	74,200	104,500
IV	4,000	8,800	30,200	43,000
TOTAL	9,000	88,000	227,000	324,000

Source: DCUTCLUS Team

d. Day Population of Workers

i) Day Population of Workers in the Project Area

In forecasting the day population of workers in the Project Area, the number of those who come from Non-Project Area into the Project Area must be taken into consideration. According to the Person Trip Survey result, the ratio of the day population of workers to the night population of workers was 1.043. Assuming, based on this, that the ratio of day to night population of workers will be 1.05 in the year 2000, the day population of workers is estimated at 340,000.

The day population of workers is, then, broken down into industries. Workers who flow into the Project Area from Non-Project Area are considered to be workers in the secondary and tertiary industry, because the day population and night population of primary industry workers are about the same by their nature. Therefore, workers flowing in are distributed at the rates of the night population of secondary and tertiary workers. The result of this forecast is as follows:

Table F. Day Population of Workers by Industry

Workers	Primary	Secondary	Tertiary	Total
Day Population	9,000	88,000	227,000	324,000
Increment	0	5,000	11,000	16,000
Night Population	9,000	93,000	238,000	340,000

Source: DCUTCLUS Team

ii) Day Population of Workers by Block

As for the primary industry, the day population of workers is assumed the same as the night population of workers.

The secondary industry is broken into manufacturing and non-manufacturing for the purpose of forecast. Workers in construction, utilities, mining, and other non-manufacturing industries presently account for about one-third of the total number of workers in the secondary industry. Assuming that this ratio will remain constant in the future, the future day population of workers in non-manufacturing industries are estimated at 31,000. This total is then distributed to each block at the composition ratios of block population. Workers in manufacturing are distributed taking into consideration the area size of industrial development and the kind of industry. The result is shown in Table G.

For the tertiary industry, the forecast is based on the number of terti industry workers per 1,000 of night population and taking into consideration the future land-use concept. The number of tertiary industry workers per 1,000 of night population is estimated for each block as follows:

The number for Block I, which will become an industrial center, is estimated at 150, which is the same as the national average.

The number for Block II, which will also become an industrial center but is close to Poblacion and, therefore, will have a high level of commercial activities, is estimated at 200, which is between the national average and the planning value for the Project Area.

Block III-A is not only the center of the Project Area but will also be the center of Davao City, Region XI, and of Mindanao Island, and, therefore, the number for this Block is assumed to be double the average for the entire Project Area, or 500.

The number for Block III-B, which will be characterized as a residential area, is estimated at 150, same as the national average.

The Project Area average of 250 is used for Block IV, in view of its characteristics as a satelite town of Poblacion.

The number of workers in the tertiary industry is estimated for each block based on the above estimates. The resultant discrepancy between the total of such workers in different blocks and the known total of tertiary industry workers in the Project Area is absorbed by Block III-A (or the number for this block is adjusted so as that the totals jibe with each other). The result is presented in Table G.

Table G. Day Population of Workers by Industry and by Block

Block	Primary	Secondary	Tertiary	Total
I	2,000	17,000	17,000	36,000
II	1,000	29,000	26,000	56,000
III-A	0	19,000	121,000	140,000
III-B	2,000	14,000	44,000	60,000
IV	4,000	14,000	30,000	48,000
TOTAL	9,000	93,000	238,000	340,000

Source: DCUTCLUS Team

iii) Day Population of Workers by C Zone

The day population of primary industry workers is assumed the same as the night population of such segment.

With the number of secondary industry workers of each block as the control total, the number of non-manufacturing workers (which is assumed to be one-third of workers in the entire secondary industry) is distributed to C zones at the zonal composition ratios of population, while the number of manufacturing workers is distributed taking into consideration the area size of industrial development and the kind of industry.

With the number of tertiary industry workers of each block as the control total, the number of tertiary industry workers is forecast for zones which will become the core of a block taking into consideration the urban scale and population, while that for other at the rate of 100 per population of 1,000.

e. Night Population of Students

The night population of students is divided into elementary school children, secondary school pupils, and college students. The rates of enrollment of elementary school children and secondary school pupils, according to the Person Trip Survey result, are 17% and 10%, respectively. Likewise, that of college students is 3.5%, but 5% is assumed in the expectation of future improvement in this rate. Thus, the night population of students is forecast by applying the total enrollment rate of 32% to total night population. The result is as shown in Table H.

f. Day Population of Students

The night population of elementary school children, secondary school pupils, and college students is converted into day population as follows:

i) Elementary school children are assumed to go to the elementary school within their barangay.

ii) Using the secondary school pupils' enrollment rate of 10% and assuming that the average number of pupils per school is 1,500, it is judged that the distribution of secondary schools is one per population 10,000 to 20,000. Therefore, it is assumed that secondary school pupils living in a barangay with a population of less than 10,000 commute to the closest barangay with a population of over 10,000 for school.

iii) It is expected that college students will commute to the academic town to be developed outside Poblacion.

iv) The number of students flowing from Non-Project Area to the Project Area is set at 2,000 in consideration of the Person Trip Survey result, and it is assumed that all of the 2,000 flow into Poblacion.

g. Day Population

Day population can be forecasted by the following equation:

Day Population = Night population - Night Population of Workers + Day Population of Workers - Night Population of Students + Day Population of Students.

The result is as shown in Table H.

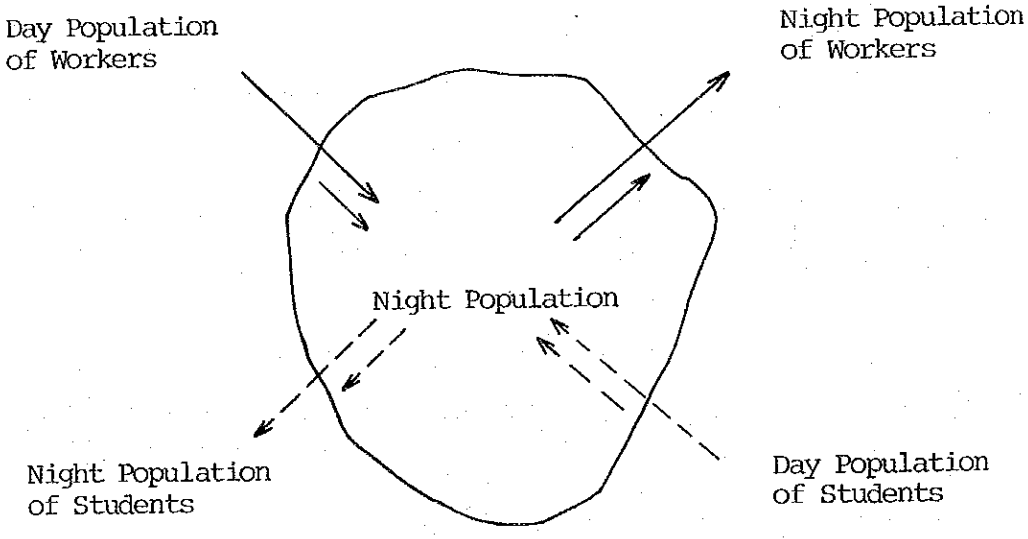


Fig. C. Concept of Day Population

Table H. Future Population Framework (Year 2000)

Block	(A) Night Population	(B) Day Population	Workers		Students		(B)/(A)
			Day Population	Night Population	Day Population	Night Population	
I	110,000	109,300	39,500	36,000	35,200	38,000	0.99
II	130,000	136,200	47,000	56,000	41,600	38,800	1.05
III-A	250,000	310, 500	90,000	140,000	80,000	90,500	1.24
III-B	290,000	238,100	104,500	60,000	92,800	85,400	0.83
IV	120 ,000	123,900	43,000	48,000	38,400	37,300	1.03
TOTAL	900,000	918,000	324,000	340,000	288,000	290,000	1.02

Source: DCUTCLUS Team

(2) Future Population Framework (Year 1990)

Population framework for the year 1990, which is a mid-point between the present (1979) and the target year (2000), is conceived of as explained hereunder.

It would be ideal if the process of development progressed with a smooth continuity, because urban development necessitates huge sums of fund and a long period of time and, therefore, an excessively rapid progress would not only entail an unbearable burden on public finance but also bring about diverse distortions through rapid change in urban structure. Therefore, the population framework for the year 1990 is estimated based on the average annual population increase rate for the period of 1979 to 2000, with minor adjustment as indicated by the review of development program under the land-use concept.

The result is as presented in Table I.

Table I. Future Population Framework (Year 1990)

Block	(A) Night Population	(B) Day Population	Workers		Students		(B)/(A)
			Day Population	Night Population	Day Population	Night Population	
I	45,000	43,300	15,100	12,000	14,200	15,600	0.95
II	60,000	64,000	20,200	25,600	18,900	17,500	1.07
III-A	225,000	263,200	75,500	107,300	70,850	77,250	1.17
III-B	190,000	159,750	63,700	37,000	59,850	56,300	0.84
IV	70,000	71,550	23,500	26,000	22,050	21,100	1.02
TOTAL	590,000	601,800	198,000	207,900	185,850	187,750	1.02

Source: DCUTCLUS Team

SUPPORTING REPORTS-3.2
INDUSTRY SURVEY RESULTS

(1) General

In connection with the DCUTCLUS purpose to formulate a comprehensive transport masterplan for the city of Davao, an industrial survey was conducted from October to December, 1980 encompasing 5 districts in the city, namely Poblacion, Bunawan, Buhangin,Talomo and Toril.

(2) Objectives

Objectives of the survey were as follows:

i. To know the distribution of manufacturing industries by type, by employment size & by operational scale;
ii. To outline the problems and difficulties confronted by the manufacturing industries;
iii. To know the future possibilities of the industries perceived by the entrepreneurs.

(3) Outline of the Survey conducted

a. Procedure

A list of manufacturing industries in Davao City with 10 or more employees prepared by the NCSO in 1978 was used as the basis of the survey, and was further updated by using the Davao City's Trade and Telephone directories. An official letter attached to the survey questionnaire was submitted to each interviewee.

b. Sample Rate

The sample survey totalled 156 establishments. As of October, 1980, 223 establishments of 10 or more employees were listed in total. therefore, the sample rate of the survey was calculated at 70.0%, although small or cottage industries of less than 10 employments were excluded from the survey. The establishments interviewed were then classified according to the Philippine Standard Industrial Classification (PSIC) based on the products they were manufacturing.

c. Questionnaire Format

The questionnaire forms used in this survey are presented in Fig. D.

(4) Results of the Survey

TABLE-A. Summary of the Interview Survey of Existing Industries, Project Area, 1980

PSIC CODE	TYPE OF INDUSTRY	ESTABLISHMENT NO.	%	EMPLOYMENT NO.	%	ANNUAL GROSS REVENUE ₱000	%	ANNUAL GROSS REVENUE/ EMPLOYMENT (₱000)
31	Food, Beverage & Tobacco	48	31	2,928	17	113,130	22	39
32	Textile, Wearing Apparel & Leather	11	7	343	2	7,065	1	21
33	Wood & Wood Products	42	27	11,193	64	184,275	36	16
34	Paper/Paper Products Printing & Publications	11	7	438	2	23,933	5	55
35	Chemical & Chemical Products	14	9	1,069	6	82,500	16	77
36	Non-Metallic Products (Cement, etc.)	3	2	225	2	15,300	3	68
37	Basic Metal (Iron, Steel, etc.)	3	2	321	2	18,000	3	56
38	Fabricated Metal Products, Machinery & Equipment)	24	15	1,054	6	71,280	14	68
39	Other Manufacturing	-	-	-	-	-	-	-
	T O T A L	156	100	17,571	100	515,483	100	

Note: Establishments interviewed are limited to those with 10 or more employees.

Source: DCUICLUS Survey

a. Distribution of Industries

- Table A. shows the 156 respondents, 31 per cent belong to food, beverage and tobacco industries; 27 per cent are in wood and wood products and 15 per cent belong to fabricated metal products, machinery and equipment. The distribution of manufacturing industries by type is shown in Fig. A. The map shows that food & beverage industry is concentrated in the Poblacion and Talomo districts. This accounts for the heavy concentration of population and the presence of large food and beverage establishments in the 2 districts. Larger industries based on forest products concentrate in the districts of Bunawan, Buhangin, and Talomo. This accounts for the industry's location requirement for water frontage. As an overall view, the northern portion of the city is characterized by the presence of medium and heavy industries (Code 33 - 38) while the southern portion is dominated by

light industries, particularly food & beverage industry (Code 31) which accounts for the areas' natural advantage of having underground water good for human and industrial consumption. For detailed Industry distribution by district, see Table B.

Table B. Total number of Establishments, by District, and by Industry Code Project Area, 1980

DISTRICT	TOTAL NUMBER ALL INDUSTRY CODE	NO. OF ESTABLISHMENT BY INDUSTRY CODE								
		31	32	33	34	35	36	37	38	39
Poblacion	56	20	9	7	8	4			8	-
Bunawan	23	2		10	2	5	2	1	1	-
Buhangin	38	6	1	13	1	2		1	14	-
Talomo	27	13		11		1		1	1	-
Toril	12	7	1	1		2	1			-
TOTAL	156	48	11	42	11	14	3	3	24	

Table C. Total Number of Manufacturing Establishments by All Industry Code by District and by Employment Size, Project Area, 1980

DISTRICT	TOTAL	NUMBER OF ESTABLISHMENT EMPLOYMENT SIZE			
		10-19	20-99	100-199	200+
Poblacion	56	34	19	1	2
Bunawan	23	1	10	7	5
Buhangin	38	9	20	7	2
Talomo	27	7	12	3	5
Toril	12	4	6	1	1
T O T A L	156	55	67	19	15

- By employment size, 43 per cent of the establishments were under 20-99 employment category; 35 per cent were listed on 10-19 employment size; 12 percent for establishments in the 100-199 group; and 10 percent for more than 200 employment category. As shown in Fig. A and Fig. B, Poblacion and some areas of Buhangin districts, namely, Agdao and Buhangin are characterized by a marked concentration of service oriented manufacturing establishments with 10-19 and 20-99 employment size; majority of these establishments belong to bakery business, printing and automotive repair shops.

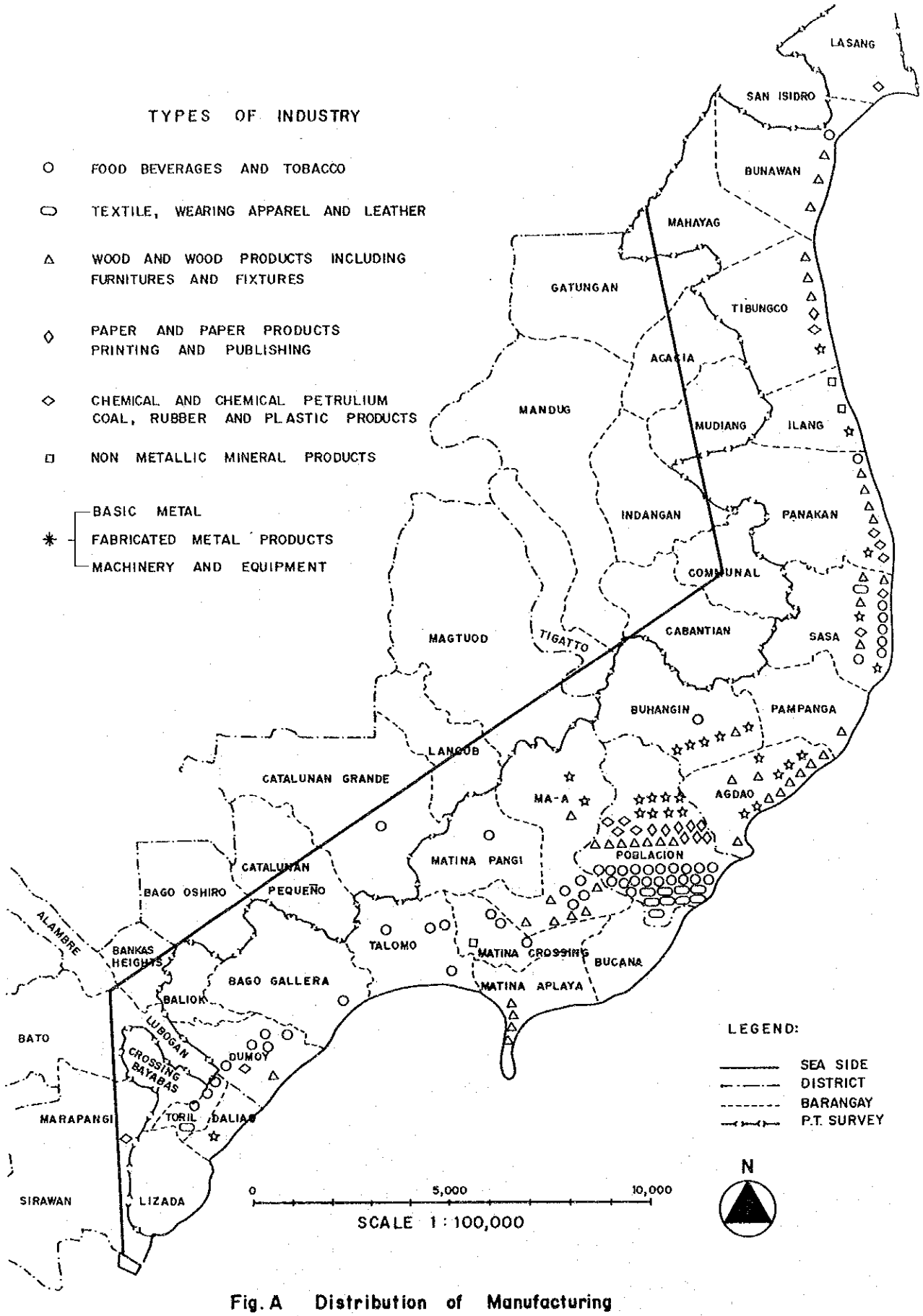


Fig. A Distribution of Manufacturing Industries by Type, 1980

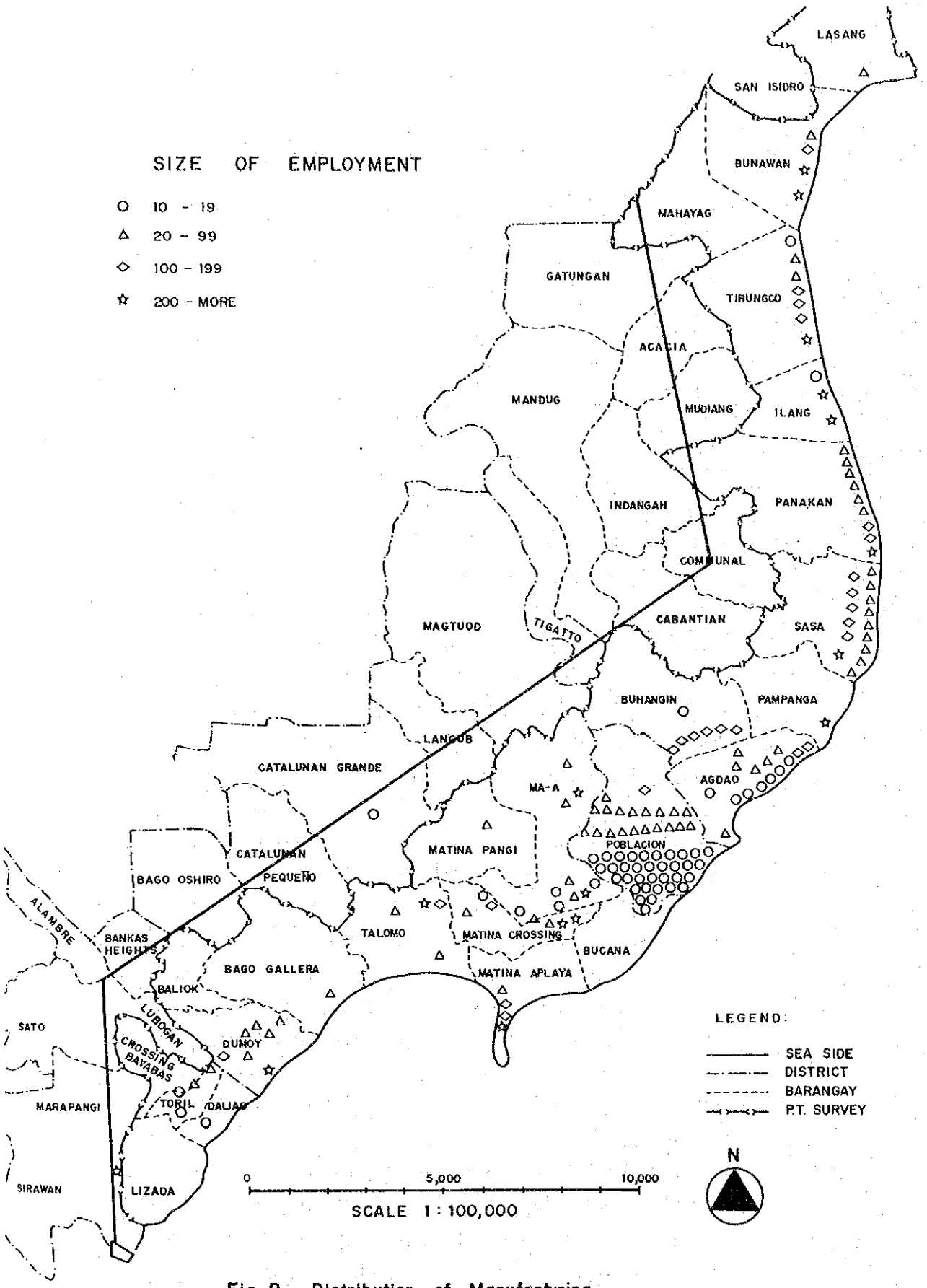


Fig. B Distribution of Manufacturing Industries by Employment Size, 1980

Table D. Total Number of Manufacturing Establishments by all Industry Code by District and by Operational Scale, Project Area, 1980

DISTRICT	TOTAL	NUMBER OF ESTABLISHMENTS ANNUAL GROSS REVENUE						
		less than 10,000	10,000- 50,000	50,001- 100,000	100,001- 500,000	500,001- 1,000,000	1,000,001- 5,000,000	5,000,001- or more
Poblacion	56	1	9	13	12	11	6	4
Bunawan	23	-	-	1	-	1	6	15
Buhangin	38	-	-	3	9	1	3	22
Talomo	27	-	-	5	3	4	5	10
Toril	12	-	2	-	1	1	2	6
T O T A L	156	1	11	22	25	18	22	57

- By operational scale, 37 percent of the sample establishments operated on 5,000,000 or more annual gross revenue scale; followed by 100,001 - 500,000 which is 16 per cent (Table D). Based on the survey result, annual gross revenue was estimated at ₱515,483,000 for all sampled industries. As estimated, 36 per cent of the gross income came from wood and wood products industry; 22 per cent from food and beverage industry; 16 per cent from fabricated metal products, machinery and equipment industry. There were 17,571 employees belong to wood and wood products industry (Code 33) and 17 per cent belong to food and beverage industry (Code 31). Although these industries (Code 31 and 33) eshibited big annual gross income, as shown in Table A gross revenue per employment is low. This is attributed to their being labor-intensive industries and the level of skills of laborers need not be very high. The heavy industries (Code 35-38) show a relatively high gross revenue per employment. This is attributable to their being capital - intensive industries and as such, uses large amounts of capital equipment in relation to their labor force. Paper and paper products, printing and publication industry (Code 34) although considered light industry, show a relatively high gross revenue per employment. This industry utilizes capital equipment resulting to a high output per worker. As shown in Fig. C, the existing industries having annual gross revenue of more than ₱5 M established their plants to areas adjacent to the sea.

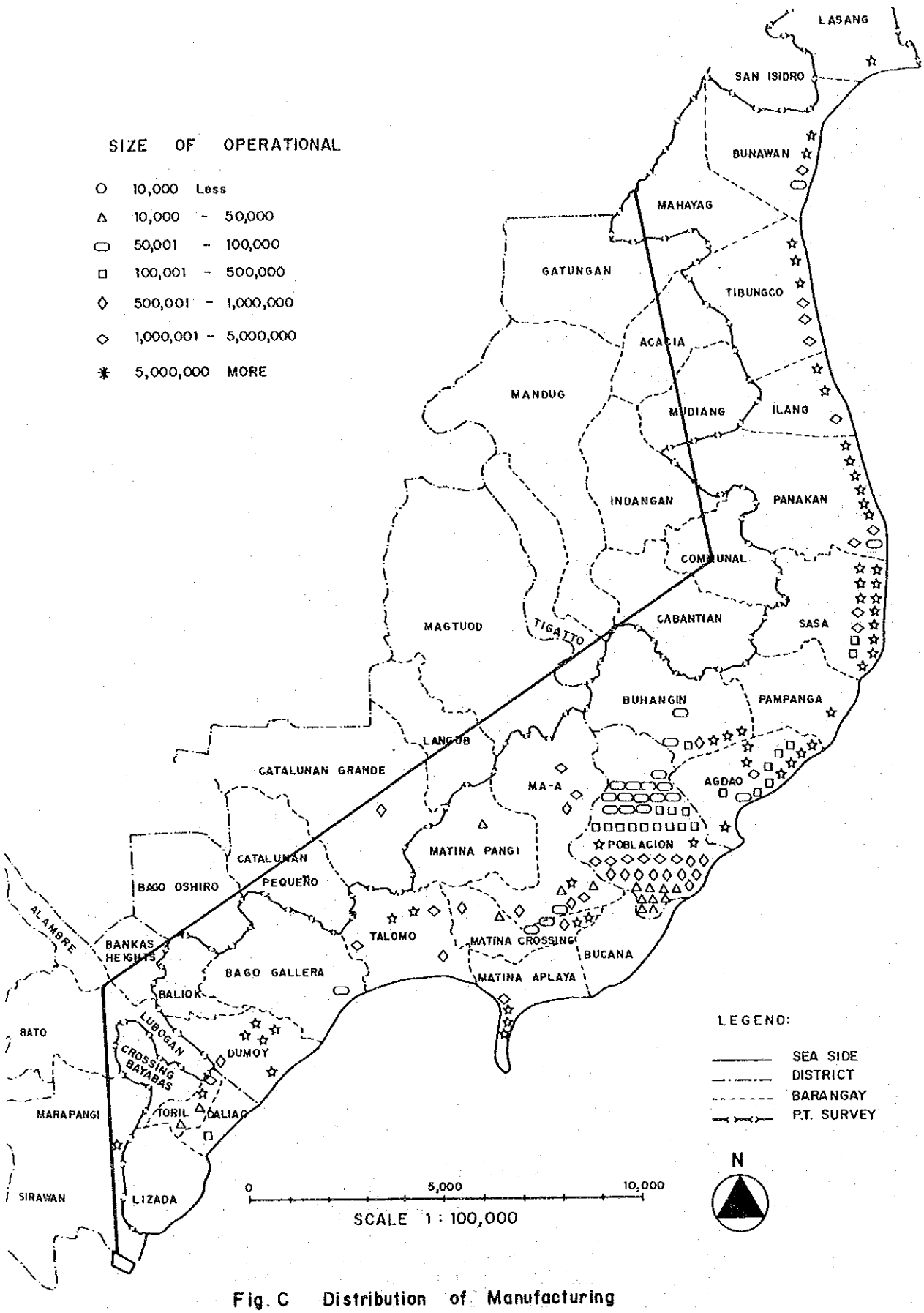


Fig. C Distribution of Manufacturing Industries by Operational Scale, 1980

b. Existing Industry Problems

From the survey results, the establishments covered in sample list have somewhat similar problems. Out of 156 surveyed industrial establishments in the project area, 56 per cent have problems on telephone. Aside from having 2 telephone companies, the PLDTC and DCTS, the inefficient operation of telephone service greatly hamper the operation of industrial establishments located in Buhangin, Talomo and Bunawan especially those engage in service oriented manufacturing businesses as shown in Table E. Other problems have been identified during the survey as follows:

i. Finance

- Out of 20 establishments having problems on finance, 12 are in Poblacion. Majority of these establishments engaged in food and beverage industry (4) and forest based industries (8) whose employment size ranges from 20-99 with annual gross revenue between 50,000-1,000,000. To further identify:

  o Bakery business - indiscriminate taxes imposed on manufacturing. As quoted: "Don't tax us out of existence".

  o Ice plant/cold storage business - bank financing loans on such ventures are freezed in Davao City. Bank financing, if any is characterized by high interest rates.

ii. Labor

As shown in the Table E, 12 out of 15 listed establishments having labor problems are found in Poblacion and Talomo. Food and beverage (6) and mechanical engineering (4) industries whose employment size ranges from 10-99 with annual operational scale of 100,000 - 1,000,000 have been notably affected. To pinpoint industries:

o Bakery business - increased in wage & allowances forced reduction of employment.

Table E Problems being Faced by Existing Industries

DISTRIBUTION OF INDUSTRIES	TOTAL	PROBLEMS (NUMBER OF ESTABLISHMENTS)							
		Water	Electricity	Telephone	Transportation of Goods	Labor	Market	Finance	Others
1) By District									
Poblacion	92	8	7	29	5	8	5	12	18
Bunawan	26		3	17	1	1	1	3	
Buhangin	35	1		22		2		4	6
Talomo	32		1	17		4		1	9
Toril	6		1	2					3
TOTAL	191	9	12	87	6	15	6	20	36
2) By Type									
31 Food, Beverages & Tobacco	65	3	2	26	3	6	2	4	19
32 Textile, Wearing Apparel and Leather	16	2	4	6	1	2		1	
33 Wood & Wood Products Including Furnitures & Fixtures	50	1	3	23	1	3	3	8	1
34 Paper & Paper Products, Printing & Publishing	12		2	5			1	1	3
35 Chemical & Chemical Petroleum coal rubber & plastic products	16		1	9	1		1	1	3
36 Non-Metallic Products	1								1
37 Basic Metal	3			3					
38 Fabricated metal product Machinery and Equipment	27	3		14		4		3	3
TOTAL	191	9	12	87	6	15	6	20	36
3) By Size of Employment									
10-19	63	4	3	23	4	6		4	19
20-99	91	4	8	39	1	7	4	13	15
100-199	18	1		14			1	1	1
200- +	19		1	11	1	2	1	2	1
TOTAL	191	9	12	87	6	15	6	20	36
4) By Annual Gross Revenues									
Less than ₱ 10,000			1					1	
10,001 -		1	2	3	1	1	1	1	
50,001 -		1	1	11	2	2		3	10
100,001 -		4	2	15		6	1	5	7
500,001 -		1	1	9	1	4		6	6
1,000,001 -		1	3	15	1			1	4
5,000,001 - +		1	2	34	1	2	3	3	9
TOTAL	191	9	12	87	6	15	6	20	36

NOTE 1) Due to multiple answers, the total differs from the number of establishments interviewed.
2) Establishments interviewed are limited to those with 10 more employees.

o Automotive/machine repair shops - lack of skilled workers

iii. Electricity

Sudden brownouts which lasted for several hours listed. Poblacion and Bunawan are the notably affected areas. As shown in the table, establishments belonging to light industries (Code 31 -34) with an employment size of 20-99 reported their problem.

iv. Water

Only 9 establishments reported having problem on water supply and 7 of those located in Poblacion. It is also observed that 6 out of 9 establishments belong to light industries whose employment size ranges from 10-99. Majority of reported establishmen ts depend on water vendor as source and the price of water is getting higher.

v. Transportation of Goods

The expected gasoline price increase and rationing causes establishments in bakery businesses, mostly found in Poblacion to become apprehensive about their future deliveries of goods. Most notably affected would be businesses whose size of employment ran ges from 10-19 with an operational scale of 10,000 or more. Other identified problems are those of transportation delays caused by highway check-ups due to lack of necessary papers and inadequate trucking services. Establishments having this problems have an annual operational scale of 500,000 to 5,000,000 or more and engaged on forest based products & chemical and chemical products industries.

vi. Cut-Throat Competition

This problem would, as some entrepreneurs in ice plant/cold storage facilities businesses, kill the industry in Davao City. Another industry suffering from stiff competition are small scale hollow blocks maker. This establishments are characterized by 10-99 employment size whose annual gross revenue reached 50,000 - 100,000.

vii. Other Problems

Most notable among these are the poor drainage system and poor road condition prevalent in the city proper.

c. Future Perspective of the Entrepreneurs in Davao City /1

While there is a general consensus of opinions among entrepreneurs about the ill-effects of the impending depressed world prices due to recession and strong competition, they look up at the government's ability to provide a good investment climate in terms of incentives, infrastructure and other social overhead to help existing and future industries to survive and grow.

The following table summarizes the entrepreneurs with positive future outlook in their respective industries:

Table F. Industries with Positive Future Outlook as Interviewed /1

FOOD & BEVERAGE INDUSTRY CODE 31	FOREST BASED INDUSTRY (CODE 33)	NON-METALLIC MINERAL INDUSTRY (CODE 36	MECHANICAL ENGINEERING INDUSTRY (CODE 37 & 38)
1) Population growth	1) Diversification of the industry into other uses of forest products, i.e., finished product form./2	1) Developmental stage of Mindanao area; massive construction activities is high .	1) Availability of cheap labor
	2) Continuous domestic & foreign increased demand for Phil. wood & wood based finished products, i.e., furniture & fixture	2) Local & foreign markets not yet fully tapped 3) Requires no extensive capital outlay & the corresponding technology is relatively simple	

/1 Based from the opinions of interviewed entrepreneurs in the project area

/2 As quoted from one respondent: "Gov't. policy to ban the exportation of raw logs actually encourages the demand for finished wood products and in fact at present we are renovating our production system to efficiently attain the higher degree of lumber production".

FIG. D. Questionnaire Forms Used in the Survey

Q U E S T I O N N A I R E

Name : _____

Address and Telephone No. _____

No. of Workers including Directors _____

Paid-Up Capital

*less than ₱10,000
*₱ 10,001 - ₱50,000
*₱ 50,001 - ₱100,000
*₱100,001 - ₱500,000
*₱500,001 - ₱1,000,000
*₱1,000,001 - ₱5,000,000
*₱5,000,001 or more

Gross Sales Amount per Annum

*less than ₱10,000
*₱10,001 - ₱50 ,000
*₱50,001 - ₱100,000
*₱100,001 - ₱500,000
*₱500,001 - ₱1,000,000
*₱1,000,001 - ₱5,000,000
*₱5,000,001 or more

Main Products:

1.
2.
3.
4.
5.

Do you see a bright future in your industry?

*Yes

*No

The reason:

_____

_____

_____

_____

_____

_____

Problems:

1. Water

Present Source

*Water Work (DCWD)

*Other Local Water Work

*Artesian Well

*Rain Water

*Water Vendor

*Other ( )

Availability and Other Problems

_____

_____

_____

_____

_____

2. Electricity

Present Source *DLPC

*Own Generator

Availability and Other Problems

_____

_____

_____

3. Telephone

Present System *PLDTC

* DCTS

*Both

Problems:

_____

_____

_____

_____

4. Transportation of Goods

_____

_____

_____

5. Labor

Availability

_____

_____

Level of Skill

_____

_____

Discipline

_____

_____

6. Market/Demand

7. Finance

8. Other

SUPPORTING REPORTS-3.3
INDUSTRIAL DEVELOPMENT

1. Objectives of Industrial Development

Industrialization has always been one of the prime objectives of the Philippine economic policy for a long time, considering the manufacturing industry as the most efficient tool towards rapid economic development. In pursuing this goal, the country has actually many advantages such as agricultural, forest and mineral resources, educated and cheap supply of labor and the proximity to the vast market of ASEAN countries, Japan, U.S.A., Australia, etc.

The prime objective of economic development is the improvement of the well being of the people. The high productivity of manufacturing industries largely contributes to the economic development. However, the speed of industrialization has been constraint by unfavorable factors such as insuffieicnt infrastructure, utilities, social instability, limited number of foreign markets and other less favorable factors. Industrialization can paradoxically eliminate them or at least mitigate their influences by cutting the vicious cycle of low industrialization and its environment and place their interrelation on a spiral course upward.

For this purpose, the development of industrial estates in Davao City is herein proposed parallel to the improvement of urban transport system.

2. Prerequisites of Industrialization of Davao City

Although there are many problems conceived by the existing industries in Davao City (See Vol. I Chapter 2), the basic environment for industrialization is bright. Firstly, the present level of industrialization in Davao City is still low compared to Metro Manila area where the bulk of industrial establishments are concentrated. The estimated 565 hectares of land allocated for industrial estates in Year 2000 in Davao will accommodate a large number of industries which Metro Manila can no longer hold. This advantage provides the opportunity for the industrial development in Davao, in line with the national policy of regional dispersal of industries. Secondly, the neighboring areas of Davao have vast undeveloped resources such as agriculture, forest and mineral products aside from the development of hydro and

geothermal energy. Thirdly, Davao City has an efficient and cheap labor supply.

In general, industrialization requires a huge amount of public investment. The government should provide better infrastructure and utilities to the potential entrepreneurs, in addition to social security and financial assistance. This seems unrealistic and inefficient at first, however, if the government would carry the economic donditions onto the spiral course upward successfully, these developments become economically feasible as a whole.

The prerequisites of industrialization of Davao City can be summarized as follows:

(1) Infrastructure

i) Land Transportation Facilities

Although the roads in Davao City are relatively well developed, there is a need of improving the capacity and levels of service to meet the future demand for road transport. Maintenance, rehabilitation and improvement of existing roads and other related facilites are also indispensable.

ii) Ports

At present, there are two public ports in Davao City namely: Sasa and Sta. Ana and a number of private ports. Sasa Port is now playing a vital role in cargo handling however, its capabilities need further intensification for the large demand in the future. Sta. Ana Port is used only for relatively small vessels. The rehabilitation of this port is very important not only to maintain cargo handling capacity but also to duplicate the access to Davao by sea.

iii) Airport

Since the length of the runway of the Davao International Airport is inadequate at present for the effective use of larger aircrafts, the extension and widening of the runway had been planned and will start soon.

iv) Telecommunication

Davao City has two independent telephone systems which provide poor services. These two must be unified to increase the capacity and improve the level of service in order to serve the public efficiently and meet the present strong demand for telephone in the city.

As shown in Table A most of the existing industries in Davao City are complaining about the inefficient service of the telephone system.

(2) Utilities

i) Electricity

Since the establishment of Mindanao Power Grid, Davao City is enjoying a power surplus of about 20MW. However, with the constant growth of population and expansion of economic activities including the proposed industrial development, this surplus is absolutely insufficient to meet the future demand for power.

Consequently, it is very necessary for the government to continue the efforts of developing hydro and geothermal energy to keep pace with the economic development.

ii) Water

Davao City is abudant in water resources but the problem is the disorganized waterworks system. Only 50% of the city's population is served by the Davao City Water District (DCWD) besides, suspension of water supply is common due to the badly maintained system.

Hence, DCWD should improve its system to a reliable one as a minimum prerequisite required in order to achieve industrialization.

iii) Flood Control, Drainage and Sewerage System

One of the critical problems within the Poblacion is the lack of flood control, drainage and sewerage system causing periodic floods with little rainfall.

In order to improve sanitary conditions and protect properties, urgent countermeasures such as setting-up of pumping stations and clearing up of open ditches must be taken immediately.

iv) Refuse Disposal System

The services provided by the Department of Public Service in Davao City are far from ideal at present.

Accompanying with the industrial development, the quantity of factory waste will increase gradually, which may cause environmental problem. Accordingly, preceding the factory construction, responsible government agencies should request the entrepreneur to formulate a wast disposal plan ready for assessment by government officials. More ideally, it is desirable for the DPS to undertake this responsibility.

(3) Social Security

Davao City, in cooperation with the national government agencies, is required to organize the city economy effectively, thereby eliminate the seedbeds of social unrest, uplift the living condition of the poor and monitor the public peace with strengthened capabilities of police outposts, fire stations, etc.

Social security is the most essential prerequisite for the introduction of investments.

(4) Financial Assistance

Lack of financial assistance is the greatest problem faced by the local entrepreneurs in industrial development. As described in Chapter 2.5 of Vol. II, the capabilities of financial institutions in Davao City are still low, although the city is playing an important role as the finance center in Mindanao at present.

As industrialization grows on, financial shortage will occur unless the capacity of existing financial institutions like the Development Bank of the Philippines (DBP), the major source of fund, increase rapidly. Davao City Government should, under any circumstances, monitor and promote money circulation in conjunction with the financial institutions and the national government agencies such as NEDA, MOI, etc.

TABLE A SUMMARY OF PROBLEMS BEING FACED BY INDUSTRIES IN DAVAO CITY

	TOTAL	PROBLEMS (NO. OF ESTABLISHMENTS)							
		Water	Electricity	Telephone	Transportation of Goods	Labor	Market	Finance	Others
1) By District									
Poblacion	92	8	7	29	5	8	5	12	18
Bunawan	26		3	17	1	1	1	3	
Buhangin	35	1		22		2		4	6
Talomo	32		1	17		4		1	9
Toril	6		1	2					3
TOTAL	191	9	12	87	6	15	6	20	36
2) By Type									
31 Food, Beverages & Toabcco	65	3	2	26	3	6	2	4	19
32 Textile, Wearing Apparel and Leather	16	2	4	6	1	2		1	
33 Wood & Wood Products Including Furnitures & Fixtures	50	1	3	23	1	3	3	8	1
34 Paper & Papaer Products, Printing & Publishing	12		2	6			1	1	3
35 Chemical & Chemical Petroleum coal rubber & plastic products	16		1	9	1		1	1	3
36 Non-Metallic Products	1								1
37 Basic Metal	3			3					
38 Fabricated metal product Machinery and Equipment	27	3		14		4		3	3
TOTAL	191	9	12	87	6	15	6	20	36
3) By Size of Employment									
10 - 19	63	4	3	23	4	6		4	19
20 - 99	91	4	8	39	1	7	4	13	15
100 - 199	18	1	8	14			1	1	1
200 - +	19		1	11	1	2	1	2	1
TOTAL	191	9	12	87	6	15	6	20	36
4) By Annual Gross Revenue									
Less than ₱ 10,000			1					1	
10,001 -		1	2	3	1	1	1	1	
50,001 -		1	1	11	2	2	2	3	10
100,001 -		4	2	15		6	1	4	7
500,001 -		1	1	9	1	4		6	6
1,000,001 -		1	3	15	1			1	4
5,000,001 +		1	2	34	1	2	3	3	9
TOTAL	191	9	12	8	6	15	6	20	36

Note: Establishments interviewed are limited to those with 10 or more workers.

Source : DCUTCLUS Survey in 1980

3. National Policy for Industrialization

Based on the Five-Year (1978-1982) and Long-Term (up to Year 2000) Philippine Development Plans, "The Philippines' Priorities and Prospects for Development" and other reports and references, the national policy for industrialization can be summarized as follows:

(1) Objectives

As part of the economic development plan, industrial development will be focussed towards the following objectives: a) to generate employment; b) to earn substantial foreign exchange; and c) to meet sufficiently the basic needs of the population including energy source.

(2) Strategies for Industrialization

To achieve the aforementioned objectives, the following strategies will be followed:

a) Cottage, small- and medium-scale industries shall be established outside Metro Manila and setting-up of a number of large industries to produce key commodities with priority to those that process indigenous raw materials and enhance technological capabilities.

b) Utilize a larger number of mineral resources in domestic production of semi-finished products for domestic and foreign markets.

c) Reduce the dependence on imported petroleum oil, selected raw materials and intermediate goods.

d) Develop higher efficiency to reduce the cost of manufactured products and maintain construction services at internationally competitive levels.

e) Produce the imported intermediate goods or the second stage import substitution.

(3) Policies on Manufacturing Industries

To stimulate industrial growth and effectively carry out the strategies the following policies shall be adopted:

a) Policies and programs for national development shall be formulated to induce inter-regional dispersal of industries as well as develop rural areas to minimize urban migration.

b) Support activities such as fiscal and credit incentives and tariff duties shall be improved and adjusted for the benefits particularly of exporting industries and other productive resources for industrial development.

c) Export-oriented industries, utilizing indigenous raw materials shall be promoted and domestic-market-oriented firms shall be required to generate export earnings in proportion to their availment of foreign exchange for imported goods.

d) Key industries shall be established in suitable areas which will serve as industrialization growth poles and center for industrial complex with government support and direct participation in the establishment.

e) Optimum utilization of mineral resources to minimize ecological imbalance and conduct technological researches for the development of labor-intensive techniques of production.

f) A minimum wage rate shall be implemented and the same shall be kept in proportion to the increase in price of goods and labor.

g) Industrial cooperation with ASEAN countries shall be promoted.

(4) Industrial Development Targets

For the first five years of development plan, (see Table B) the industry sector is targeted to rise from 29.2 per cent in 1978 to 31.8 per cent in 1982 at an average annual growth rate of 10.0 per cent. This increase is expected from the manufacturing subsector with 20.3 per cent share to the industry sector's 1982 net value. By 1987, industry sector is expected to add 36.9

TABLE B NET DOMESTIC PRODUCT OF INDUSTRY SECTOR
FOR THE YEAR 1978-82, 1987 and 2000
(In millign of pesos at 1972 constant prices)

	1978	1979	1980	1981	1982	1987	2000*	GROWTH RATE PER ANNUM 1978-82	1978-87	1978-2000	% SHARE TO TOTAL NDP 1978	1982	1987	2000*
Mining & Quarrying	1,151	1,249	1,355	1,484	1,625	2,553	2,553	9.0	9.3	9.6	1.7	1.8	1.9	2.2
Manufacturing	13,161	14,285	15,548	17,000	18,707	31,570	130,008	9.2	10.2	10.9	19.2	20.3	23.2	32.2
Construction	5,189	5,812	6,511	7,325	8,243	14,874	64,902	12.3	12.4	12.1	7.6	9.0	10.9	16.1
Electricity, Gas & Water	448	495	547	607	677	1,195	6,563	10.9	11.5	12.9	0.7	0.9	0.9	1.6
T O T A L	19,949	21,841	23,961	26,416	29,252	50,201	210,235	10.0	10.8	11.2	29.2	31.8	36.9	52.1

Source: Five Year Philippine Development Plan
*Long Term Philippine Development Plan

per cent to the net domestic product and 52.1 per cent to that of year 2000, growing at an average rate of 11.2 per cent annually. The manufacturing subsector is envisioned to contribute the biggest share within the period 1982-2000.

Effort to disperse industries throughout the regions is expected to be attained in the next six years (1987). Mindanao and Luzon excluding Metro Manila are envisioned to increase their share to total industrial output from 11.9 per cent and 31.2 per cent in 1982 to 14.6 per cent and 33.3 per cent in 1987, respectively, while the Visayas is expected to maintain its 17.2 per cent share of output by 1987. The share of Metro Manila might drop by 8 per cent from 42.9 per cent in 1978 to 34.9 per cent in 1987. This lessens the congestion of industries in the said area thus, minimizing ecological imbalance.

By the year 2000, net domestic product in industry sector is targeted at ₱210.2 billion representing 52.1 per cent of the total net domestic product. This is envisioned to arise from manufacturing industries such as heavy and export-oriented light industries.

(5) Industrial Development Programs and Projects

In line with the national development plans to encourage self-sufficiency of basic commodities and increase the regional production output through dispersal of industries and population, industrial programs are geared to the development of labor-intensive, small- and medium-scale industries aside from large-scale, capital-intensive industries and agro-based industries.

Establishment of 35,000 small- and medium-scale industries is expected by 1982. An additional 191,000 workers will be absorbed in employing about 960,000 workers. It is targeted that 27 per cent of the total activities of small- and medium-scale industries will concentrate in Metro Manila, 28 per cent in Regions I, II, IV & VII and 45 per cent will be dispersed among Regions VI, X and XI.

In the year 2000, cottage, small- and medium-scale industries are envisioned to expand at a substantial growth rate resulted from positive measures on credit and marketing, efficient organization of entrepreneurs, improvement in technical services and expertise, etc. Large-scale industries that produce intermediate and capital goods are expected to exhibit dynamic growth in 2000.

In support to this program 14 major industrial projects have been proposed namely: integrated steel complex, phosphatic fertilizer, automotive diesel engine, lumber and lumber products, newsprint, linerboard and corrugating medium, silicon carbide, steel plate mill, copper smelter & coconut oil mills.

However, with the adoption of aggressive industrial development policies in 1979, the Board of Investment (BOI) selected eleven major industrial projects for immediate implementation. These are the integrated steel mill, petrochemical complex, copper smelter, phosphatic fertilizer, aluminum smelter, heavy engineering industries, diesel engine manufacturing, cement industry expansion, coconut industry rationalization, alcogas, and integrated pulp & paper. All of these are capital-intensive projects expected to generate a number of tertiary industries which are labor-intensive & export-oriented.

The integrated steel plant is expected to supply the raw material needs of the industries like shipbuilding and other steel based industries. It will be located in Northern Mindanao where raw ore is prepared as its raw material.

Support industries like limestone quarries, ferro-alloy refractory plants and machine shops are to be established in the nearby areas.

The establishment of copper smelter will provide the raw materials for the phosphatic fertilizer plant and copper-based manufacturing industries. Preparatory engineering works are being undertaken at Leyte Industrial site.

The integrated pulp and paper mill and an unbleached long fiber plant are expected to sufficiently supply the local demand for pulp and paper. Lumber has also been given priority as the source of raw materials for the mill and for manufacturing of wood products.

Ten coconut oil mills have been approved by the Board of Investment (BOI) to be located in rural areas where there is abundant supply of copra. This is the result of the government policy to phase out the exportation of copra and rationalize the coconut industry.

The alcogas project, one of the first energy priorities program will involve in the setting-up of distilleries to refine alcohol from sugarcane, cassava, and sweet potato for mixing with gasoline.

Establishment of one cement industry each year is another major project. This project calls for the rehabilitation of equipment of selected cement factories and gradual shiftment from petroleum to coal as an energy source.

The establishment of export processing zones, and the proposed NHA smaller industrial estates will boost the country's foreign exchange earnings and will generate big employment. These estates are proposed to cater mostly to food processing plants.

4. Industry Types to be Developed in Davao City

(1) Role of Mindanao in Industrialization

Mindanao Island has been called as the Land of Promise and referred to as the richest island of the country. Its land area of 10 million hectares with 10.1 million inhabitants have vast natural resources which are of great potentials for development. Thus, the effort of the government is directed towards the maximum utilization of these resources to hasten industrialization in the region.

In the long-term development plan for Mindanao, the strategy is to fully tap its agricultural potential, at the same time effect its industrialization to counteract the concentration of industries in Luzon area.

Because of its abundance in forest products, rich mineral deposits, and availability of agricultural raw materials, Mindanao is envisioned to experience a rapid growth of economic development. Its rich mineral resources such as nickel, iron,copper, limestone, gold, manganese and ore are vital to the development of manufacturing industries.

The establishment of the major industrial projects like the steel mill and aluminum smelter is expected to increase employment, income to workers and increase foreign exchange earnings. The reserve ore of the region will be utilized by the steel mill. This project is intended to produce consumer hardware, construction materials, industrial raw materials and machinery for foreign markets.

The development of cottage, small- and medium-scale industries, heavy industries, mining and other sectors in Mindanao area is expected to absorb surplus labor in the year 2000.

The establishment/expansion of its export facilities such as seaports, airports, industrial estates, processing zones, etc. is expected to facilitate the processing of raw materials and agricultural products.

The development of the ports of Cagayan de Oro and Davao into major seaports of entry will open the region to international trade at the same time relieve the burden of the port of Manila as the principal transhipment center of the country.

(2) Role of Davao City in Industrialization

Davao City is envisioned to be a major city in the South. Its growth has been determined largely by its strategic location which offers prospects and opportunities for economic activities.

Its location is potential as an alternative center for commerce, trade, manufacturing and tourism in relation to Southeast Asian countries. The expansion of the ports of Sasa and Sta. Ana and Bangoy airport makes easy that the city be opened to international trade.

The designation of Davao City, as one of the poles in the tripolar strategy is designed to act as countermagnet to Metro Manila. Being the regional capital and the primary growth center of Southern Manila, it is projected to dominate the hierarchy of settlements in Region XI. With the establishment of proper intermodal links like roads, airports & seaports it will be the marketing center in Mindanao area.

Davao City has been defined as one of the priority areas for investment and location of dispersed industries. It has been identified as the site of an industrial estate and an export processing zone. These projects expect to disperse industries and other economic activities from the metropolis, create job opportunities and earn substantial foreign exchange.

The establishment of Toril Export Processing will support the development of industrial estate in the region. Construction of a road network, water system, power facilities, and one standard factory building is scheduled on January 1981.

(3) Strategies and Policies for Industrial Development of Davao City

The strategy for industrialization of the city calls for the promotion and support of agro-based and labor- intensive small- and medium-scale industries with high priority on food processing, furniture and fixture, metal works and mechanical products engineering, non-metallic mineral products, garments and handicrafts. The promotion and development of these industries are looked upon to make significant impact by providing increased employment and income to workers. The industrial strategy will rely on the relative advantage of the region in terms of location, availability of agro-based materials and supply of electric power.

The industrial base is expected to expand further from wood-based industries and food processing into more broadly based manufacturing and consumer goods industries.

To effect a concerted effort for industrial development in the city, the following shall be instituted:

1. establish a wider resource industries;
2. utilize available raw materials;
3. establish industrial estate;
4. establish more processing plants;
5. introduce modern technology to upgrade local product standard;
6. intensify manpower development program;
7. provide incentives to viable financing schemes;
8. extend technical expertise tc entrepreneurs; and
9. establish linkage among related industries.

In general, Davao City encourages all types of industries except those environmentally critical industrial activities as identified by the National Environmental Protection Council (NEPC) which are subject to their evaluation and approval.

(4) Industry Types to be Developed in Davao City

The industries currently proposed by government agencies in Davao City are identified based on the availability of resources, production technology, present level of skilled labor and the size of potential market, as shown in Table C.

Table C. Proposed Industries for Davao City

PSIC Code No.	Type of Industry (PSIC Division)	Main Products to be Manufactured
31	Manufacture of Food Beverage & Tobacco	milled rice, milled corn, dried noodles, bakery products
32	Textile, Wearing Apparel and Leather Industries	children's and ladies' dresses, undergarmets, embroidered materials, leather belts, bags, & shoes, fiber bags & mats, jute sacks
33	Manufacture of Wood and Wood Products, Including Furniture & Fixture	wooden fishing boat, rattan & wood furniture & fixtures including upholstery, wall decors & frames, bamboo, buri & nito & agsam craft
35	Manufacture of Chemical and Chemicals, Petroleum, Coal Rubber & Plastic Products	castor oil, petroleum oil, lumbang oil, alcohol, processed cassava, plastic products, pesticides, herbicides, fungicides.
36	Manufacture of Non-Metallic Mineral Products, Except Product of Petroleum & Coal	ceramics, hollow blocks, cement pipes, pre-stressed concrete products, bricks
37	Basic Metal Industries	foundry & machine shop products
38	Manufacture of Fabricated Metal Products, Machinery and Equipment	fabricated structural metal, barge/cargo/passenger boat

Sources: Private-Public Sector Interface to the RDIP Technical Services and Management Consultants
Eleven Investment Priorities Plan
Second Agricultural Investment Plan
Small Business Advisory Centers, Region XI
Trade Assistance Center, Region XI
National Economic and Development Authority, Region XI
Development Bank of the Philippines, Davao Branch

Since the main interest of government agencies is in relatively short-term industrialization utilizing the resources already available or within easy reach, the proposed industries are concentrated in agro-based, forest-based, mineral-based and comparatively low technology machinery industries.

However, the target year of this study is 2000, when Davao City is supposed to have already taken off economically with a variety of industries.

Although it is very difficult to outline quantitatively the profile of future industries of Davao City in the absence of present accumulation of industrial capital, industry types to be developed in Davao City can be listed up based on the preceding discussions.

Table D presents the selected types of manufacturing industries to be developed in Davao City. Although quantitative share of each industry cannot be determined, the following comments will be useful.

i) By the year 2000, a wide range industrial development shall be attained, as listed in Table D.

ii) For short-term industrial development program, industries listed in Table C shall be promoted.

Table D. Industry Types to be Developed and Possible Products in Davao City

PSIC Code	Type of Industry (PSIC Division)	Possible Products
31	Food, Beverage and Tobacco	Packed Meat, Processed and Preserved Meat, Canned Meat, Milk, Cream, Butter, Cheese, Canned Fruit and Vegetable, Fruit Juice, Sauce, Canned Fish, Smoked Fish, Preserved Fish, Coconut Oil and Other Coconut Product, Vegetable and Animal Oil, Margarine, Fish Oil, Milled Rice, Milled Corn, Flour, Cassava Flour, Bread, Cake, Pastry, Biscuit, Noodle, Cocoa, Chocolate, Ice, Roasted Coffee, Animal Feed, Starch, Mayonnaise, Vinegar, Soft Drinks, Fruit Wine.
32	Textile, Wearing Apparel and Leather	Thread, Yarn, Cloth (Imported Cotton, Abaca, Banana, Ramie, etc.), Dress, Undergarmet, Industrial Bag, Canvas, Mat, Rope, Fishing Net, Mosquito Net, Leather Belt, Leather Bag, Leather Shoes.
33	Wood and Wood Product	Lumber, Plywood, Hardboard, Wooden Case, Furniture, Fixture, Upholstery (Rattan, Bamboo, Buri, Nito, Agsam and Wood),

		Other Construction Material, Wooden Boat.
34	Paper and Paper Product	Pulp, Paper, Paperboard, Box, Printed Matter,
35	Chemical and Chemical Product	Alcohol, Fertilizer, Pesticide, Insecticide, Fungicide, Herbicide, Paint, Lacquer, Medicine, Soap, Cosmetics, Detergent, Wax, Candle, Match, Adhesive Glue, Explosive, Industrial Oil, Rubber Footwear, Plastic Product
36	Non-Metallic Mineral Product	Ceramic, Glass and Glass Product, Cement and Cement Product, Structural Clay Product, Structural Concrete Product, Cut Stone, Abrasive.
37	Basic Metal Product	Iron and Steel Foundry, Galvanized Iron, Other Processed Iron and Steel Product, Smelter of Non-Ferrous Metal (Gold, Copper, Nickel, etc)
38	Fabricated Metal, Machinery & Equipment	Cutlery, Hand Tool, Nail, Bolt, Nut, Structural Steel Product, Sheet Metal Component, Tin Container, wire, other General Hardware, Assembly of Agricultural & Constructior Machinery and Equipment, Machine Tool, Food Machinery Textile Related Machinery, Other Light Machinery & Equipment, Electric Fan, Electrothermic Cooking Appliance, Battery, Electric Wire and Wiring Device, Small Boats, Motor Vehicle Parts and Accessories, Bicycle, Electric Lamp.
39	Miscellaneous	Jewelry, Silver- and Gold-ware Sporting Goods, Toy, Stationery, Umbrella, Button, Pin, Fastener, etc.

Source: DCUICLUS

5. Development of Industrial Estates

(1) Industrial Estates to be Developed

Seven (7) industrial districts were identified in the future land use plan for Davao City. Among these 7 industrial districts, Matina Aplaya has different characteristics from others. Namely, several large-scale establishments specialized in wood and wood product industry are already operating there, and there is no room for future expansion since the adjacent area is already taken up as low-density (good quality) residential district.

Generally speaking, industrial estate is an efficient measure of industrialization, because the government can save resources by concentrating public investment on limited areas and, above all, industries established in an industrial estate can be easily promoted and controlled as a cluster.

Therefore, industrial estates have been allocated within six (6) industrial districts excluding Matina Aplaya. Industrial estates proposed here are considered key facilities for promoting industrialization of Davao City, although they cover only 58% of industrial activities of the City in terms of employment size.

Table E shows location and size of the proposed industrial estates. In addition, Daliao, Fagel/Lizada industrial district is divided into two (2) industrial estates, Daliao and Fagel/Lizada.

Table E Size of Industrial Estates to be Developed

Industrial Estate	Area (ha)		No. of Employment	
	1990	2000	1990	2000
Bunawan	70	160	4,000	12,100
Panacan	115	260	5,600	15,100
Sasa	40	50	1,500	2,000
Agdao	10	15	500	1,600
Ma-a	-	10	-	500
Daliao	10	30	700	2,100
Fagel/Lizada	20	40	1,400	2,100
TOTAL	265	565	13,700	36,200

(2) Policies and Strategies on the Development of the Proposed Industrial Estates

Based on the selected industry types to be developed in Davao City (Table D) and the local conditions of the proposed sites of industrial estates, policies and strategies on the development of industrial estates are determined as presented in Table F.

(3) Industry Types to be Developed in the Proposed Industrial Estates

In accordance with Table F, industries to be promoted in the proposed industrial estates were identified as shown in Table G, based on the following considerations.

i) Export-oriented industries shall be established mainly in Bunawan and Fagel/Lizada, Bunawan Industrial estate shall utilize the local material to the maximum extent, while Fagel/Lizada industrial estate is closely related to the proposed Toril EPZ.

ii) Import substitution shall be largely attained mainly by Panacan, Sasa and Agdao industrial estates. Panacan shall provide a variety of consumer goods and intermediate products for local markets and industries, Sasa shall supply electric appliances and equipment starting from assembly based on imported materials and gradually shifting to manufacturing, while Agdao shall be specialized on manufacturing daily necessaries for the local market taking advantage of its proximity to Poblacion.

iii) The markets in Davao City shall be supplied with a variety of consumer goods from Panacan, Agdao, Daliao, and Ma-a industrial estates.

iv) Daliao shall be principally based on fishery and Ma-a shall be especialized in abattoir-based industries. Since the local market cannot fully consume the products of these industrial estates, the surplus shall be transported for external consumption.

v) Production surplus of other industrial estates shall go to the domestic and, if possible, international markets, thus uplifting the position of Davao as a production center of the country.

vi) It is very important for an integrated industrial development to create a hierarchy of manufacturing industries within the City. Fig. E illustrates the schematic input-output flow and the interrelationship of the proposed industrial estates.

Table F. Policies & Strategies on the Development of the Proposed Industrial Estates

Industrial Estates		Industry Types to be Promoted	
Bunawan	o Heavy and/or Obnoxious Industry o Utilization of Local Materials o Export and Domestic Market Oriented Industry	o Food (Coconut Related) o Paper Products o Non Metallic Mineral Products o Basic Metal Products o Chemical Products	
Panakan	o Utilization of Sasa Port o Non-Pollutive Industry o Wide range Industrial Development	o Food o Wood Wood Products o Chemical Products o Machinery & Equipment o Textile/Textile Products	o Paper Products o Fabricated Metal Products o Miscellaneous
Sasa	o Utiliztion of Sasa Port o Non-Pollutive Heavy Industry using Imported Materials	o Fabricated Metal Products, Machinery and Equipment	
Agdao	o Local Market Oriented Industry o Local-Intensive Light/Medium Industry	o Food o Wood Products	o Textile/Textile Products o Chemical Products
Ma-a	o Local Market Oriented Industry o Medium Industry using Local materials o Abattoir (Proposed) Related Industry	o Food (especially Meat Processing) o Leather/Laether Products	
Daliao	o Local and Domestic Oriented Industry o Medium Industry using Marine Products o Service Industry for Vessels	o Food (Marine Products) o Shipyard for repair and maintenance	
Fagel, Lizada	o Light Non-offensive and Service-Oriented Industry o Establishment of an Export Processing Zone	o Wood Products o Eabricated Metal Products, Machinery and Equipment	o Chemical Products

Table G. Industry Types to be developed in the Proposed Industrial Estates

Industrial Estate	Category H Heavy	Category M Medium	Category L Light	PSIC Classification (Division)	Main Products	Market Export	Market Domestic	Market Local	Material Import	Material Domestic	Material Local	Other Characteristics Of the Industry
BUNAWAN		0	0	Food Beverage & Tobacco	Coconut Products, Animal Feed	0	0				0	Bad odor and water pollution in some cases
	0	0	0	Paper Products	Paper, Paperboard, carton	0	0	0	0		0	Water Pollutive Occasionally
	0	0		Chemical Products	Alcohol, Paints Soap, Fertilizer, etc.	0	0	0	0	0	0	Air & Water Pollutive in some cases
	0		0	Non-Metallic Products	China, Glass, Cement, Clay Product, etc.	0	0	0				Air and water Pollutive in some cases
	0	0		Basic Metal Products	Iron and steel Foundry, Non-Ferrous Metal Refining	0	0	0	0	0	0	Water Pollutive Occasionally
PANAKAN		0	0	Food, Beverage & Tobacco	Cans of Fruits/ Vegetables, Milled Rice & Corn Beverage, etc.	0	0	0			0	Producing Various Foods of wide range
		0		Wood/Wood Products	Lumber, Plywood	0	0	0			0	
			0	Paper Products	Paperboard, Carton Printing		0	0		0	0	
			0	Textile/Textile Products	Textile, Wearing Apparel		0	0		0	0	
	0	0		Chemical Products	Plastic Product, Fertilizer, Medicine, etc.		0	0	0	0	0	
	0	0		Fabricated Metal Products Machinery and Equipment	Metal Fixture Electrical ApplianceAgricultural Equipment, etc.		0	0	0	0		Providing Basic Materials for all Industries of the area
			0	Miscellaneous	Sporting Goods, Toy Office Supply, etc.	0	0	0		0	0	

Note: "Heavy" industry is defined as capital-intensive industry with heavy fixed assets and relatively small number of employees compared to the area of operation, while "light" industry is labor-intensive with little fixed assets.

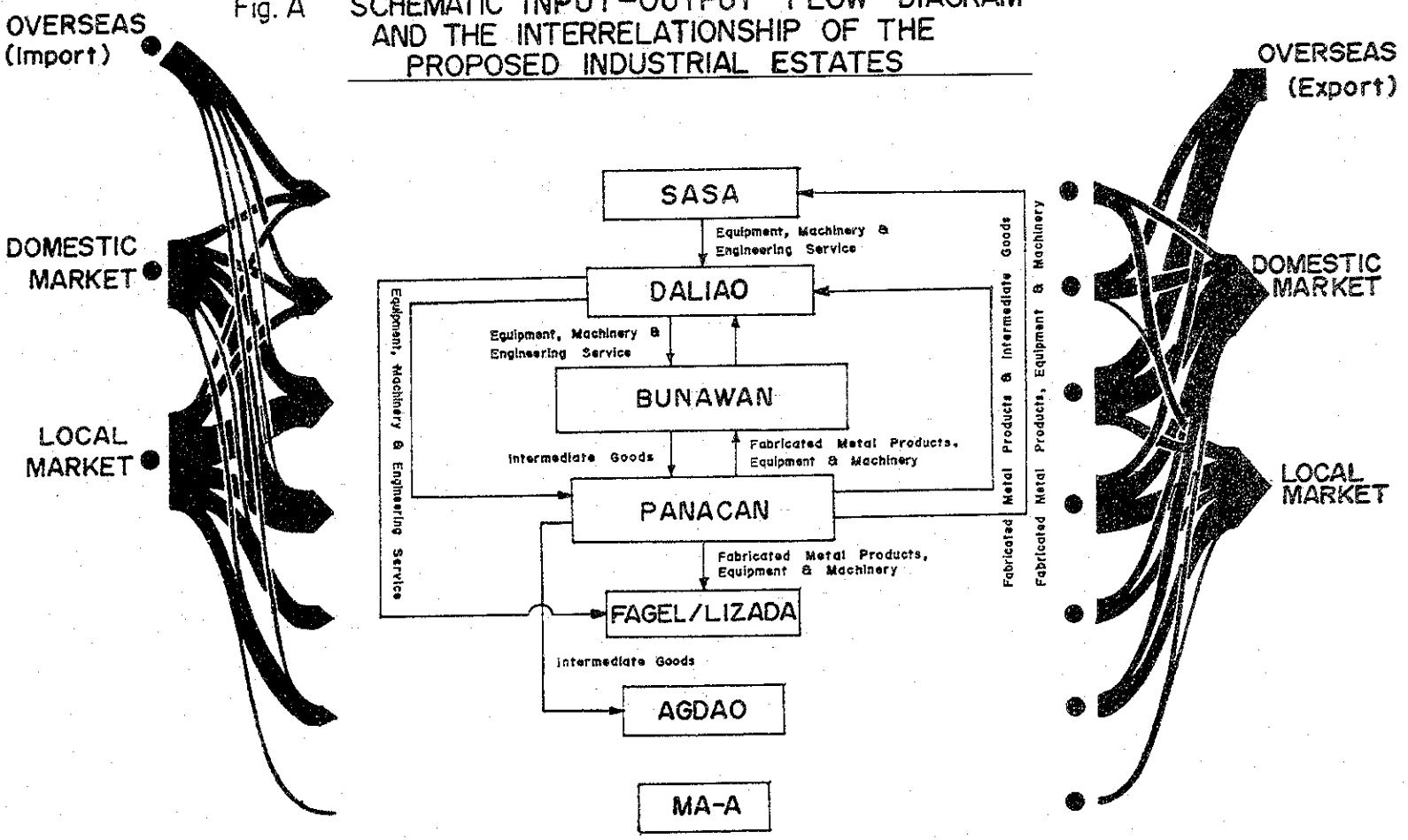
Table G - (cont'd.)

Industrial Estate	Category H Heavy	Category M Medium	Category L Light	PSIC Classification (Division)	Main Products	Market Export	Market Domestic	Market Local	Material Import	Material Domestic	Material Local	Other Characteristics of the Industry
SASA	0			Fabricated Metal Products Machinery & Equipment	Assembly of Electrical appliance & Industrial Machines		0	0	0	0	0	Assembly for the time being
AGDAO		0	0	Food, Beverage & Tobacco	Milk, Flour, Ice, Bakery and other dairy food			0		0	0	
			0	Textile/Textile Products	Wearing Apparel, Tailoring, Embroidery, etc.			0	0	0	0	
			0	Wood/Wood Products	Furniture, Fixture, Carvings, etc.		0	0			0	
		0	0	Chemical Products	Soap, Cosmetics, Rubber footwear, etc.			0		0	0	
MA-A		0		Food, Beverage & Tobacco	Slaughtering, preparing, and preserving meat		0	0			0	Abattoir (Proposed) Related
		0		Textile/Textile Products	Leather shoes, bags, belts, etc.		0	0			0	-do-
DALIAO		0		Food, Beverage & Tobacco	Canning & Preserving Marine Products		0	0		0	0	Fishery - based
		0		Fabricated Metal Products Machinery & Equipment	Repair & Maintenance of Vessels, ship-building (small)			0		0	0	
		0		Wood/Wood Products	Furniture, Fixture Handicrafts, etc.	0	0	0			0	
		0		Chemical Products	Soap, Cosmetics Plastic Products etc.	0	0	0	0	0	0	

Table G (cont'd.)

Industrial Estate	Category H Heavy	Category M Medium	Category L Light	PSIC Classification (Division)	Main Products	Market Export	Market Domestic	Market Local	Material Import	Material Domestic	Material Local	Other characteristics of the Industry
		0		Fabricated Metal Products, Machinery & Equipment	General Hardware, Fixture Electric Appliance, etc.	0	0	0	0	0	0	Including Engineering Service and Repair Workshops
		0		Miscellaneous	Office Supply, Toy, Sporting Goods, etc.	0	0	0	0	0	0	

Fig. A SCHEMATIC INPUT-OUTPUT FLOW DIAGRAM AND THE INTERRELATIONSHIP OF THE PROPOSED INDUSTRIAL ESTATES



SUPPORTING REPORTS - 3.4

ESTIMATION OF FUTURE CAR OWNERSHIP RATE

(1) Definition

$$\text{Car Ownership Rate} = \frac{\text{Members of car owning families}}{\text{Population}}$$

(2) Estimation

a. Macroscopic Estimation in Proportion to Metro Manila

Assumption: That car ownership rate in Davao City will reach, in the year 2000, the present level of Metro Manila, where such rate is currently the highest in the Philippines.

Steps:

i) The average numbers of vehicles registered per population of 1,000 in various areas are as follows:

Table A NUMBER OF REGISTERED VEHICLES PER 1000 POPULATION, 1970 - 78

YEAR	DAVAO CITY	METRO MANILA	MINDANAO	PHILIPPINES
1970	14.7	40.6	2.5	7.6
1971	15.3	40.8	2.5	7.7
1972	15.2	41.5	3.2	8.3
1973	15.5	40.2	3.0	8.5
1974	17.4	47.2	3.6	10.1
1975	14.2	45.7	3.1	9.9
1976	21.4	43.8	3.2	9.5
1977	24.0	45.4	3.5	10.0
1978	15.9	52.5	3.5	11.0
1978/1970	1.08	1.29	1.40	1.45
Average Annual Growth Rate(%)	1.0	3.3	4.3	4.7

NOTE: Vehicles owned mostly by business establishments such as "T" and "TH" trucks are excluded.

Source: BLT

ii) While the reliability of the values presented in Table A, which fluctuate substantially from year to year, is subject to challenge, the average number of vehicles registered per population of 1,000 in Metro Manila is about 2.7 times that in Davao in terms of 9-year average from 1970 to 1978. Such average for the entire Philippines is about 3 times that in Mindanao, suggesting that the position of Davao in Mindanao is analogous to the position of Metro Manila in the Philippines.

iii) The Person-Trip Survey indicated that the car woner-whip rate in the Project Area was 8.7% in 1979. Such rate in Metro Manila in the same year was estimated about 2.7 times the Project Area rate, or about 23.5%.

iv) In view of the above, car ownership rate in Davao City in the year 2000 is estimated at about 23.5%.

b. Estimation by Car Ownership Rates by Income Class

Assumption: That car ownership rate depends upon the distribution of households by income class. Then, if the future distribution of households by income class can be estimated, the average car ownership of the future can be arrived at by applying such distribution to the car ownership rates of households in various income classes as revealed by the Person-Trip Survey.

Steps:

i) The car ownership rates by income class, as revealed by the Person-Trip Survey, were as presented in Table B.

Table B CAR OWNERSHIP RATE BY FAMILY INCOME, PROJECT AREA, 1979

	0 -500 (₱/month)	501 -1000 (₱/month)	1001-2000 (₱/month)	2001-5000 (₱/month)	5001- (₱/month)	TOTAL (Average)
Share in Population (%)	51	33	11	4	1	100
Car Ownership Rate (%)	2.8	7.4	22.2	46.6	59.3	8.7

Source: DCUTCLUS

ii) If the average income of the Project Area inhabitants will increase in proportion to increase in per capita GDP, average income per household will increase by 1.7 times from 1979 to 2000.

iii) In view of the presently extremely large income gap between the rich and the poor, the year 2000 distribution of households by income class is adjusted in the Figure below by doubling the income of those currently in the 1,000 pesos per month and below class and by the corresponding downward adjustment to those in higher income classes.

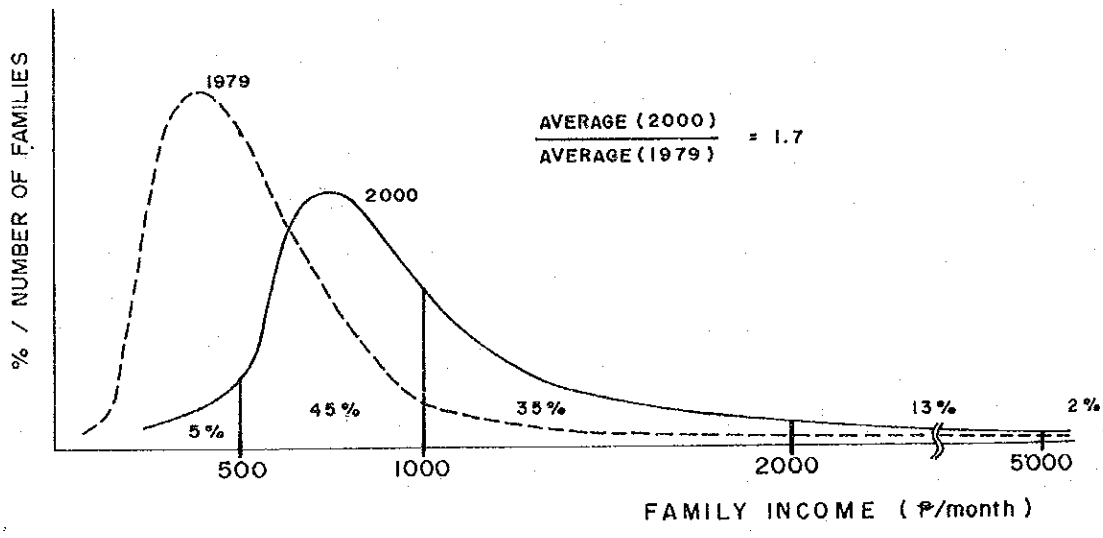


Fig. A FAMILY INCOME DISTRIBUTION, PROJECT AREA, 2000

iv) By applying the adjusted distribution of households by income class in the year 2000,as estimated in the above, to the car ownership rates by income class, as revealed by the Person-Trip Survey, the average car ownership rate in the Project Area is estimated to reach 18.5% in the year 2000.

Table C CAR OWNERSHIP RATE BY FAMILY INCOME, PROJECT AREA, 2000

	0 -500 (₱/month)	501-1000 (₱/month)	1001-2000 (₱/month)	2001-5000 (₱/month)	5001- (₱/month)	TOTAL (Average)
Share in Population (%)	5	45	35	13	2	100
Car Ownership Rate (%)	2.8	7.4	22.2	46.6	59.3	18.5

Source: DCUTCLUS

c. Trend Estimation

Assumption: That the average car ownership rate in the Project Area in the year 2000 can be estimated based on the past trends of car ownership rate per 1,000, of average number of family per household, and of the average number of cars owned by each car-owning household.

Steps:

i) The definition of car ownership rate is modified as follows:

Car Ownership Rate

$$= C \cdot \frac{P}{1{,}000} \cdot \frac{1}{K} \cdot H \cdot \frac{1}{P}$$

Wherein:

C is the number of cars owned per population of 1,000

P is population

K is average number of cars owned per car owning household

H is average number of family per household

ii) The past trend of car ownership per population of 1,000 is shown in Table A. Although the numbers shown for Davao City fluctuate greatly from year to year and the average growth rate is very small, an average growth rate of 3.5% per annum is assumed on reference to values for other areas. Then, the average car ownership per population of 1,000 in the year 2000 is estimated at 40.7 cars.

iii) According to the census data, average number of family per household in Davao City was 6.1 in 1970 and 6.0 in 1975. On this trend, such average for the year 2000 is estimated at 5.5.

iv) Average car owning household in Davao City ownerd 1.36 cars in 1979 (Person-Trip Survey). It is estimated that this value will decline as car ownership rate will rise in the future. Here, an average per car-owning household of 1.2 cars is estimated for the year 2000.

v) Using the above estimated values of C, K, and H, car ownership rate in the year 2000 is estimated at 18.5% by the equation of i) above.

(3) Conclusion

The car ownership rates in the Project Area estimated for the year 2000 by the three methods discuased above compare as follows:

a. Estimation in proportion to Metro Manila ... 23.5%
b. Estimation by car ownership rates by income class 18.5%

c. Trend estimation 18.5%

While the methods b. and c. resulted in the same estimate values, the method a. resulted in a value about 27% higher.

This Study, one of those major objectives is the realization of efficient urban transport operation by the enhancement of public transport, aims at the avoidance of an excessive reliance on cars in the interest of economic and fuel efficiency. For this reason, the 18.5% arrived at by the methods b. and c. (rather than the higher rate arrived at by the method a.) is to be used as the average car ownership rate in the year 2000.

By interpolating the 8.7% for 1979 and the 18.5% for 2000, car ownership rate in 1990 is estimated at 12.5%.

(4) Car Ownership Rates by Block

With the average car ownership rate estimated above as the control total, future car ownership rates by land use are estimated based on the 1979 Person-Trip Survey findings and in accordance with the car wonership rates by the current land use and land demand by future land use per land use plan (see Table D).

Future car ownership rates by block are estimated in Table E, based on the future land uses by block and the values of Table D.

Table D CAR OWNERSHIP RATE BY LAND USE (%)

LAND USE	1979 (From P.T. Survey)	1990	2000
RESIDENTIAL (High Density)	9.0	10.0	14.0
RESIDENTIAL (Medium and Low Density)	14.0	16.4	23.5
COMMERCIAL	12.0	13.0	18.0
INDUSTRIAL	10.0	11.0	15.0
OTHERS	3.0	4.0	5.0
AVERAGE	8.7	12.5	18.5

Source: DCUTCLUS

Table E CAR OWNERSHIP RATE BY BLOCK (%)

BLOCK	1979 (From P.T. Survey)	1990	2000
BLOCK I	3.7	8.0	16.4
BLOCK II	4.1	8.8	17.0
BLOCK III	10.1	13.8	21.5
BLOCK IV	8.2	12.1	18.3
BLOCK V	16.0	18.0	21.0
BLOCK VI	5.9	8.9	15.8
AVERAGE	8.7	12.5	18.5

Source: DCUTCLUS

SUPPORTING REPORTS-3.5

TRAFFIC VOLUME ESTIMATES OF TRUCKS RELATED TO THE PROPOSED INDUSTRIAL ESTATES

(1) Total Number of Truck Trips Related to the Proposed Industrial Estates (2000)

The total number of truck trips, as the Person Trip Survey revealed, was approximately 14,000 (person-trips) per day in 1979. This will increase, in proportion to the growth of GDP, to approximately 58,000 (person-trips) in 2000. However, the GDP growth rate was set a little upward deviating from the past trends considering the possible developmental increase accompanying the development of seven (7) industrial estates.

The truck traffic increased due to the development of industrial estates shows, in general, a completely different pattern of distribution, since industrial estates are always developed based on policies and strategies. This is the reason why the developmental traffic of trucks must be dealt with separately.

Out of 58,000 person-trips per day of trucks in 2000, those related to the proposed industrial estates can be extracted using the following equation:

$$58{,}000 \times \frac{\text{GDP in Industrial Estates (Day Population Base)}}{\text{Total GDP in Project Area (Day Population Base)}}$$

$$58{,}000 \times \frac{1{,}426 \text{ (million pesos/year at 1972 const. prices)}}{7{,}343 \text{ (million pesos/year at 1972 const. prices)}}$$

$$= 11{,}300$$

By dividing this figure by average number of passengers per truck, which is 1.8, the total number of truck trips in 2000 can be calculated.

$$\frac{11{,}300}{1.8} = 6{,}300 \text{ (truck-trips per day)}$$

(2) Number of Employments by Industrial Estate and by Industry Type (2000)

Industries to be developed in the proposed industrial estates are summarized as presented in Table G in supporting reports-3.3. The process of determining these industries is described in Chapter 3.2, Vol. II.

Although it is very difficult to determine scale of operation of selected industries due to a number of uncertain factors, employment size of each industry was assumed as "most likely" figures based on the present situation of manufacturing industries in Davao City (Chapter 2.4, Vol. 1), industry types to be developed (Table G in Supporting reports - 3.3), and the schematic input-output flow of the proposed industrial estates (Fig. E in Supporting reports - 3.3) as shown in the Table A.

Table A. Number of Employments of the Proposed Industrial Estates by Type of Industry, 2000

PSIC CODE	INDUSTRY	BUNAWAN	PANACAN	SASA	AGDAO	MA-A	DALIAO	TAGEL/LIZADA	TOTAL
31	Food, Beverage & Tobacco	5,000	2,600		800	400	1,500		10,300
32	Textile, Wearing Apparel and Leather		500		400	100			1,000
33	Wood and Wood Products		4,000		100			1,400	5,500
34	Paper and Paper Products	1,800	300						2,100
35	Chemical Products	1,500	1,500		300			500	3,800
36	Non-Metallic Mineral Products	3,000							3,000
37	Basic Metal Products	800							800
38	Fabricated Metal Products, Machinery and Equipment		6,000	2,000			600	600	9,200
39	Miscellaneous		200					300	500
TOTAL MANUFACTURING		12,100	15,100	2,000	1,600	500	2,100	2,800	36,200

Source: DCUTCLUS ESTIMATE

(3) Estimate of the Number of Truck Trips by Industrial Estate (2000)

"Feasibility Study on the Development of Industrial Estates in Ujung Pandang, Indonesia" (JICA 1977) adopted following ratios of goods volume to/from industrial estate per employment:

Food,Beverage and Tobacco	60	tons/year/employment
Textile, Wearing Apparel and Leather	30	"
Wood and Wood Products	40	"
Paper and Paper Products	50	"
Chemical Products	50	"
Non-Metallic Mineral Products	70	"
Basic Metal Products	50	"
Fabricated Metal Products, Machinery & Equipment	10	"
Miscellaneous	40	"

The figures above were determined by specialist based on statistics of the existing industrial estates in Asian countries. Aside from the discussion whether these figures are right or wrong, the proportion among industries can be used independently, because the total number of truck trips related to industrial estates is already fixed at 6,300 (truck trips per day) for the year 2000.

Using the proportion, number of truck trips per day per employment by industry can be calculated as follows:

Food, Beverage and Tobacco	0.248	trips/day/employment
Textile, Wearing Apparel and Leather	0.126	"
Wood and Wood Products	0.165	"
Paper and Paper Products	0.207	"
Chemical Products	0.207	"
Non-Metallic Mineral Products	0.290	"
Basic Metal Products	0.205	"
Fabricated Metal Products, Machinery and Equipment	0.041	"
Miscellaneous	0.164	"
Total Manufacturing	0.174	"

Then the number of truck trips of each industrial estate can be calculated, as shown below:

Table B. No. of Truck Trips of the Proposed Industrial Estates, 2000

Industrial Estate	Daily No. of Truck Trips (trips/day)
Bunawan	3,000
Panacan	2,000
Sasa	100
Agdao	300
Ma-a	100
Daliao	400
Fagel/Lizada	400
Total	6,300

Source: DCUTCLUS Estimate

(4) Estimate of the Number of Truck Trips by Industrial Estate (1990)

For the year 1990, the same method can be adopted. Since the developmental traffic volume of trucks in 1990 is small compared to 2000, the relative importance is very low.

The process of the estimate is hereinafter described briefly:

A. Total Number of Truck Trips Related to the Proposed Industrial Estates (1990)

$$\text{Total No. of Truck Trips (person trips/day)} \times \frac{\text{GDP in Industrial Estates (Day Population Base)}}{\text{Total GDP in Project Area (Day Population Base)}}$$

$$= \frac{\text{30,000 (person-trips/day)} \times \frac{\text{438 (million pesos/year at 1972 const. prices)}}{\text{3,804 (million pesos/year at 1972 const. prices)}}}{\text{Average No. of Passengers per Truck}}$$

$$= \frac{\text{30,000 (person-trips/day)} \times \frac{438}{3,804}}{1.8 \text{ (passengers/truck)}}$$

$$= 1,900 \text{ (truck-trips/day)}$$

B. Number of Employments by Industrial Estate and by Industry Type (1980)

TABLE C. Number of Employments of the Proposed Industrial Estates by Type of Industry, 1990

PSIC CODE	INDUSTRY	BUNAWAN	PANACAN	SASA	AGDAO	MA-A	DALIAO	FAGEL/LIZADA	TOTAL
31	Food, Beverage and Tobacco	2,500	1,300		200		600		4,600
32	Textile, Wearing Apparel and Leather		500		200				700
33	Wood and Wood Products		3,400		100			1,000	4,500
34	Paper and Paper Products	400	100						500
35	Chemical Products	300	300						600
36	Non-Metallic Mineral Products	800							800
37	Basic-Metal Products								
38	Fabricated Metal Products Machinery and Equipment			1,500			100	400	2,000
39	Miscellaneous								
TOTAL MANUFACTURING		4,000	5,600	1,500	500		700	1,400	13,700

C. Estimate of the Number of Truck Trips by Industrial Estate (1990)

Number of Truck Trips per Day per Employment by Industry

Food Beverage and Tobacco	0.188	trips/day/employment
Textile, Wearing Apparel and Leather	0.096	"
Wood and Wood Products	0.125	"
Paper and Paper Products	0.156	"
Chemical Products	0.155	"
Non-Metallic Mineral Products	0.219	"
Basic Metal Products	-	"
Fabricated Metal Products, Machinery and Equipment	0.032	"
Miscellaneous	-	"
Total Manufacturing	0.139	"

The figures above are approximately 80% of those of 2000, reflecting the relatively low productivity of manufacturing industries in 1990.

TABLE D. Number of Truck Trips by Industrial Estate

Industrial Estate	Daily No. of Truck Trips (trips/day)
Bunawan	750
Panacan	800
Sasa	50
Agdao	100
Ma-a	-
Daliao	100
Fagel/Lizada	100
Total	1,900

(5) Distribution of Truck Trips Related to the Proposed Industrial Estates (1990, 2000)

Based on Tab. G and Fig. A in Supporting reports - 3.3, the distribution of truck traffic related to the proposed industrial estates is determined as shown below. In addition, the distribution pattern is assumed to be the same for the years 1990 and 2000.

a. Bunawan

1990	750 trips/day
2000	3,000 "
35%	Outside Davao City (north)
30%	Sasa Port
10%	Outside Davao City (south)
5%	Sta. Ana Port
5%	Panacan Industrial Estate
5%	Commercial Areas in Poblacion including Agdao
5%	Intra-Estate
3%	Calinan
2%	Fagel/Lizada Industrial Estate

b. Panacan

1990	800 trips/day
2000	2,000 "
30%	Commercial Areas in Project Area.
20%	Outside Davao City (north)
20%	Sasa Port
10%	Outside Davao City (South)
5%	Sta. Ana Port
5%	Calinan
5%	Intra-Estate
3%	Bunawan Industrial Estate
2%	Fagel/Lizada Industrial Estate

c. Sasa

1990	50 trips/day
2000	100 trips/day
60%	Sasa Port (Intra-Estate)
30%	Commercial Areas in Poblacion including Agdao
5%	Panacan Industrial Estate
5%	Fagel/Lizada Industrial Estate

d. Agdao

1990	100 trips/day
2000	300 trips/day
50%	Commercial Areas in Project Area
10%	Sta. Ana Port
10%	Outside Davao City (North)
10%	Panacan Industrial Estate
5%	Sasa Port
5%	Outside Davao City (South)
5%	Calinan
5%	Intra-Estate

e. Ma-a

1990	trips/day
2000	100 trips/day
45%	Outside Davao City(South)
25%	Commercial Areas in Project Area
10%	Sta. Ana Port

5%	Calinan
5%	Outside Davao City (North)
5%	Sasa Port
5%	Intra-Estate

f. Daliao

1990	100 trips/day
2000	400 trips/day
25%	Intra-Estate (Between Port and Estate)
20%	Sta. Ana Port
20%	Commercial Areas in Project Area
10%	Sasa Port
10%	Outside Davao City (South)
5%	Outside Davao City (North)
5%	Panacan Industrial Estate
5%	Fagel/Lizada Industrial Estate

g. Fagel/Lizada

1990	100 trips/day
2000	400 trips/day
50%	Intra-Estate (Between Port and Estate)
20%	Sasa Port
10%	Sta. Ana Port
5%	Bunawan Industrial Estate
5%	Panacan Industrial Estate
5%	Commercial Areas in Poblacion including Agdao
3%	Sasa Industrial Estate
2%	Daliao Industrial Estate

SUPPORTING REPORTS-3.6
ESTIMATE OF THE AMOUNT OF POSSIBLE PUBLIC INVESTMENT ON TRANSPORT SECTOR IN PROJECT AREA

(1) Past Trends of Public Investment (Philippines)

Table A. Past Trends of Public Investment (Philippines)

	Investment at 1972 const. prices							Average Growth Rate (% p.a.)
	1972	1973	1974	1975	1976	1977	1978	
Public Investment (₱ Million)	1,034	1,183	1,508	2,294	3,128	3,565	3,905	24.8
Share in GNP (%)	1.9	1.9	2.3	3.3	4.3	4.6	4.7	-
Other Investment (₱Million)	10,539	11,357	14,143	16,690	17,503	16,798	18,218	9.6
Total Investment (₱ Million)	11,573	12,540	15,651	18,984	20,631	20,363	22,123	11.4
Share in GNP (%)	20.8	20.6	24.2	27.7	28.1	26.1	26.8	-

Source: 1979 Philippine Statistics Year Book

(2) Estimating Process

i) According to the Long-Term Plan 2000, the shares of Luzon, Visayas and Mindanao in public investment are 50%, 25% and 25% respectively, which are considered to be constant up to the year 2000.

ii) The proportion of public investment to GNP was 3% in 1975, and is estimated at 5% in 1980 and 6% in 2000 in the Long-Term Plan 2000. This target is reflected in the recent rapid increase in the share of public investment in GNP, as revealed in Table A. The Government of the Philippines is considered to be faithfully pursuing this goal.

iii) Since the total GNP of the country in 2000 is estimated at 474,001 million pesos at 1972 constant prices, the total public investment in Mindanao in 2000 is calculated as follows:

$$474{,}001 \times 0.25 \times 0.06 = 7{,}110 \quad (₱ \text{ Million at 1972 prices})$$

iv) By multiplying 0.38, which is the proportion of Region XI to Mindanao in public investment increment assumed in the Long-Term Plan 2000, by the figure above, public investment of Region XI in 2000 can be calculated:

7,110 x 0.38 = 2,700 (₱ Million at 1972 constant prices)

This corresponds to 6.4% of the projected GRDP of 42,029 (₱ Million at 1972 constant prices) of Region XI in 2000, which is slightly high compared to the national average of 6.0%.

v) Since the population of Region XI in 2000 is 7,274,000 as projected, per capita public investment of Region XI can be calculated at ₱371.

vi) For per capita public investment of Davao City, the following two (2) cases are considered:

I. ₱371 - same as the regional average

II. ₱445 - 20% higher than the regional average considering the fact that the City will service whole Mindanao and Region XI as a center of administration, economy, culture, education, etc.

vii) Since the projected population of the City is 1.3 million in 2000, the possible public investment for the year 2000 is calculated at ₱482 million, and ₱579 million for the cases I and II respectively.

viii) With regard to the actual public investment of the country in 1979, the share of transport sector was 38% with 30% for land transport (estimated based on interviews with NEDA, MPH, MPW, PPA, BAT, etc.). Holding these shares as constant public investment of the City can be calculated as presented in Table B and Table C.

Table B. Public Investment at 1972 Constant Prices, Davao City, 1979 & 2000

	₱ Million		Average Growth Rate (% p.a.)
	1979	2000	
Case I Public Investment	N.A.	482	-
Transport Sector	6.7	183	17.1
Land Transport	3.0	145	20.3
Other	3.7	38	11.7
Case II Public Investment	N.A.	579	-
Transport Sector	6.7	220	18.1
Land Transport	3.0	174	21.3
Other	3.7	46	12.8

Table C. Accumulated Public Investment at 1972 Constant Prices, Davao City

(₱ Million)

	1981 - 1990	1991- 2000	Total
Case I Public Investment	-	-	-
Transport Sector	207	1,002	1,209
Land Transport	122	752	874
Other	85	250	335
Case II Public Investment	-	-	-
Transport Sector	221	1,166	1,387
Land Transport	130	871	1,001
Other	91	295	386

ix) Since the projected GDP of the City in 2000 is ₱9,625 million at 1972 constant prices, the proportion of public investment to GDP is 5.0% and 6.0% for cases I and II respectively. These shares are smaller than the regional average due to the high per capita GDP of the City.

x) In the period of 1981 - 1990, the amount of public investment of the City is very small compared to that of the period of 1991 - 2000. However, by issuing public bonds, advanced public investment will be possible.

xi) Assuming price index of 2.5, the 1972 constant prices can be converted into 1980 constant prices, as shown in Table D.

Table D. Accumulated Public Investment at 1980 Constant Prices, Davao City

(₱ Million)

	1981 - 1990	1991 - 2000	Total
Case I Public Investment	-	-	-
Transport Sector	518	2,505	3,023
Land Transport	305	1,880	2,185
Other	213	625	838
Case II Public Investment	-	-	-
Transport Sector	553	2,915	3,468
Land Transport	325	2,178	2,503
Other	228	737	965

(3) Conclusion

i) With regard to the Project Area, the amount of possible public investment there can be calculated from Table D by using the shares of the Area in population and GDP, as presented in Table E.

Table E. Accumulated Public Investment at 1980 Constant Prices, Project Area.

(₱ Million)

	1981 - 1990	1991 - 2000	Total
Case (Population Proportional)			
Transport Sector	351	1,734	2,085
Land Transport	207	1,302	1,509
Other	144	432	576
Case I (GDP Proportional)			
Transport Sector	391	1,960	2,351
Land Transport	230	1,471	1,701
Other	161	489	650
Case II (Population Proportional)			
Transport Sector	375	2,018	2,393
Land Transport	220	1,508	1,728
Other	155	510	665
Case II (GDP Proportional)			
Transport Sector	417	2,281	2,698
Land Transport	245	1,705	1,950
Other	172	576	748

ii) Based on "Philippine Island Road Feasibility Study" (MPH, 1980) annual cost for maintaining existing roads in the Project Area is estimated at ₱9.6 million, which nearly double the current insufficient budget allocation for road maintenance in the Project Area. Therefore, public investment on new land transport facilities can be calculated at ₱1,317 million for the most conservative Case I (Population Proportional) and ₱1,758 million for the most optimistic Case II (GDP Proportional), for the period 1981-2000.

iii) Although the estimated figures above are the DCUTCLUS conclusion. NEDA recently made an adjustment downward on the estimated GNP for the year 2000 from ₱474 billion to ₱374 billion (in 1972 constant prices). This adjustment is considered to be shortly authorized by next 5-year development plan, etc.

Assuming the GNP in 2000 of ₱374 billion, public investment on new land transport facilities can be calculated at ₱1,067 million for the most conservative case and ₱1,431 million for the most optimistic case, by applying same methodology described above.

SUPPORTING REPORTS-3.7

VEHICLE OPERATING COSTS AS OF 1980, DAVAO

(1) General

This paper deals with the method of calculating vehicle operating costs of representative type of vehicles for economic and financial evaluation of the project. The method adopted in this study is mainly based on the Highway Planning Manual, Vol. 4, PPDO, MPH, with some cost items updated by the field survey in Davao.

Taking into account the fact that most of the arterial roads comprising the basic transport network of Davao City is paved, vehicle operating costs were calculated in detail for paved flat roads. For gravel roads, however, vehicle operating costs were estimated simply by multiplying an adjustment factor by the vehicle operating costs on paved flat roads.

Vehicle operating costs composed of running costs and fixed costs can be further broken down as follows:

A. Running Costs

a) Fuel Cost
b) Lubricant Oil Cost
c) Tire Cost
d) Maintenance and Repair Cost
e) Distance-Related Depreciation Cost

B. Fixed Costs

a) Time-Related Depreciation Cost
b) Capital Opportunity Cost
c) Creq Cost
d) Overhead, License, Motor Vehicle Fee, etc.
e) Insurance Cost

Running costs are defined as a part of vehicle operating costs which vary in proportion to the operating distance run by vehicles, while fixed costs are defined as a part of vehicle operating costs which vary directly with operating time, i.e. running time plus waiting time.

(2) Representative Vehicles

The following representative vehicles are selected in this study:

Car	:	Toyota Corona 4 Door Sedan
Jeep	:	McArthur Type
P.U. Taxi	:	Chrysler Minica Standard
Jeepney & Auto Calesa	:	Ford Fiera
Bus	:	International 1600 + Local Body
Truck	:	Toyota D 115L + Local Body

With regard to auto calesa, it is assumed that vehicle operating costs are same as those of jeepneys. Although there are some significant differences between auto calesa and jeepney, i.e. seating capacity and vehicle age, the basic mechanisms including chassis and engines are almost same and the low depreciation cost of auto calesa owing to the age will be cancelled to some extent by its high maintenance cost.

As to buses and trucks, the representative vehicles are selected according to the average seating and loading capacities surveyed in 1975 by NTSS team.

(3) Running Cost

a. Fuel Cost

Fuel cost can be estimated by multiplying fuel consumption ratio (liter/km) for each representative vehicle by fuel price (pesos/liter) that are shown in Table A and Table B respectively.

b. Lubricant Oil Cost

Lubricant Oil cost can also be calculated by multiplying oil consumption ratio (liter/1000 kms) by oil price (pesos/liter) as is the case for fuel cost. Table A and Table B show these figures required for input.

Table A. Price of Fuel and Lubricant Oil, September, 1980, Davao (pesos/liter)

Cost Item	Fuel			Lubricant Oil	
	Diesel	Regular Gasoline	Premium Gasoline	Diesel Vehicles	Gasoline Vehicles
Price excluding Tax	2.33	3.19	3.26	7.78	7.63
Customs duty	0.20	0.25	0.24	0.58	0.57
Specific Tax and Special Fund	0.32	1.15	1.29	1.18	1.18
Energy Development Impost	-	0.19	0.19	0.19	0.19
Price including Tax	2.85	4.78	4.98	9.73	9.57

Source: Caltex

Table B. Fuel and Oil Consumption Ratio

Vehicle Type	Fuel consumption Ratio		Oil Consumption Ratio
	Fuel Type	Liters/km	Liters/1000 kms
Car	Regular Gasoline	0.10	0.7
Jeep	Regular Gasoline	0.12	1.0
P.U. Taxi	Regular Gasoline	0.08	0.5
Jeepney & Auto Calesa	Regular Gasoline	0.11	0.9
Bus	Diesel	0.24	3.0
Truck	Diesel	0.26	3.0

Source: Highway Planning Manual, Vol. 4, PPDO, MPH

c. Tire Cost

Tire cost is estimated by dividing the price of a set of tires by tire life expressed in terms of kilometers.

However, considering the fact that recapped tires are commonly used by larger vehicles, the following assumptions are made:

i) The tire life will be extended by 50% of the original life at 85% use.

ii) The cost of recapping will be 30% of the brand-new price.

iii) Recapping will be done once per tire on an average for larger vehicles.

Table C indicates prices and life of tires

Table C. Prices and Life of Tires, September, 1980, Davao

Vehicle Type	No. of Tires	Tire Size	Tire Set Price (₱) Including Tax	Tire Set Price (₱) Excluding Tax	Tire Life (000 kms) New	Tire Life (000 kms) Recapped
Car	4	5.60-13 4PR	1,020	910	35	-
Jeep	4	6.00-16 6PR	1,490	1,330	45	60.75
P.U. Taxi	4	5.20-10 4PR	810	720	25	-
Jeepney & Auto Calesa	4	6.50-13 4PR	1,790	1,600	30	40.50
Bus	6	9.00-20 10PR	7,610	6,790	60	81.00
Truck	6	8.25-20 10PR	6,580	5,870	50	67.50

Source: Interviews with Dealers,
Highway Planning Manual, Vol. 4, PPDO, MPH

d. Maintenance and Repair Cost

Maintenance and repair cost can be divided into 2 portions, i.e. spare parts component and labour component.

Annual cost for spare parts is estimated in terms of percent of the adjusted vehicle retail price (vehicle price less tire set price), while labour cost is calculated as the required number of labour hours per vehicle per annum.

Table D. Requirements for Maintenance and Repair

Vehicle Type	Spare Parts Requirement (%)	No. of Labour Hours Required per year	Unit cost of Labour (₱/hr)	
			Including Tax	Excluding Tax
Car	2.5	60		
Jeep	5.0	100		
P.U. Taxi	5.0	120		
Jeepney & Auto Calesa	10.0	200	10.67	10.35
Bus	8.0	300		
Truck	7.0	250		

Source: Highway Planning Manual, Vol. 4, PPDO, MPH

e. Distance Related Depreciation Cost

The distance related depreciation cost per kilometer is calculated as the distance related share in per cent of the vehicle retail price, reduced by the price of a set of tires, divided by the like kilometrage of representative vehicle.

The split of the depreciation cost is assumed as shown in Table E. Prices of representative vehicles are shown in Table F.

Table E. Operating Characteristics and Split Ratio of Depreciation Cost

Vehicle Type	Vehicle Life		Annual Operating Distance (000 kms)	Split Ratio of Depreciation Cost (%)	
	Year	000 kms		Distance Related	Time Related
Car	10	150	15	50	50
Jeep	15	300	20	65	35
P.U. Taxi	3	135	45	85	15
Jeepney & Auto Calesa	5	300	60	85	15
Bus	8	640	80	85	15
Truck	12	540	45	65	35

Source: Highway Planning Manual, Vol. 4, PPDO, MPH

Table F. Price of Representative Vehicles, February, 1980, Davao

Vehicle Type	Price including Tax (pesos)	Price excluding Tax (pesos)
Car	52,000	42,100
Jeep	41,400	36,000
P.U. Taxi	24,500	19,800
Jeepney & Auto Calesa	36,500	31,800
Bus	213,500	177,200
Truck	165,000	135,300

Source: Davao Southern Industries, Davao Union Motorama, etc.

f. Summary of Running Cost

Table G shows the summary of running costs by vehicle type.

Table G. Running Cost

(pesos/vehicle/km)

Cost Item	Car	Jeep	P.U. Taxi	Jeepney & Auto Calesa	Bus	Truck
Cost Including Tax						
Fuel	0.478	0.574	0.382	0.526	0.684	0.741
Lubricant Oil	0.007	0.010	0.005	0.009	0.029	0.029
Tire	0.029	0.032	0.032	0.057	0.122	0.127
Maintenance (Spare parts)	0.085	0.100	0.026	0.058	0.040	0.246
Maintenance (Labour)	0.043	0.053	0.028	0.036	0.040	0.059
Depreciation (Distance)	0.170	0.086	0.149	0.098	0.273	0.191
T O T A L	0.812	0.855	0.622	0.784	1.354	1.393
Cost Excluding Tax						
Fuel	0.319	0.383	0.255	0.351	0.559	0.606
Lubricant Oil	0.005	0.008	0.004	0.007	0.023	0.023
Tire	0.026	0.028	0.029	0.051	0.109	0.113
Maintenance (Spare parts)	0.069	0.087	0.021	0.050	0.170	0.201
Maintenance (Labour)	0.041	0.052	0.028	0.035	0.039	0.058
Depreciation (Distance	0.137	0.075	0.120	0.086	0.226	0.156
T O T A L	0.597	0.633	0.457	0.580	1.126	1.157

(4) Fixed Cost

a. Annual Operating Hours

Average annual operating hours are assumed as follows:

Table H. Annual Operating Hours of Representative Vehicles

Vehicle Type	Per Day	Per Year
Car	6.5	2,000
Jeep	6.5	2,000
P.U. Taxi	10	3,000
Jeepney & Auto Calesa	10	3,000
Bus	10	3,000
Truck	9	2,700

Source: Highway Planning Manual, Vol. 4, PPDO, MPH

b. Time Related Depreciation Cost

The time related depreciation cost is calculated as the time dependent share in percent of the vehicle retail price, reduced by the tire set cost, and divided by the product of vehicle life in years and annual operating hours. This calculation method is based on the straight line depreciation and no salvage value is assumed.

c. Capital Opportunity Cost

The capital opportunity cost is estimated at 15% per annum for the country. Therefore, the average capital employed over a vehicle's lifetime can be considered to be half the initial purchasing cost in the absence of any salvage value.

The capital opportunity cost is calculated with the following equation.

$$\text{Capacity Opportunity Cost} = \frac{\text{Vehicle Price (with Tires)} \times 0.15 \times 0.5}{\text{Annual Operating Hours}}$$

d. Crew Cost

The crew cost per hour comprising salary, allowance, social benefit and commission are shown in Table I with the required number of crew per vehicle.

Table I. Crew Cost

(pesos/hour)

Vehicle Type	Driver	Conductor	Helper
Car	0.3 1/ x 4.00 =1.20	-	-
Jeep	0.4 1/ x 4.00 =1.60	-	-
P.U. Taxi	1 x 2.70	-	-
Jeepney & Auto Calesa	1 x 2.60	-	-
Bus	1 x 3.60	1 x 3.20	-
Truck	1 x 2.60	-	2 x 1.55 = 3.10

Note 1/ Proportion of commercial vehicles

Source: Estimated based on the Highway Planning Manual, Vol. 4, PPDO, MPH

e. Overhead and Motor Vehicle Fee

This cost is estimated by assuming that the September 1980 price level would be about 5% higher than that worked out in the PPDO's Manual.

Table J. Overhead and Motor Vehicle Fee

(pesos/hour)

Vehicle Type	Including Tax	Excluding Tax	Motor Vehicle Fee
Car	0.44	0.3 1/ x 1.21 =0.36	0.08
Jeep	0.55	0.4 1/ x 1.21 =0.48	0.07
P.U. Taxi	1.26	1.21	0.05
Jeepney & Auto Calesa	1.89	1.84	0.05
Bus	8.78	8.51	0.27
Truck	6.33	6.04	0.29

Note: 1/ Proportion of commercial vehicles

Source: Estimated based on the highway Planning Manual, Vol. 4, PPDO, MPH

f. Insurance Cost

The insurance cost per vehicle per hour can be calculated as the annual premiums over the manual operating hours.

It is assumed that the September 1980 price level is 5% higher than that shown in the PPDO's Manual.

Table K. Insurance Cost

(pesos/hour)

Vehicle Type	Insurance Cost 1/
Car	0.46
Jeep	0.46
P.U. Taxi	0.46
Jeepney and Auto Calesa	0.81
Bus	1.00
Truck	0.89

Note: 1/ Insurance cost is considered same for both cases with and without tax.

Source: Highway Planning Manual, Vol. 4, PPDO, MPH

g. Summary of Fixed Cost

The fixed costs are summarized in Table L.

Table L. Fixed Cost

(pesos/vehicle/hour)

Cost Item	Car	Jeep	P.U. Taxi	Jeepney & Auto Calesa	Bus	Truck
Cost: Including Tax						
Depreciation (Time)	1.275	0.466	0.395	0.347	1.287	1.711
Capital Opportunity Cost	1.950	1.553	0.613	0.913	5.338	4.583
Crew Cost	1.200	1.600	2.700	2.600	6.800	5.700
Overhead & Motor Vehicle Fee	0.440	0.550	1.260	1.890	8.780	6.330
Insurance	0.460	0.460	0.460	0.810	1.000	0.890
T O T A L	5.325	4.629	5.428	6.560	23.025	19.214
Cost Excluding Tax						
Depreciation (Time)	1.030	0.404	0.318	0.302	1.605	1.398
Capital Opportunity Cost	1.579	1.350	0.495	0.795	4.430	3.758
Crew Cost	1.200	1.600	2.700	2.600	6.800	5.700
Overhead & Motor Vehicle Fee	0.360	0.480	1.210	1.840	8.510	6.040
Insurance	0.460	0.460	0.460	0.810	1.000	0.890
T O T A L	4.629	4.294	5.183	6.347	21.805	17.786

(5) Running Cost on Gravel Roads

Although gravel roads are of less importance in the road network of Davao City, vehicle running costs on gravel roads are estimated in order to make the analysis more realistic.

However, in the absence of data, vehicle running costs on gravel roads are estimated simply by multiplying an adjustment factor on the vehicle running cost on paved roads. This adjustment factor is determined as 1.3 based on the following references:

- Quantification of Road User Savings, IBRD, 1966
- Tables for Estimating Vehicle Operating Costs on Rural Roads in Developing Countries, TRRL, Dept. of the Environment, UK, 1976.

In addition, it will be noted that vehicle fixed cost on gravel roads is considered same as that on paved roads owing to its dependence on time clasped during vehicle operation.

Table M. Running Cost on Gravel Roads

(pesos/vehicle/km)

	Car	Jeep	P.U. Taxi	Jeepney & Auto Calesa	Bus	Truck
Cost Including Tax	1,056	1,112	0.809	1.019	1.760	1.811
Cost Excluding Tax	0.776	0.823	0.594	0.754	1.464	1.504

(6) Time Cost

In general, the time cost is defined as a possible benefit which drivers and passengers could produce if they had allocated their in-vehicle time for other economic activities. However, the crew cost, which is already included in the fixed cost as a component, must be excluded from the time cost, since the time cost can be calculated only for those who can allocate their time to additional works if they want.

The time cost is allocated a monetary value for those "at work" and "to/from work", while no time cost is assumed for those travel on other purposes.

Table N indicates the estimated time cost per hour per person for different types of passengers.

Table N. Time Cost

Type of Passenger/Driver	(pesos/hour/person) At Work	To/From Work	Other Purposes
Car/Jeep Driver (Owner)	10.35	5.18	0
Car/Jeep Passenger	4.14	2.07	0
P.U. Taxi Passenger	4.14	2.07	0
Jeepney/Auto Calesa Passenger	2.07	1.04	0
Bus Passenger	2.61	1.31	0
Truck Passenger	1.55	0.78	0

Source: Estimated Based on the Highway Planning Manual, Vol. 4, PPDO, MPH

SUPPORTING REPORTS - 3.8

COST ESTIMATE FOR INTRODUCTION OF RAIL TRANSIT SYSTEM

1. Introduction

Three (3) alternative plans have been formulated for the long term transportation masterplan. The introduction of a rail transit system has been proposed under Alternative A. A rail transit system is envisaged to be the similar type as the Metro Manila Light Rail System. Costs for construction of the rail transit system are roughly estimated hereunder.

2. Facilities

Facilities for the rail transit system are summarized as follows:

Route	- - - Toril-Talomo-Ecoland-Poblacion-Agdao-Sasa-Panacan-Bunawan
Length	- - - Total length: 35.7 kilometers consisting of 31.7 kilometers of at grade section and 4.0 kilometers of elevated section
Number of trucks	- - - Double trucks
Number of rolling stocks	- - - 60 cars (capacity: 280 passengers per car)
Number of stations	- - - 34
Number of terminals	- - - 3
Land space	- - - 2.5 hectares for depot, workshop, office and marshalling yard
Number of grade separation	- - - At 8 intersections

3. Cost Estimates

Costs for the introduction of rail transit system have been roughly estimated in 1980 constant prices. Unit prices used in estimate of Metro Manila Light Rail System have been referenced.

	Item	Unit Price	Quantity	Cost (in Million ₱)
1)	Civil Work			
	a) At grade structure including stations	₱1.5 Million/ km.	31.7 km	47.6
	b) Elevated structure including stations	₱42.0 Million/km.	4.0 km	168.0
	c) Depot, workshop, office and marshalling yard including buildings	₱1,800/m^2	25,000 m^2	45.0
	d) Truck work	₱2.3 million/ km.	35.7 km	82.0
	e) Terminals	-	3	40.5
	f) Civil work for power supply, signalling and communication	₱1.0 million/ km.	35.7	35.7
	g) Grade separation	₱12.0 million/ each	8	96.0
	h) Underground passenger access to the station	₱1.5 million/ each	20	30.0
	i) Design, sub-surface investigation, etc.	3%	-	16.4
	Sub-Total			561.2
2)	Rolling stocks and Truck Equipment			
	a) Rolling stocks	₱6.2 million/ car	60	372.0
	b) Truck equipment	₱2.1 million/ km.	35.7	75.0
	c) Truck equipment for marshalling yard	-	-	12.2
	Sub-Total			459.2

	Item	Unit Price	Quantity	Cost (in Million ₱)
3)	Power Supply, Signalling & Communication			
	a) Sub-station	-	-	72.0
	b) Power supply	₱2.32 million/ km.	35.7 km	82.7
	c) Signalling	₱1.25 million/ km.	35.7 km	44.7
	d) Communication	₱1.06 million/ km.	35.7 km	38.0
	e) Workshop equipment and spare parts	-	-	64.7
	Sub-Total			302.1
4)	Land Acquisition & Utility Relocation			
	a) Land Acquisition along route	₱50-150/m^2	24.4 ha.	16.4
	b) Land acquisition for depot, office, etc.	₱ 50/m^2	2.5 ha.	1.3
	c) Land acquisition for terminals	₱150-1200/m^2	0.65 ha.	3.6
	d) Property compensation	-	-	20.0
	e) Public utility relocation	-	-	16.8
	Sub-Total			58.1
	Grand Total			1,380.6

SUPPORTING REPORTS-3.9

ANALYSIS ON TRAVEL DISTANCE - TRAVEL TIME RELATIONSHIP OF PUBLIC TRANSPORT

(1) Basic Inputs for the Analysis

Based on the basic policies on public transport mentioned in Chapter 4.1, Vol. II, the following basic information was worked out on a map showing land use, public transport routing scheme, design standards of roads and rail transit guideways, and proposed location of stations of trunk service of public transport.

a. Access Length to Major Public Transportation Route

Case I Rail Transit as a Trunk Service

Average Access Length 2.1 kms. (using Bus)
Average Access Length 0.8 kms. (using PUJ)

Case II Bus as a Trunk Service

Average Access Length 2.0 kms. (using Bus)
Average Access Length 0.8 kms. (using PUJ)

b. Travel Speed

Case I Rail Transit as a Trunk Service

Rail Transit	35 kms./h
Bus (Feeder)	20 kms./h
PUJ (Feeder)	15 kms./h

Case II Bus as a Trunk Service

Bus (Trunk Service)	25 kms./h
Bus (Feeder)	20 kms./h
PUJ (Feeder	15 kms./h.

c. Passenger Waiting Time

Case I Rail Transit as a Trunk Service

for Rail Transit	15 minutes
for Bus (Feeder)	4 minutes
for PUJ (Feeder)	2 minutes

Case II Bus as a Trunk Ser vice

for Bus (Trunk Service)	4 minutes
for Bus (Feeder)	4 minutes
for PUJ (Feeder)	2 minutes

(2) Standpoint of the Analysis

Since the current fare systems of bus and PUJ are the same and the fare system of the proposed rail transit is assumed to have no large difference from those of other public transport modes, future passenger fare can be assumed not to vary largely by travel mode if travel distance is fixed. Therefore, travel time will be a good criterion for evaluating public transport systems. If monetary value can be determined on passenger travel time (in-vehicle time + waiting time), then the travel time can be converted into time cost. The total travel cost the passenger must pay is, calculated by adding time cost to the fare, which is supposed to be similar among various modes of public transport. Then it becomes possible to evaluate various public transport systems by comparing travel distance - travel time relationships.

(3) Results of the Analysis

Fig. A., Fig. B and Fig. C show the results of the analysis. Fig. A deals with Case I having rail transit as trunk service and Fig. B deals with Case II having bus as trunk service, while Fig. C shows the result of a comparative analysis of Cases I and II.

The following comments will be useful:

a. As a feeder service, PUJ is advantageous when the travel distance does not exceed 2 kms.

b. When a rail transit is constructed (Case I):

   i) For those who have access to PUJ feeder service, it is recommended to transfer to rail transit if the travel distance is longer than 7.3 kms.

   ii) For those who have access to bus feeder service, it is recommended to transfer to rail transit if the travel distance is longer than 13.5 kms.

c. When rapid bus service starts along trunk roads (Case II):

   i) For those who have access to PUJ feeder service, transfer to trunk bus service is recommended if the travel distance exceeds 3.3 kms.

ii) For those who have access to bus feeder service, transfer to trunk bus service is recommended if the travel distance exceeds 8.7 kms.

d. Based on the comparative analysis of Cases I and II (See Fig. C), it is concluded that the proposed rail transit is more effective and economical for the passengers who want to travel more than the passengers who want to travel more than 17 kms. If it is possible to cut down the headway and, therefore, the passenger waiting time, the threshold distance above will be reduced remarkably.

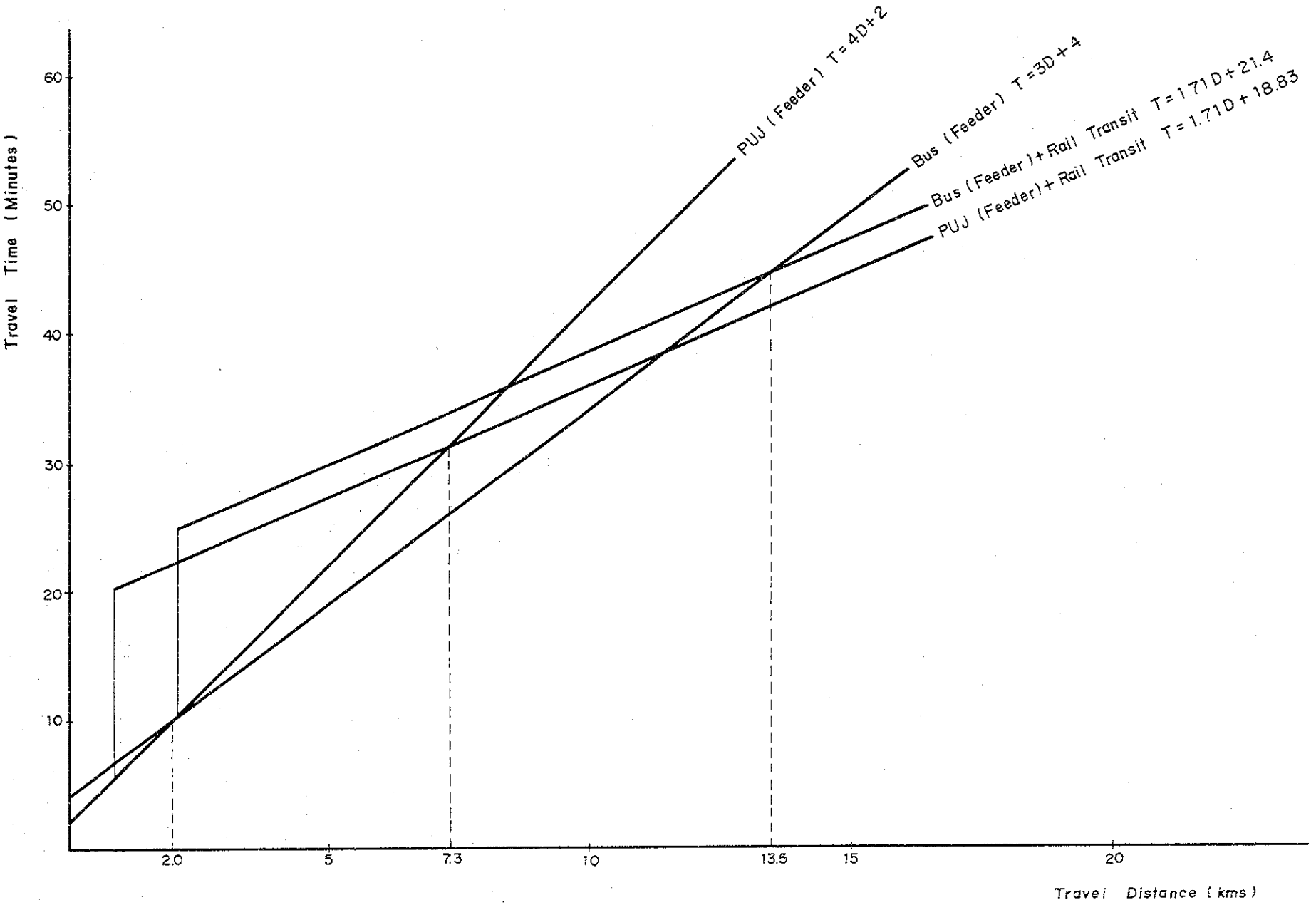


Fig. A Distance - Time Relationship of Case I

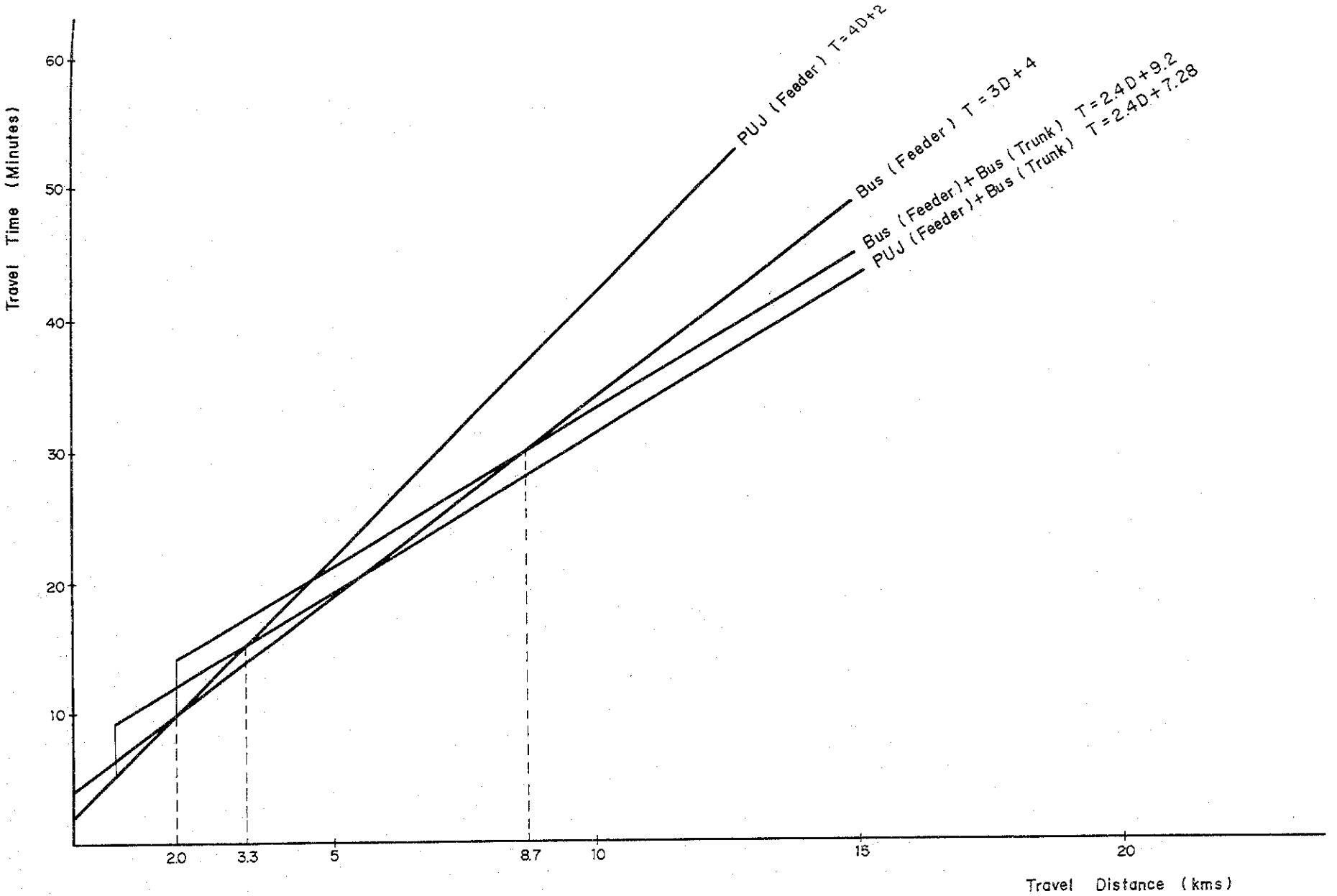


Fig. B Distance - Time Relationship of Case II

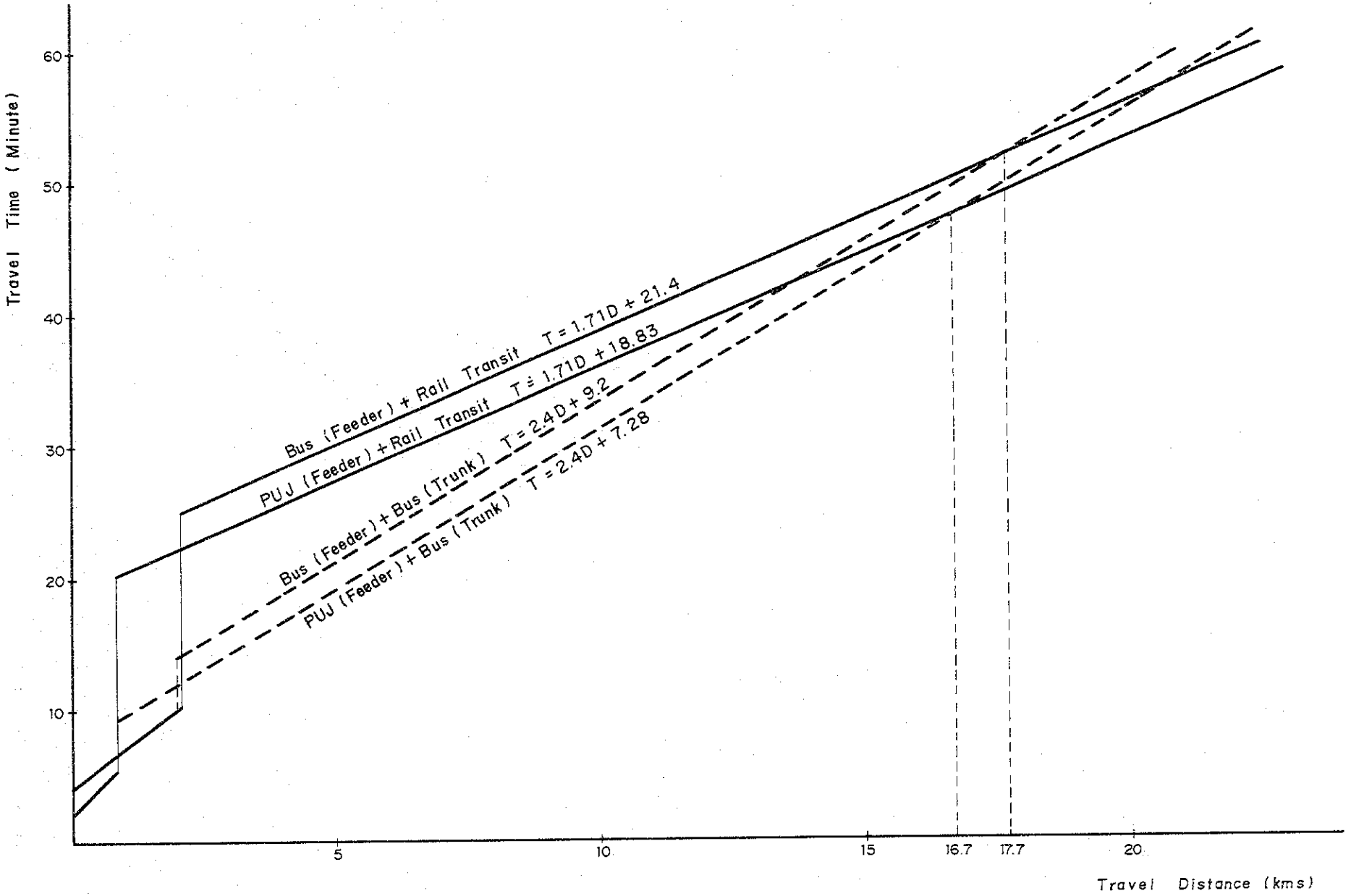


Fig. C Comparison of Case I and Case II

SUPPORTING REPORTS - 3.10

EFFECT OF CITY BUS INTRODUCTION

The introduction of city bus system, discussed in chapter 7.3.1, volume III, will bring about 1) transportation efficiency improvement and 2) consequential transportation cost reduction, and, more practically, 3) reduction of road traffic and 4) consequential curtailment of needs for additional road construction.

1) Transportation Efficiency Improvement

Assumed for this Plan are the bus capacity of 50 passengers (usually from 50 to 60) and the average occupancy rate of about 45% (slightly lower than the present PUJ occupancy rate), and, thus, the daily average of 22 passengers per bus. Each bus corresponds to 2 passenger car units (PCU), which is the unit used in measuring road traffic volume and, therefore, average transportation quantity is 11 passengers per PCU of bus.

In comparison, the average quantity of transportation by the PUJ is 5.4 passengers per PCU, that of car is 1.8 passengers per PCU, and that of the PU is 0.61 passengers per PCU. The transportation efficiency of the bus is, therefore, overwhelmingly high in comparison with these other modes (Table A).

Table A NUMBER OF PASSENGERS PER PCU BY PUV MODE

	No. of Vehicle	No. of Pass. per Vehicle	PCU Equivalent	No. of Pass. per PCU
CAR	1 Unit	1.80	1.0	1.80
PUJ	1	8.10	1.5	5.38
BUS	1	22.00	2.0	11.00
PU	1	0.61	1.0	0.61

2) Vehicle Operating Cost Reduction

Based on the vehicle operating costs presented in Supporting Reports-3.7, the cost of transportation by bus is 0.102 pesos per passenger-kilometer and that by PUJ is 0.139 pesos per passenger-kilometer, as listed in Table B. The introduction of the bus will result in a saving of approximately 30% in transportation cost.

Table B Vehicle Operating Costs

	BUS	PUJ	NOTE
a)Running cost	1.354 Pesos/Vehicle/km	0.784	see Volume 3.7
b)Fixed Cost	23.205 Pesos/Vehicle/hour	6.560	see Volume 3.7
c)Average operating speed	26.0 km./hour	20.0	
d)Fixed Cost b)/c)	0.893 Pesos/Vehicle/km.	0.328	
e)Total operating Cost	2.247 Pesos/Vehicle/km.	1.112	
f)Average No. of Pass per Vehicle	22.0 Person/Vehicle	8.0	
g)Operating Cost per Pass. km.	0.102 Peso/Pass.km.	0.139	

3) Road Traffic Volume Reduction

Because of the high transportation efficiency of bus, the number of bus units required to transport a given quantity of public transport passengers will be less than the number of vehicles of PUJ required to transport the same quantity. Thus, it is predicted that the introduction of the bus in place of the PUJ will result in an about 20% reduction in road traffic on Davao-Cotabato Road and 10% on Davao-Agusan Road in the year 2000 (see Table C).

Table C Reduction of Traffic Volume by Bus Introduction

		Traffic Volume in PCU, 2000					
				PUV			
		Total	CAR	BUS	PUJ	Mis	PU
			PCU	PCU	PCU	PCU	PCU
DAVAO-COTABATO ROAD at Bankerohan Bridge	Do Nothing Case 2,000	55,290	20,183	490	20,908	4,567	9,142
					35,107 PCU		
	Bus Introduction case 2000	44,519	20,183	490	10,137	4,567	9,142
					24,336		
DAVAO-AGUSAN at Panacan/Sasa	Do nothing case 2000	31,857	23,797	390	5,840	694	1,136
					8,060		
	Bus Introduction case 2000	28,847	23,797	390	2,831	694	1,136
					5,051		

4) Reduction in Need for Road Construction

Reduction in road traffic demand as discussed in 3) above will result in a corresponding reduction in the quantity of necessary road construction work. Thus, there will be a substantial difference between road construction demand should the PUJ continue to be the major transportation mode and such demand should the bus is newly introducted in place of the PUJ.

Plan B, which is the alternative under which the bus will be the major mode of public transport, will result in the savings of approximately 25% in the total extension (lane-kilometer) of roads to be newly constructed, about 13% in the extension of upgraded roads, and about 22% in road construction cost (Table D) when compared against Plan C, under which the PUJ will be the major public transport mode as discussed in Chapter 5 "Alternative Plan", Volume III.

Table D **REDUCTION OF TOTAL ROAD LENGTH AND CONSTRUCTION COST BY INTRODUCTION OF BUS**

CASE	USING PUJ	USING BUS
NECESSARY LENGTH OF MAJOR ROAD (in Lane - Km.)	New Construction 176.2	132.6
	Up - Grading 416.4	365.8
CONSTRUCTION COST FOR ROAD (₱ million)	1,441.0	1,266.0

SUPPORTING REPORTS - 3.11
RAILROAD SERVICE FREQUENCY AND REQUIRED ROLLING STOCK QUANTITY

1) Route Selection and Passenger Demand

The planned railroad route will connect Bunawan, Poblacion, and Toril so as to cover the major flows of public transport demand, as presented in the Figure A and as discussed in Volume III, Chapter 7. The total extension of this route will be 35.7 kilometers and, as also shown by the Figure A, the Predicted maximum railroad demand between any pair of stations is 97,200 passengers per day and the minimum, 13,700 passengers per day (see in Volume III, Chapter 5).

2) Railroad Service Frequency Determination

In view of the substantial difference in estimated demand, two types of operation are considered. Outer route is the shuttling of the trains for the entire length of the route and inner route is shuttling to cover only the high-demand inner section in order to effect a higher service frequency in the inner section than in the outer section. Inner route is extending on both sides of Poblacion for an extension of 21.4 kilometers from Station 9 (Panakan) to Station 31 (Talomo) and extension of outer route is full 35.7 kilometers from Station 1 (Bunawan) to Station 37 (Toril). Separate service frequencies are to be determined for the inner and outer routes.

Assuming the same type of train as the Light Rail Transit presently being developed in Manila and single car train with a practical capacity of 280 passengers per car, the following service frequencies are proposed.

i) Inner Route

Maximum Station-to-Station Demand ... 97,200 passengers per day (between Station 18 and Station 19)

Peak-Hour Concentration Rate ... 13% (according to

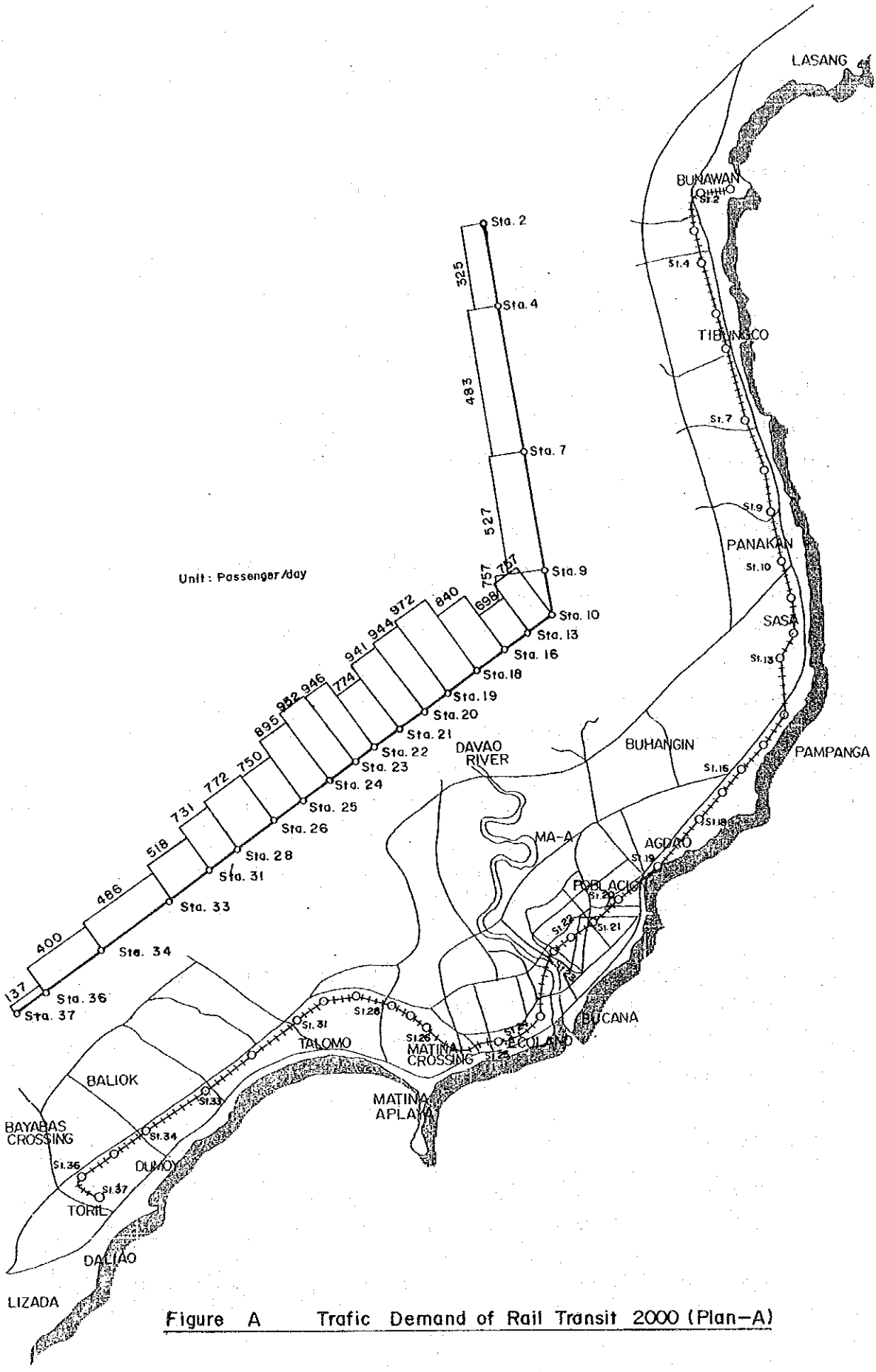


Figure A Trafic Demand of Rail Transit 2000 (Plan-A)

the result of Person-Trip Survey, the peak-hour concentration rate of public transport passengers is from 12% to 13% of daily demand)

Heavy-Direction Rate . . . 75%

Peak-Hour Service Frequency ... 33.8 runs per peak hour (97,200 x 13% x 75% ÷ 280 passengers per car)

Peak-Hour Headway ... 2.0 minutes (one direction)

ii) Outer Route

(North)

Maximum Station-to-Station Demand ... 52,700 passengers per day, between Station 7 (Tibungco) and Station 9

Other conditions ... same as the inner route

Peak-Hour Heavy-Direction Service Frequency ... 18.4 runs per peak hour (in heavy direction)

Peak-Hour Headway ... 4.0 minutes (one direction)

(South)

For the outer route in the south, where the maximum station-to-station demand is 51,800 passengers between Station 31 (Talomo) and Station 33, which compares to the maximum between Stations 7 and 9 in the north, the same service frequency and the same train operation headway as for the north are to be proposed for the south.

3) Required Number of Cars

The number of railroad cars needed (N) is to be calculated as follows:

a) If $\frac{2L}{V} + \alpha_1 + \alpha_2 < 60$ minutes

Then, $N = \frac{\frac{2L}{V} + \alpha_1 + \alpha_2}{t_1} (1 + r)$

b) If $\frac{2L}{V} + \alpha_1 + \alpha_2 > 60$ minutes

Then, $N = \left(\frac{60}{t_1} + \frac{\left(\frac{2L}{V} + \alpha_1 + \alpha_2 \right) - 60}{t_2} \right) (1 + r)$

Wherein:

L is the length of the route

V is travel speed

α_1 and α_2 are resident time at the terminal stations

r is 10%

t_1 is peak-hour headway

t_2 is off peak-hour headway

The conditions of the calculation are as follows:

Inner route trains:

Service distance ... 21.5 kilometers

Operation headway ... 2 minutes (peak hour)

4 minutes (off peak hour)

Outer route trains:

Service distance ... 35.7 kilometers

Operation headway ... 4 minutes (peak hour)

8 minutes (off peak hour)

Using the above equations and the conditions, the number of railroad cars needed is calculated as follows:

Needed for inner route ...	31 cars
Needed for outer routes ...	21 cars
Reserve cars ...	8 cars
Total:	60 cars