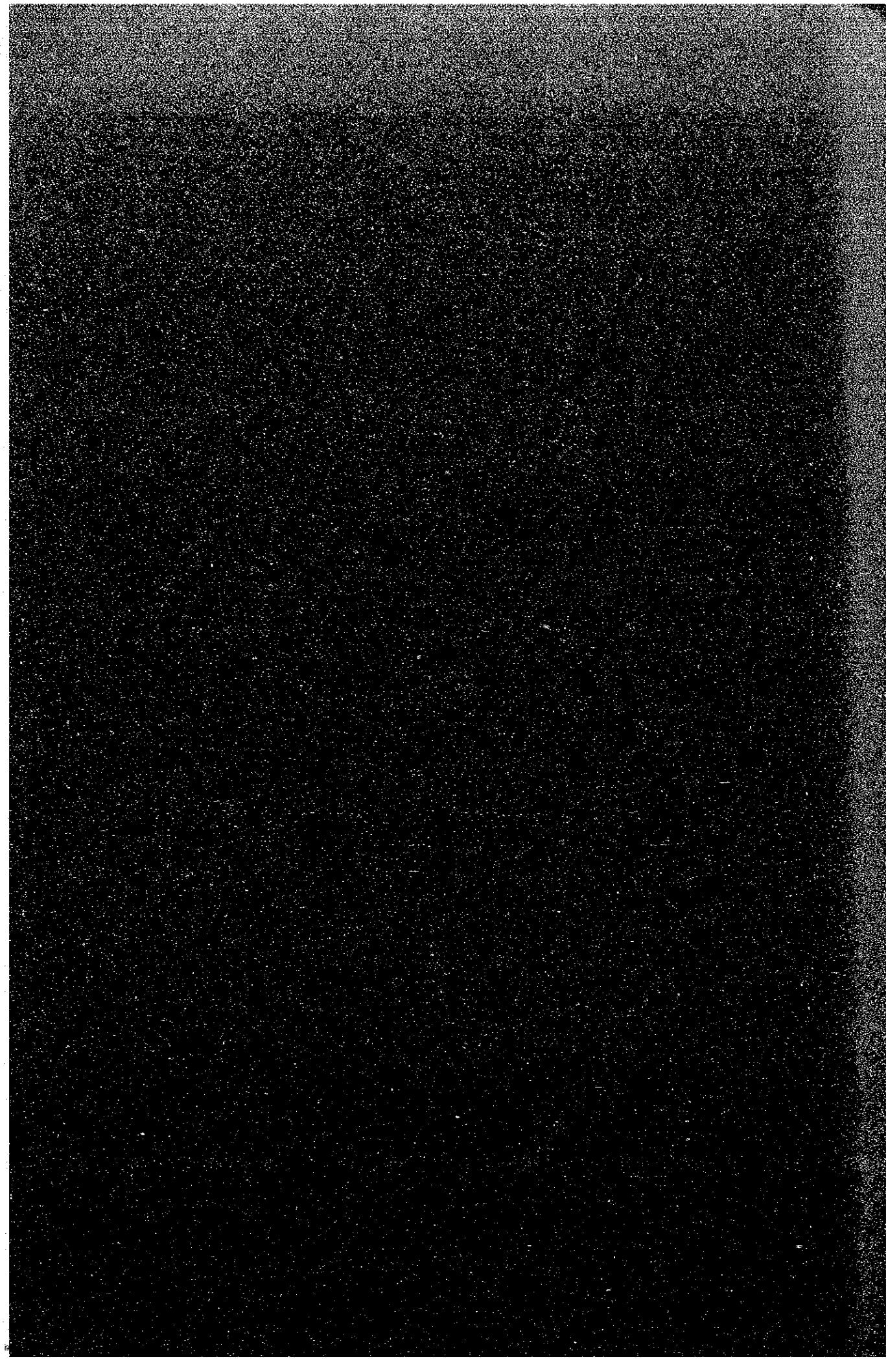
APPENDIXES FOR CHAPTER 11



APPENDIX NOTE 11.1 BASIC ROAD TRAFFIC COST

11.1.1 General

Studies on the vehicle operating cost were conducted on the following four vehicle types, each having different operating characteristics:

1. Small vehicles including cars and vans
2. Jeepneys
3. Buses
4. Medium Trucks

The vehicle operating cost is composed of distance-related (running costs) and time-related cost (fixed hourly cost). Running costs are defined as part of vehicle operaing costs which vary in proportion to the operating distance run by vehicles, while fixed costs are defined as part of vehicle operating costs which vary directly with operating hours, i.e. running hours plus idling hours. The Manual on Basic Traffic Cost Calculation Procedures,1/ prepared by the MPWH was the main reference for the study with some minor modifications to be consistent with findings of the Study Team.

11.1.2 Representative Vehicles

The following representative vehicles were selected in this Study:

APPENDIX TABLE 11.2-1 PRICE OF REPRESENTATIVE VEHICLES, JUNE 1981

	Weighted Retail Price	
	Including Tax (IT) (₱)	Excluding Tax (ET) (₱)
1. Bantam RG	57,480	45,930
2. Jeepney Mac-Arthur RG	50,860	44,250
3. Bus D 1)	248,580	214,505
4. Truck D 2)	216,430	182,410

R = Regular, P = Premium, RG = Gasoline Regular
D = Diesel

1/ PPDO of MPWH, The Manual on Basic Traffic Cost Calculation Procedures, (Vol. 4, July 1979 with prices updated to June 1981).

Source: Manual on Basic Road Traffic Cost Calculation Procedures, Vol. 4 PPDO, MPH in July 1979 with prices updated to June 1981.

1) The average price of a small and a large bus. The 50% share each on large buses and small buses was determined by reviewing the traffic count data at the cordon screen AA' in the DIZ of the Project Study.

2) Medium Truck of net cargo weight approximately 6 tons.

11.1.3 Basic Running Costs

The basic running cost comprises of fuel, lubricant, tire, maintenance and repair costs. A part of depreciation cost to be included was estimated as in the latter subsection 4).

1) Fuel Cost

Fuel cost was estimated by multiplying fuel consumption (liter/Km.) for each representative vehicle by fuel price (pesos/liter). They are shown in the following Tables 4). 11.2-2 and 11.2-3.

APPENDIX TABLE 11.2-2 PRICE OF FUEL AND OIL AS OF JUNE 1981

Unit: Pesos/Liter

	Fuel			Engine Oil 1)	
	Diesel	Regular Gasoline	Premium Gasoline	Cars, Vans & Jeepneys	Buses & Trucks
Price excluding tax	2.660	3.392	3.507	8.687	10.087
Customs duty	0.160	0.160	0.160	0.160	0.160
Specific Tax & Special Funds	0.290	1.308	1.393	1.263	1.263
Energy Tax	-	0.190	0.190	0.190	0.190
Price including tax	3.110	5.050	5.250	10.300	11.700

Source: Oil Industry Commission through the Manual of PPDO.

1) ESSO Motor Oil 10^{W} for cars and jeepneys, and model HD 90 for buses and trucks.

APPENDIX TABLE 11.2-3 FUEL AND OIL CONSUMPTION

Vehicle Type	Fuel Consumption Fuel Type	Liters/Km.	Oil Consumption (Liters/1,000 Kms.)
Bantam Car	Regular Gas	0.10	0.7
Jeepney MacArthur 2)	Diesel	0.15	1.0
Bus 1)	-do-	0.20	2.75
Medium Truck	-do-	0.26	3.0

Source: Manual of PPDO

1) The averaged fuel and oil consumption of a small and a large bus.

2) According to the survey in 1979 for Manila-Bataan Road Study, the majority was using diesel.

2) Tire Cost

Tire cost was estimated by dividing the price of a set of tires by tire life expressed in kilometers. However, considering the fact that recapped tires were commonly used by commercial vehicles, the following assumptions were made:

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

2. The cost of recapping will be 30% of the brand new price.

3. Recapping will be done once per tire on average for commercial vehicles.

APPENDIX TABLE 11.2-4 PRICES AND LIFE OF TIRES, JUNE 1981

Vehicle Type	No. of Tires	Tire Size	Tire Set Price (₱) IT	ET	Tire Life (000 Kms.) New	Recapped
Car	4	5.60-13 4-PR	1120	986	35	-
Jeepney	4	6.00-16 6 PR	1819	1601	40	54.00
Bus	6	8.25-20 10 PR	8831	7770	55	74.25
Truck (Medium)	6	8.25-20 10 PR	8257	7266	50	67.50

Source: Manual of PPDO

3) Maintenance and Repair Cost

Maintenance and repair cost was divided into two components; one in the distance-related running cost and the other in

the time-related cost. The former was determined as follows:

a. The spare part component was estimated in terms of percent of the adjusted vehicle retail price (vehicle price less tire set price).

b. The labor component was calculated as the required number of labor hours per vehicle per annum. Appendix Table 11.2-5 shows the maintenance and repair requirement.

APPENDIX TABLE 11.2-5 REQUIREMENT FOR MAINTENANCE AND REPAIR

Vehicle Type	Spare Parts Requirements (%)	No. of Labour Hours Required Per Year	Unit Cost of Labour (₱/hr.) Including Tax	Unit Cost of Labour (₱/hr.) Excluding Tax
Car	2.5	60	14.30	13.90
Jeepney	10.0	200		
Bus 1)	9.0	275		
Medium Truck	7.0	250		

Source: Manual of PPDO

1) The average of a small and a large bus.

4) Distance-Related Depreciation Cost

The distance-related depreciation cost per kilometer was calculated as the distance-related portion of the vehicle retail price less the price of a set of tires, divided by the life kilometerage of the representative vehicle. The split of the depreciation cost between the distance-related portion and the time-related one is assumed as shown in Appendix Table 11.2-6.

APPENDIX TABLE 11.2-6 OPERATING CHARACTERISTICS

Vehicle Type	Vehicle Life		Annual Operating Distance (1000 Kms.)	Split Ratio of Depreciation Cost	
	Years	1000 Kms.		Distance-Related	Time-Related
Car	10	150	15	50%	50%
Jeepney	7	420	60	85%	15%
Bus 1)	7	530	75	85%	15%
Medium Truck	12	540	45	65%	35%

Source: Manual of PPDO

1) The average of a small and a large bus.

5) Summary of the Running Cost per Kilometer

Appendix Table 11.2-7 shows the summary of the financial and the economic running cost by vehicle type, respectively.

APPENDIX TABLE 11.2-7 RUNNING COST, JUNE 1981

(Pesos/Vehicle/Km.)

Cost Item	Bantam Car	MacArthur Jeepney	Bus 1) Diesel	Medium Truck Deisel
Cost Including Tax				
Fuel	0.5050	0.4666	0.6220	0.8086
Lubricant Oil	0.0072	0.0103	0.0322	0.0351
Tire	0.0381	0.0438	0.1484	0.1817
Maintenance:				
Spare parts	0.0936	0.0817	0.2672	0.3220
Labor	0.0572	0.0477	0.0524	0.0794
Depreciation (Distance)	0.1872	0.0992	0.3630	0.2492
Total:	0.8883	0.7493	1.4852	1.6760
Cost Excluding Tax				
Fuel	0.3392	0.3989	0.5320	0.6916
Lubricant Oil	0.0061	0.0087	0.0278	0.0303
Tire	0.0335	0.0385	0.1305	0.1599
Maintenance:				
Spare Parts	0.0746	0.0711	0.2314	0.2708
Labor	0.0556	0.0463	0.0509	0.0772
Depreciation (Distance)	0.1492	0.0863	0.3145	0.2105
Total:	0.6582	0.6498	1.2871	1.4403

Source: Manual of PPDO

1) The average of small and a large bus.

11.1.4 Time Related Costs (Fixed Costs)

1) General

Time related cost is part of vehicle operating cost, which is considered suitable to associate it with the operating hours regardless of actual running time. It was estimated as in the following subsections.

2) Annual Operating Hours

Average annual operating hours were assumted as follows:

APPENDIX TABLE 11.2-8 ANNUAL OPERATING HOURS

Vehicle Type	Operating Hours Per Day	Per Year
Car	6.5	2,000
Jeepney	10.0	3,000
Bus	10.0	3,000
Medium Truck	9.0	2,700

Source: Manual of PPDO

3) Time-Related Depreciation Cost

The time-related depreciation cost was calculated as the time dependent share in percent of the vehicle retail price less the cost of a tire set. The percent share is shown in Appendix Table 11.2-6. The cost was divided by the product of vehicle life in years and annual operating hours. Thus, calculation method was based on the straight line depreciation and no salvage value was assumed.

4) Capital Opportunity Cost

The capital opportunity cost (the interest rate) was estimated at 15% p.a. for the country. Therefore, the average capital employed over a vehicle's lifetime could be considered to be half the initial purchasing cost with zero salvage value. The capital cost (the interest charge) was calculated with the following equation:

$$\text{Capital Cost} = \frac{\text{Vehicle Price (Without Tires)} \times 0.15 \times 0.5}{\text{Annual Operating Hours}}$$

5) Crew Cost

The crew cost per hour comprising salary allowance, social benefit and commission is shown in the following table with the required number of crew per vehicle.

APPENDIX TABLE 11.2-9 CREW COST

Vehicle Type	Driver	Conductor	Helper
Car			
Jeepney	1 @ ₱3.50		
Bus	1 @ ₱4.25	1 @ ₱3.95	
Truck	1 @ ₱3.40		2 @ ₱2.15 = 4.30

Source: Manual of PPDO

6) Overhead and Vehicle Fee

Overhead and vehicle fee per hour is quoted from the updated Basic Traffic Cost Manual and are shown in Appendix Table 11.2-12.

7) Insurance Cost

The insurance cost per vehicle per hour could be calculated as the annual premiums over the annual operating hours. In this case the premium was for the all-risk coverage.

APPENDIX TABLE 11.2-10 INSURANCE COST

Vehicle Type	Insurance Cost 1) (Pesos/Hour)
Bantam Car	0.53
Jeepney	0.94
Bus 2)	1.04
Medium Truck	1.02

Source: Manual of PPDO

1) Insurance cost was considered same for both cases with and without tax.

2) The average of a small and a large bus.

8) Basic Fixed Cost Reduction Factors

Based on the research made by the PPDO of the MPWH only 30% of bantam cars were considered to be in commercial use. The total fixed cost of this commercial use has been taken into the operating cost. The cost for private use was deleted.

Fleet reduction factors will vary with the type of vehicle, type of operation and area. The factors are supposed to express the degree at which time saving due to road improvements can lead to productivity gain in the form of fleet reduction.

It was further assumed that the utilization of saved time would probably be higher on vehicles with characteristics of short and frequent trips, such as jeepney and commercial cars, while large vehicles would not be utilized effectively because they were subject to extensive repair and rescheduling trips over longer distances.

Basic fixed cost reduction factors, comprising commercial use and fleet reduction factors were assumed as shown in Appendix Table 11.2-11.

APPENDIX TABLE 11.2-11 REDUCTION FACTOR

Vehicle Type	Reduction Factor	
	Commercial Use	Fleet Red.
Bantam Car	0.30	1.0
Jeepney	1.00	0.9
Bus 1)	1.00	0.75
Truck	1.00	0.60

Source: Manual of PPDO

1) The average of a small and a large bus.

9) Summary of Fixed Cost

APPENDIX TABLE 11.2-12 FIXED COST

(Pesos/Vehicle/Hour)

Cost Item	Bantam Car	Jeepney	Bus 4)	Truck
Cost Including Tax				
Depreciation (Time)	1.40	0.35	1.64	2.24
Capital Cost at 15% p.a.	2.16	1.27	6.22	6.01
Crew Cost	-	3.50	8.20	7.70
Overhead & Motor Vehicle Fee	0.10[1] 1.48[2]	2.18	8.62	7.33
Insurance	0.53	0.94	1.04	1.02
Total	4.19[1] 5.57[2]	8.24	25.72	24.30
Reduction Factor Commercial Use	0.30	1.00	1.00	1.00
Reduction Factor Fleet Use	1.00	0.90	0.75	0.60
Basic Fixed Cost[3]	1.51	6.57	18.21	13.97
Cost Excluding Tax				
Depreciation (Time)	1.12	0.30	1.42	1.88
Capital Cost	1.72	1.11	5.36	5.07
Crew Cost	-	3.50	8.20	7.70
Overhead & Motor Vehicle Fee	-[1] 1.39[2]	2.11	8.38	6.95
Insurance	0.53	0.94	1.04	1.02
Total	3.37[1] 4.76[2]	7.96	24.40	22.62
Reduction Factor Commercial Use	0.30	1.00	1.00	1.00
Reduction Factor Fleet Use	1.00	0.90	0.75	0.60
Basic Fixed Cost[3]	1.27	6.32	17.25	12.96

Source: Manual of PPDO

1) Private Car Only

2) Commercial Car Only

3) Excluding Insurance

4) The average of a small and a large bus.

11.1.5 Time Cost of Passengers

In general, time cost is defined as a possible benefit which drivers and passengers could produce had they allocated their in-vehicle time for other economic activities resulting from running on the improved road system.

Time cost was allocated a monetary value for those "at work" and "to/from work," while no time cost was assumed for travels with other purposes. (See Appendix Note 11.2 for the values actually used). The updated hourly rate value of time is shown below:

Descriptions	In Work	To/From Work
Car: Driver, Owner	₱14.50	7.00
Driver otherwise and passenger	5.50	2.75
Jeepney passenger	2.75	1.40
Bus passenger 1)	3.13	1.58

Source: Manual of PPDO

1) A passenger on the average of a small and a large bus.

APPENDIX NOTE 11.2 dl METHOD (APPLICATION OF BASIC TRAFFIC COSTS ON THE ROAD NETWORKS WITH AND WITHOUT THE PROJECT)

11.2.1 General

As stated in Chapter 6, the traffic volume was assigned on the road network by applying the Q-V relationship formula, the diversion curve and the time minimum path selection on the network. The results of the asignment work were then used for estimating the overall traffic cost on the road network in the designated area. The cost was estimated by using the "dl method" of the then MPH. The following statements are the determination of the values in the factors of the dl method.

The basic running cost is the cost of a vehicle running on a level, straight road with a good paved surface condition, free flow of traffic and insignificant roadside friction. Individual running cost on a road not in ideal conditions is assumed to be equal to the cost of running at an ideal conditions on the same length plus an extra distance which varies in accordance with the actual conditions of the link.

The MPWH has developed a set of dl values applicable to various road conditions since 1971[1/]. The method was applied for the study of Manila-Bataan Coastal Road and Its Related C-5 and C-6 Roads Project in 1980. The Study Team decided to adopt this system with an adjustment suitable to the actual road conditions for the road system in the Project Area. Most of the following items are the elements of dl applicable to the Project which could be additive independently to obtain the actual traffic costs on a road section.

11.2.2 dl Factors

1) Roadside Friction

Roadside frictions are categorized into four classes with the following definitions:

a. None: Few or no hourses along the carriageway.

b. Light: Houses and/or intersections along and close to the carriageway, 100-200 meters apart. Pedestrian and other slow moving traffic seen occasionally.

c. Medium: Scattered roadside development, 50-100 m, between buildings and/or intersections. Pedestrian and other slow moving traffic observed frequently.

1/ An example is shown in Road Feasibility Study II, June 1975 (MPWH and Norconsult A. A. & Hoff Overgard.)

d. Heavy: Continuous roadside development. Pedestrian and other slow moving raffic tends to frequently disrupt motor vehicle traffic flow and reduce travel speed to under 40 KPH. even at low traffic densities.

2) Service Levels

Levels of service are classified as follows in terms of the volume capacity ratio per hour. The traffic volume per hour is estimated by multiplying the assigned traffic volume (AADT base) with 7.7% where the percent was determined by the average peak hour ratio of the 24 hour traffic count data. (See Appendix Tables 4.2-4 and 4.2-5). The capacity per hour is shown in Appendix Table 6.3-2.

Level of Service	Volume Capacity Ratio
A	0.00 - 0.20
B	0.21 - 0.50
C	0.51 - 0.70
D	0.71 - 0.85
E	0.86 - 1.00
F	1.01 - 1.15
G	1.16 - 1.30
H	1.31 - 1.50
I	1.51 -

3) Gradient and Pavement (dls)

a. Surface type: Paved

Unit: in Km.

Gradient Class		1	2	3	4	5	6	7	8
Length		<400				>400			
Gradient % Condition		<3%	3-5%	6-7%	>7%	<3%	3-5%	6-7%	>7%
Good	S.J.	0.00	0.15	0.30	0.65	0.00	0.15	0.40	0.75
	B.T.	0.00	0.20	0.45	0.80	0.00	0.75	1.60	2.00
Fair	S.J.	0.20	0.35	0.50	0.80	0.20	0.35	0.55	0.90
	B.T.	0.30	0.50	0.70	1.05	0.30	1.00	1.80	2.20
Bad	S.J.	0.40	0.55	0.70	1.00	0.40	0.55	0.75	1.10
	B.T.	0.60	0.75	1.00	1.35	0.60	1.80	2.10	2.50
Very bad	S.J.	0.60	0.75	0.90	1.20	0.60	0.75	0.95	1.30
	B.T.	0.90	1.00	1.30	1.65	0.90	1.60	2.40	2.80

Note: Upper lines for light vehicles and lower lines for heavy vehicles.

Remarks: S: Small vehicles J: Jeepney
B: Buses and T: Trucks

b. Surface type: Gravel

Unit: in Km.

Gradient Class		1	2	3	4	5	6	7	8
Length		≤400				>400			
Condition \ Gradient %		<3%	3-5%	6-7%	>7%	<3%	3-5%	6-7%	>7%
Good	S.J.	0.15	0.30	0.45	0.75	0.15	0.30	0.50	0.85
	B.T.	0.20	0.45	0.65	1.00	0.20	1.00	1.80	2.20
Fair	S.J.	0.30	0.45	0.65	0.90	0.30	0.45	0.65	1.00
	B.T.	0.40	0.70	0.90	1.25	0.40	1.20	2.00	2.40
Bad	S.J.	0.60	0.75	0.90	1.20	0.60	0.75	0.95	1.30
	B.T.	0.90	1.05	1.30	1.60	0.90	1.60	2.40	2.80
Very bad	S.J.	0.90	1.05	1.20	1.50	0.90	1.05	1.25	1.60
	B.T.	1.30	1.45	1.65	2.00	1.30	2.00	2.80	3.20

Note: Upper lines for light vehicles and lower lines for heavy vehicles.

Remarks: S: Small vehicles J: Jeepneys.
B: Buses and T: Trucks.

4) dl Value Classified by Road Side Friction and Level of Service (dl_1)

A	C'	dl in Km.	
Degree of Friction	Level of Service	S.J. Light Vehicle	B.T. Heavy Vehicle
None	A, B	0.00	0.00
	C, D	0.10	0.20
	E	0.40	0.50
	F, G	0.60	0.70
	H	0.80	0.90
	I	1.00	1.10
Light	A, B	0.00	0.00
	C	0.10	0.20
	D	0.20	0.30
	E	0.40	0.50
	F, G	0.60	0.70
	H	0.80	0.90
	I	1.00	1.10
Medium	A	0.00	0.00
	B	0.10	0.20
	C	0.20	0.30
	D	0.30	0.40
	E	0.50	0.60
	F, G	0.70	0.80
	H	0.90	1.00
	I	1.10	1.20

A	C'	dl in Km.	
Degree of Friction	Level of Service	S.J. Light Vehicle	B.T. Heavy Vehicle
	A	0.10	0.20
	B	0.20	0.30
	C	0.30	0.40
	D	0.40	0.50
Heavy	E	0.60	0.70
	F, G	0.90	1.00
	H	1.10	1.20
	I	1.30	1.40

C' is determined in item (11.2.2.2) of this Note.

Remarks: S: Small vehicles, J: Jeepneys
B: Buses and T: Trucks.

5) dl Value for A Sharp Curve (dl_3)

R ≤ 25M	S	0.10 per place
	J	0.10 per place
	B	0.20 per place
	Tr	0.20 per place

6) High Speed Penalty (dl_4)

The speed (V_f) under the assigned traffic volume, which was derived through the Q-V relationship formula of Appendix Fig. 6.3-1, was used to find if there was any section on which vehicles would run at a high speed because of less traffic.

If the speed (V_f) is high and lies in the range of the following criteria, an additional value is subsequently added to VOC.

(Velocity KPH)	60 - 69	70 - 79	80 -
V_{Sm}	0.00	0.00	0.10
V_J			
V_B	0.00	0.10	0.20
V_{Tr}			

The above two dls (dl3 and dl4) were incorporated in the computer program. However, there were no road links which indicated any of the said dl values because the traffic volume was substantially large. There was no section in the road network which had a sharp curve with R≤25 M.

7) Major Intersection (dls)

dl value is assumed for one major intersection as follows:

Sm and J	0.25
B and Tr	0.35

8) Speed Associated with dt Calculation

When the actual link length ℓ is increased by dls, the time consumed on the length of 1 + dls is to be measured by the normal speed. However, the following is another approach:

If 1 is divided by V_0, which is the speed obtained by the result of assigned traffic flow associated with Q-V formula, the travel time on the link of 1 Km. is calculated.

In this study, the aggregate length of the link 1 + Σ dl is divided by the normal speed to obtain a travel time. The normal speed, V_0, is assumed to be equal to V_1 or V_2 in Q-V curves as shown in Appendix Fig. 6.3-1. The speed for jeepneys, buses and trucks are reduced by 20% in each road link.

9) Passenger Time Value

The time value of passenger was determined as in Appendix Note 11.1. Using this unit value, the average time value for a passenger vehicle was determined as follows:

a. Small Vehicles

It was assumed that owner drivers are 70% and employed drivers are 30%. Using the average passenger occupancy and the percent distribution by trip purposes from the result of the traffic survey (see Chapter 4), the passenger time value per hour per vehicle was calculated as follows:

A small vehicle with owner driver

	Composition	Driver	Others	@	@	Dr.	Ot.
In work	0.29	0.29	0.56	14.50	5.50	4.20	3.08
To/From Work	0.21	0.21	0.42	7.00	2.75	1.54	1.16
Others	0.49	0.49	0.95	-	-	-	-
Total	1.00	1.00	1.93	-	-	5.74	4.26
Total		2.93					10.00

A small vehicle with employed driver

	Composition	Driver	Others	@	@	Dr.	Ot.
In work	0.29	-	0.85	-	5.50	-	4.68
To/From Work	0.21	-	0.64	-	2.75	-	1.76
Others	0.49	-	1.44	-	-	-	-
Total	1.00	-	2.93	-	-	-	6.44

A small vehicle in average

$$10.00 \times 0.7 + 6.44 \times 0.3 = \underline{₱8.93/H \text{ per vehicle}}$$

b. Jeepneys and Buses

The time value per vehicle was calculated as follows:

Jeepney

	Composition	Persons	@	Persons
In work	0.124	1.14	2.75	3.14
To/From Work	0.143	1.31	1.40	1.83
Others	0.733	6.74	-	-
Total	1.000	9.19		4.97

Bus

	Composition	Persons	@	Persons
In work	0.124	3.77	3.13	11.80
To/From Work	0.143	4.34	1.58	6.86
Others	0.733	22.26	-	-
Total	1.000	30.37	-	18.66

Considering the Philippine economy where full employment of resources and labor has not yet been attained though the economy has developed steadily, it should be noted that the saved time in transport system is not always used in other productive activities. In this Study, the above value is halved in the use of economic evaluation.

A small vehicle	8.93 x 1/2 = ₱4.47 per hour
A jeepney	4.97 x 1/2 = 2.49 per hour
A bus	18.66 x 1/2 = 9.33 per hour

APPENDIX NOTE 11.3 DEVELOPMENT BENEFITS (SAVINGS IN TRAFFIC COST ASSOCIATED WITH THE DEVELOPMENT OF A NEW TRAFFIC PATTERN)

11.3.1 General

It is anticipated that the Project Roads, if completed, will result in a number of impacts on the economy of the adjacent area. Some of the direct benefits were quantified but others were not because of difficulty and shortage in data (an example is traffic accidents) or of the intricate phenomenon of the economic impact which usually comes out with the other investments.

In the economic evaluation of the project, the savings in traffic cost were only used as a measure of the benefit of the project. It is considered that the estimated savings in traffic cost as stated in 11.3-1 of Chapter 11 represent the most part of the benefits pertinent to the project.

However, it should be noted that the impacts of the construction of the loop road (Route C) have different features from that of the improvements of Routes A and B. Aside from the traffic cost savings of Route C for the diverted traffic and decongestion of existing major roads in the DIZ, it has a developmental impact on the traversed area due to better accessibility.

11.3.2 Development Benefit of the New Road Construction

In the case of Route C, it is practically impossible to quantify the magnitude of investment in other infrastructures and on private sectors which will result in the increase in the regional output. The net value added approach is not applicable because of shortage of the statistical data of the regional output. Accordingly, the following estimate was conducted to measure the net economic gain in terms of savings in traffic cost resulted from a new pattern of traffic distribution associated with the construcgion of Route C.

1) Adjacent Municipalities (Zones)

The zones directly influenced by the construction of Route C were determined as No. 3, 8, 12, 13, 17, 11, 21 in Paranaque, Las Pinas, Muntinlupa and Bacoor. Zone 25 (Dasmarinas) was deleted because the influence was considered modest since Route C would pass through the farthest eastern part of the zone. (See Fig. 4.3-1). The seven zones are named as the zones in the analysis.

2) New Location of Employment Opportunity

The increasing difficulty to locate and operate in the crowded MMA would initiate enterprises to move in these

zones and adjacent municipalities.

The new location of enterprises and/or factories is determined when the enterpreneur recognizes that the production at the new location can compete well in the market against those who have already been operating elsewhere.

3) Employment and Residents

A newly established factory generates employment opportunities for those living in the municipalities as well as those living in other areas. Assuming that the wage rates for workers are equal among the factories regardless of the distance from their residences, the new opportunity will be more attractive to those in adjacent zones.

It is reasonable to expect that the employee living far from the new enterprise will move in the zones or adjacent municipalities because of the development of new housing areas.

If they leave the job, they will be replaced most probably by those living in adjacent areas. It is quite likely that the majority of the employees in the new enterprise are those living in the zones and/or in the adjacent municipalities. Their travel pattern will be different from those who have employment opportunity in MMA.

4) New Travel Pattern

Even if the wage rate of those who are employed in the newly located enterprise is equal to those working in MMA, the travelling cost within the area of the zones and adjacent municipalities is quite less than that to and from MMA. The difference can be a saving in transport cost which would eventually augment the real disposable income of the employees and their family in the zones. The difference is measured as stated in the following section 11.3.3.

11.3.3 Savings in Traffic Cost as Part of the Development Benefit

1) Assumptions

a. The zones along Route C

The zones along Route C were established in 11.3.2 above. They are zones Nos. 3, 8, 13, 17, 11, 12 and 21.

b. Population

Population in the zones along Route C is divided into two components, one which grows at a normal rate with

traffic pattern the same as at present regardless of the road construction and the other with which people immigrate in the zones after the road is constructed having a different pattern of traffic distribution from the former.

It is assumed that the population in the zones will grow at 4% p.a. in the former case. It is an estimated overall growth in the DIZ (4.64% p.a. in 1980-90 and 3.37% in 1990-00) under a condition that Route C will not be constructed.

While in the latter case, the additional population growth over this normal trend of increase (net increase of 200,000 inhabitants in 2000) can be credited as a result of the construction of Route C. The population with and without Route C is shown in Appendix Table 11.3-1.

c. Traffic Flows

Using the trips in the O-D Table of 1981, the trips to and from the zones can be summarized as in Appendix Table 11.3-2. It is found that out of the total trips in the zones, 45% was to/from the north including Manila, 35% was to/from the other zones in the DIZ and only 3% was within the zones.

Under the normal growth of population as 4% p.a. without Route C, the trips associated with the zones in 2000 are obtained. The difference of the trips with and without Route C associated with the zones in 2000 are shown in Appendix Table 11.3-3. The percent distribution among the groups in 2000 has changed slightly from 1981; 49% is to/from the other zones in the DIZ and 34% to/from the north including Manila.

d. New Traffic Pattern and Savings

From the trips in Appendix Table 11.3-3 the new pattern of trip distribution can be presented by a proximity of workplace and residence as assumed in Subsection 3.2 of this Note. It is assumed that the change is in such a way that the trips within the zones (Group 2) will increase the share up to 34% while those to/from the northern area (Group 1) will reduce to 5%.

This change will result in the reduced vehicle miles and subsequent savings in traffic cost. Using the unit costs in Table 11.1, the average distance of Groups 1 and 2 at 20 Km., (30 Km. including dls) and 5 Km. (8 Km. including dls), respectively, and the normal running speed of 40 KPH for all types of vehicles, the savings are estimated at ₱265,761 per day in year 2000.

Since the construction of the first stage will be completed in 1986, the savings are assumed to increase at an equal amount from zero in 1986 to ₱265,761 in 2000, or an average increase of ₱18,983 per day p.a. These benefits are reduced by half by applying the principle of the triangle area under the demand curve. This benefit stream is incorporated in the cost benefit analysis of Section 11.5 in Chapter 11.

APPENDIX TABLE 11.3-1 POPULATION WITH AND WITHOUT THE PROJECT ROUTE C

(In thousand)

Zones	Population			Growth p.a.		Population Growth without Project 1)					Net increase in 2) Population by R.C.	
	1980	1990	2000	80-90	90-00	1980	1990	2000	p.a. 80-90	p.a. 90-00	1990	2000
3.8												
12.13	142	289	401	7.36 %	3.33 %	142	223	312	4.64 %	3.37 %	66	97
17.11 21	142	288	422	7.33 %	3.89 %	142	223	311	"	"	64	113
Total in: 7 zones	284	577	823	7.35 %	3.37 5.5 %	284	447	623	" 4.0%	"	130	200
Total in: DIZ	1582	2490	3468	4.64 %	3.37 4.0 %	1582	2360	3268	" 4.0%	"	130	200

Notes: 1) It is assumed that if the Route C is not constructed, the population in these 7 zones will increase at an annual rate of 4.64% for the years 1980-90 and 3.37% for the years 1990-2000. The annual growth rates used are those for the total of the DIZ.

2) The balance of the population in the seven zones with and without the project is assumed not to be influenced by other projects.

APPENDIX TABLE 11.3-2 TRIPS TO/FROM THE ZONES IN 1981

GROUP	Sm	J	B	T	TOTAL
1	17131	6329	1123	4808	29391
	(0.37)	(0.65)	(0.46)	(0.66)	(0.45)
2	1344	538	2	110	1994
	(0.03)	(0.05)	(0.00)	(0.02)	(0.03)
3	20063	845	819	1271	22998
	(0.43)	(0.09)	(0.33)	(0.17)	(0.35)
4	7835	1991	518	1087	11431
	(0.17)	(0.21)	(0.21)	(0.15)	(0.17)
Total	46373	9703	2462	7276	65814
	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)

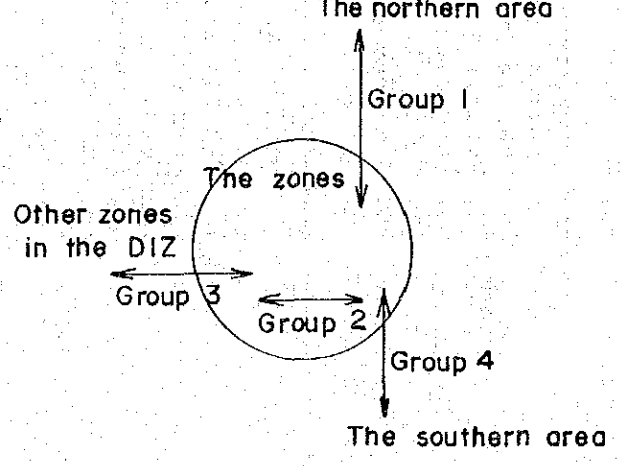
Remarks: Figures in ( ) indicate the ratio in the total of the group.

APPENDIX TABLE 11.3-3 BALANCES OF THE TRIPS IN 2000 ASSOCIATED WITH THE ZONES; WITH AND WITHOUT ROUTE C

Group	Sm Vehs.	Jeepneys	Buses	Trucks	T o t a l
1	15136	308	309	886	16632
	(0.39)	(0.07)	(0.26)	(0.17)	(0.34)
2	1855	502	107	200	2664
	(0.05)	(0.12)	(0.09)	(0.04)	(0.05)
3	16810	2956	577	3392	23735
	(0.44)	(0.68)	(0.50)	(0.66)	(0.49)
4	4629	583	172	648	6032
	(0.12)	(0.13)	(0.15)	(0.13)	(0.12)
Total	38430	4349	1158	5126	49063
	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)

Remarks: Figures in ( ) indicate the ratio in the total of the group.

Groups are classified as follows:



APPENDIX TABLE 11.3–4 NORMAL ECONOMIC SAVINGS OF THE ALTERNATIVES IN DIZ[1]

(Pesos in million per year)

		Plan 1		Plan 2		Plan 3	
1987	Savings in						
	1. Vehicle Running Cost	132.03	(78.30)	178.99	(76.32)	191.24	(79.19)
	2. Vehicle Time Cost	17.48	(10.17)	27.44	(11.70)	25.67	(10.63)
	3. Passenger Time Value	15.65	(9.28)	24.63	(10.33)	21.13	(8.75)
	4. Total	165.16	(97.75)	231.06	(98.34)	238.03	(98.57)
	5. Development Benefits	3.46	(2.25)	3.46	(0.17)	3.46	(1.43)
	6. G. Total	168.62	(100.00)	234.52	(100.00)	241.49	(100.00)
1991	Savings in				2)		2)
	1. Vehicle Running Cost	726.56	(77.09)	174.76	(71.08)	222.53	(75.72)
	2. Vehicle Time Cost	101.59	(10.79)	26.59	(10.99)	29.62	(10.08)
	3. Passenger Time Value	96.05	(10.20)	23.27	(9.62)	24.42	(8.31)
	4. Total	924.20	(98.08)	224.61	(91.59)	276.57	(94.11)
	5. Development Benefits	17.30	(1.92)	17.30	(8.41)	17.30	(5.89)
	6. G. Total	941.50	(100.00)	241.91	(100.00)	293.87	(100.00)
1995	Savings in						
	1. Vehicle Running Cost	871.44	(76.83)	492.44	(72.79)	492.50	(73.16)
	2. Vehicle Time Cost	113.43	(10.00)	81.87	(12.16)	81.87	(12.16)
	3. Passenger Time Value	118.24	(10.30)	67.80	(10.07)	67.80	(10.07)
	4. Total	1103.11	(97.13)	642.11	(95.02)	642.16	(95.38)
	5. Development Benefits	31.14	(2.87)	31.14	(4.98)	31.14	(4.62)
	6. G. Total	1134.25	(100.00)	673.25	(100.00)	673.30	(100.00)

Notes: 1) Savings are estimated on the road networks of DIZ.

2) No staged construction was assumed for this year in these alternatives.

APPENDIX TABLE 11.4-5 CONSTRUCTION COST OF THE ASSOCIATED ROADS WITH THE PROJECT IN DIZ

ROADS	LENGTH IN KM	LANES	COST IN ₱ MILLIONS
1. Metro Manila Expressway Bicutan-Taguig (R-4 Ext)	5.8	4	169.7
2. C-5 Bicutan-Pateros	7.2	4	230.6
3. Imelda Ave. Ext. 1 Route A - Route B	4.1	4	93.9
4. Imelda Ave. Ext. 2 Bacoor-Rosario	14.4	4	329.8
5. South Feeder Road Route C- Carmona - 1	5.2	2	63.1
- 2	5.2	+ 2	+ 56.1

Remarks: All items such as in Table 10.5-1 are included in the cost. Taxes is assumed at 10% of the cost.

: Plan 1 incorporates the completion of 1, 2, 4 and 5-1 above in 1990 and 5-2 in 1994. Imelda Ave. Ext. 1 is assumed to be completed by 1986.

: Plans 2 and 3 incorporates the completion of 1, 3, and 5-1 in 1994.

APPENDIX TABLE 11.5-1 PLAN 1 : BENEFITS & COST STREAMS

In million pesos

YEAR	Benefits			Cost			
	Normal	Develop-ment	Total	Project	Associated Roads	Maintenance	Total
1983				9.79			9.79
1984				78.22			78.22
1985				173.23			173.23
1986				225.63			225.63
1987	165.16	3.46	168.62	68.43	16.89	0.33	85.65
1988	184.96	6.92	191.88		209.10	0.33	209.43
1989	207.14	10.38	217.52	85.03	278.80	0.33	364.16
1990	231.97	13.84	245.81	85.03	209.10	0.33	294.46
1991	924.20	17.30	941.50			0.82	0.82
1992	937.53	20.76	958.29			0.82	0.82
1993	970.42	24.22	994.64	45.91	25.25	0.82	71.98
1994	994.38	27.68	1022.06	45.91	25.24	0.82	71.97
1995	1103.11	31.14	1134.25			1.11	1.11
1996	1140.98	34,60	1174.58			1.11	1.11
1997	1180.15	38.06	1218.21			1.11	1.11
1998	1220.66	41.52	1262.18			1.11	1.11
1999	1262.56	44.98	1307.54			1.11	1.11
2000	1305.90	48.50	1354.40			1.11	1.11
2001	1350.73	48.50	1399.23			1.11	1.11
2002	1397.09	48.50	1445.59			1.11	1.11
2003	1445.05	48.50	1493.55			1.11	1.11
2004	1494.66	48.50	1543.16			1.11	1.11
2005	1545.97	48.50	1594.47			1.11	1.11
2006	1599.04	48.50	1647.54	-273.71	-235.73	1.11	-508.33
Total	20,661.66	654.36	21,316.02	543.47	528.64	17.92	1090.03

Benefits = 21,315.0 Cost = 1,090.0 B-C = 20,225.0 B/C = 3.7

IRR = 39% PW = 2,154.5 (i = 15%)

(i = 15%)

APPENDIX TABLE 11.5-2 PLAN 2 : BENEFITS & COST STREAMS

In million pesos

YEAR	Benefits			Cost			
	Normal	Develop-ment	Total	Project	Associated Road	Maintenance	Total
1983				9.79			9.79
1984				78.22			78.22
1985				148.68			148.68
1986				188.81			188.81
1987	231.06	3.46	234.52	68.43		0.68	69.11
1988	229.43	6.92	236.35			0.68	0.68
1989	227.81	10.38	238.19			0.68	0.68
1990	226.20	13.84	240.04			0.68	0.68
1991	224.61	17.30	241.91		7.86	0.68	8.54
1992	223.03	20.76	243.79		85.85	0.68	86.53
1993	221.45	24.22	245.67	119.46	114.47	0.68	234.61
1994	219.90	27.68	247.58	119.46	85.85	0.68	205.99
1995	642.11	31.14	673.25			0.82	0.82
1996	647.24	34.60	681.84			0.82	0.82
1997	652.42	38.06	690.48			0.82	0.82
1998	657.64	41.52	699.16			0.82	0.82
1999	662.90	44.98	707.88			0.82	0.82
2000	668.20	48.50	716.70			0.82	0.82
2001	673.55	48.55	722.05			0.82	0.82
2002	678.94	48.50	727.44			0.82	0.82
2003	684.37	48.50	732.87			0.82	0.82
2004	689.84	48.50	738.34			0.82	0.82
2005	695.36	48.50	743.86			0.82	0.82
2006	700.81	48.50	749.21	-273.71	-109.82	0.82	-382.71
Total	9,856.77	654.36	10,511.10	459.14	184.21	15.28	658.63

Benefits = 10,511.1 **Cost** = 658.6 **B-C** = 9,852.5 **B/C** = 3.3

IRR = 40% **PW** = 1,057.5 (i = 15%) (i = 15%)

APPENDIX TABLE 11.5-3 : BENEFITS & COST STREAMS

In million pesos

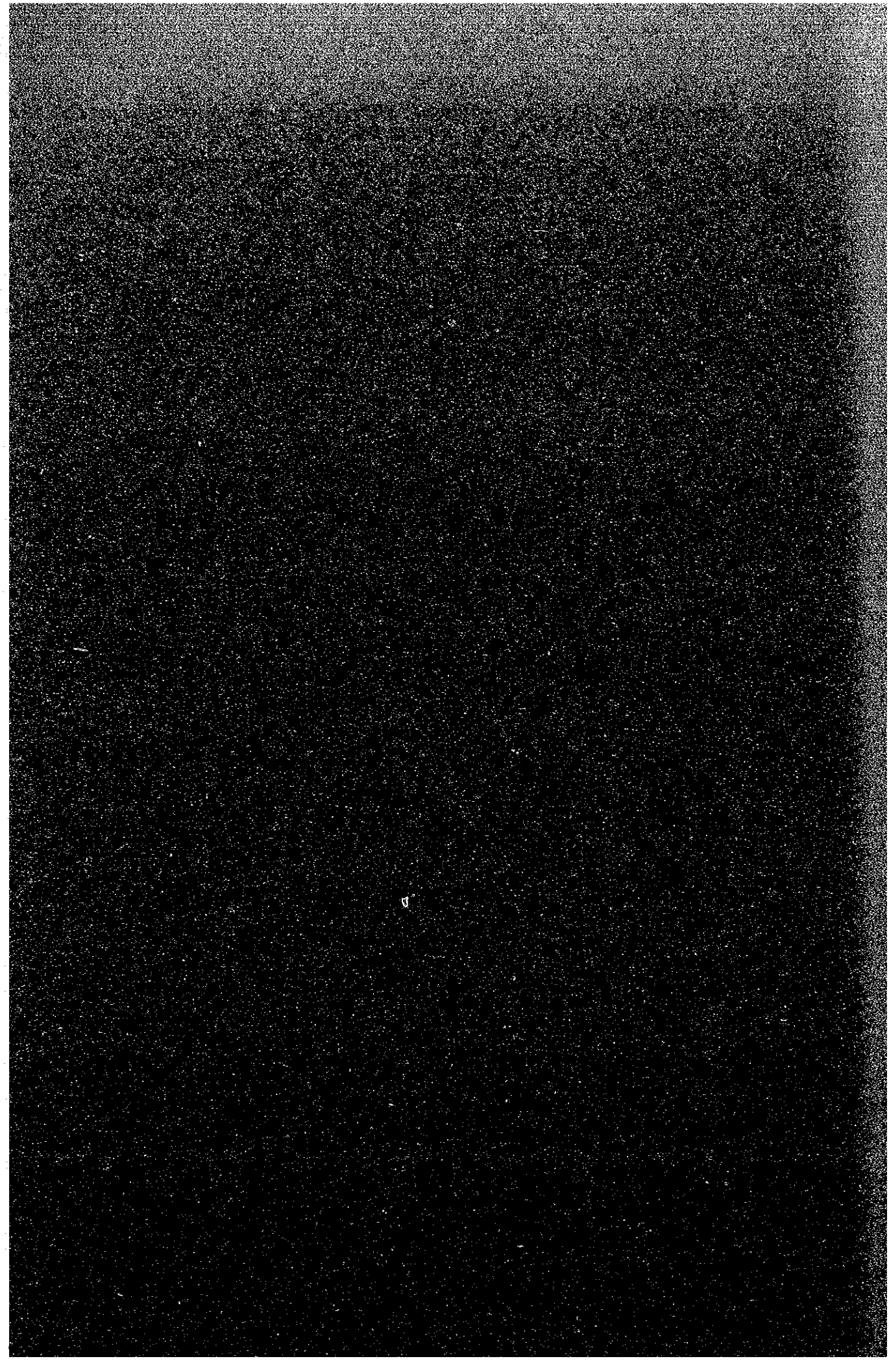
YEAR	Benefits			Cost			
	Normal	Development	Total	Project	Associated Roads	Maintenance	Total
1983			0	9.79			9.72
1984			0	78.22			78.22
1985			0	200.39			200.39
1986			0	266.36			266.36
1987	238.03	3.46	241.49	68.43		0.50	68.93
1988	247.13	6.92	254.05			0.50	0.50
1989	256.59	10.38	266.97			0.50	0.50
1990	266.39	13.84	280.23			0.50	0.50
1991	276.57	17.30	293.87		7.86	0.50	8.36
1992	287.16	20.76	307.92		85.85	0.50	86.35
1993	298.13	24.22	322.35	54.83	114.47	0.50	169.80
1994	309.53	27.68	337.21	54.83	85.85	0.50	141.18
1995	642.16	31.14	673.30			0.82	0.82
1996	647.28	34.60	681.88			0.82	0.82
1997	652.45	38.06	690.51			0.82	0.82
1998	657.65	41.52	699.17			0.82	0.82
1999	662.90	44.98	707.88			0.82	0.82
2000	668.18	48.50	716.68			0.82	0.82
2001	673.51	48.50	722.01			0.82	0.82
2002	678.89	48.50	727.39			0.82	0.82
2003	684.30	48.50	732.80			0.82	0.82
2004	689.76	48.50	738.26			0.82	0.82
2005	695.26	48.50	743.76			0.82	0.82
2006	700.81	48.50	754.31	-273.71	-109.82	0.82	-382.71
Total	10,237.60	654.36	10,892.00	459.14	184.21	13.84	657.19

Benefits = 10,892.00 Cost = 657.2 B-C = 10,234.0 B/C = 3.1

IRR = 37% PW = 1,111.8 (i = 15%)

(i= 15%)

APPENDIXES FOR CHAPTER 13



APPENDIX NOTE 13.1 FUNDING AND DISBURSEMENT FOR HIGHWAYS IN NATIONAL CAPITAL REGION AND REGION IV-A

Budgetary allowance of the disbursement was studied in the area of NCR and Region IV-A. Capital outlays for highways in the area in 1981 and 1982 are shown in Appendix Table 13.3-1. It is found that the obligation program is invested over the subsequent several years. The capital obligation and the cash disbursement increased approximately by 10% in those years. Assuming that both of the obligation and the disbursement increase at 10% p.a., their magnitudes in future years are estimated as shown in Appendix Table 13.3-2.

Cash disbursement program for the Project and the associated roads can be prepared as in Appendix Table 13.3-3. Its percent share in the disbursement for the area of NCR and Region IV-A is calculated as follows for selected years. (percent share in 1985 is 190.1/385 = 0.49, 0.49 x 100 = 49 percent. Percentage in other year is calculated likewise.)

Disbursement Year	1985	1986	...	1989	1990	...	1993	1994
Plan 1 %	49	59		72	53		1	1
Plan 2 %	42	49		-	-		32	26
Plan 3 %	57	70			-		23	18

Plan 2 will result in less budgetary burden than the others. Since Plan 2 proposes less investment for the first stage and much for the latter stage the percent share is the smallest among the three plans under the increasing tendency of the budget. Plan 1 has the largest share in the second stage because of the extensive construction of the associated roads. Plan 3 also has the large investment in the first on the Project Roads.

Besides the Project and the associated roads, there are a number of other road projects in NCR, which have urgent necessity for implementation in 1980's such as the grade separation on EDSA (C-4) road, and the construction of C-3 circumferential road, R-4 extension, R-10 extension together with the north-western section of C-5, the southern half of Metro Manila Expressway in the first stage, etc. Their viability was already confirmed by feasibility sutdies.

It is an urgent requirement that the Government should review these plans and determine an overall implementation program of these major road projects by taking into account certain restraint of capital outlays for the coming 5 to 10 years.

APPENDIX TABLE 13.3–1 BUDGETS FOR CAPITAL OUTLAYS FOR HIGHWAYS: MPWH

(In million pesos and million dollars)

	Obligation Program 1)		Cash Disbursement by the 1981 Budget				
	1981	1982	1981 Obligation	1981	1982	1983	1984
National Capital Region	519.3 $4.0	598.3 $4.0	519.3 $4.0	160.3 $4.0	330.1 $ –	28.1	0.8
Region IV-A	67.7 $ –	59.7 $ –	67.7 $ –	35.6 $ –	32.1 $ –		
Total	587.0 $4.0	658.0 $4.0	587.0 $4.0	195.9	362.2	28.1	0.8

Source: MPWH, CY 1981 Integrated National Infrastructure Program, 1982 MPWH Program NCR, and 1982 MPWH Program Region IV-A.

Note: 1) Obligation Program is the total of the revalidation and new issues.

APPENDIX TABLE 13.3–2 ASSUMED CAPITAL OUTLAYS IN FUTURE FOR NCR AND REGION IV–A

(In million pesos)

		1981	1982	1983	.....	1985	1986	....	1989	1990	.....	1993	1994
Obligation Program		587	658	710	.....	859	945	....	1256	1384	.....	1842	2026
Cash Disbursement in the 1981 Budget	Low	196	215	237	.....	287	315	....	420	462	.....	615	676
	High	–	362	398	.....	482	530	....	705	776	.....	1033	1136
	Average	196	289	318	.....	385	423	....	563	619	.....	824	906

Source: From Appendix Table 13.3–1 Cash Disbursement is assumed to increase by 10% p.a.

APPENDIX TABLE 13.3–3 CASH DISBURSEMENT BY THE PROJECT AND ASSOCIATED ROADS

(In million Pesos of financial cost)

Plan	Roads	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
1	Project Roads	11.3	79.8	190.1	250.9	68.4		98.2	98.2			53.1	53.1		903.1
	Associated Roads					19.0	232.2	309.7	232.3			28.0	28.1		849.3
	Total	11.3	79.8	190.1	250.9	87.4	232.2	407.9	330.5			81.1	81.2		1752.4
2	Project Roads	11.3	79.8	161.2	207.6	68.4						138.1	138.2		804.6
	Associated Roads									8.7	95.4	127.2	95.4		326.7
	Total	11.3	79.8	161.2	207.6	68.4				8.7	95.4	265.3	233.6		1131.3
3	Project Roads	11.3	79.8	221.0	297.3	68.4						63.4	63.4		804.6
	Associated Roads									8.7	95.4	127.2	95.4		326.7
	Total	11.3	79.8	221.0	297.3	68.4				8.7	95.4	190.6	158.8		1131.3

Remarks: In the case of Plan 1, if the project and the associated roads are implemented simultaneously, the cash disbursement of 232.2 million in 1988 will have a share of 45% (232.2/512= 0.45), of the total cash disbursement in these two regions (refer to Appendix Table 13.3-1). The amount of 407.9 million in 1989 will have a share of 72% (407.9/563 = 0.72). The capital outlay requirement for other projects in these regions will be so extensive as it has been in the past, specific larger budgetary allocation becomes necessary. In the case of Plan 2, the largest outlay is programmed around 1993 in which the share will be 34% (265.3/824 = 0.32) under the same assumption.

It is likely that if the timing of the implementation is postponed to the latter years, the percent share in the budgetary outlay will be less under the extrapolation of this increasing tendency. However, it should be emphasized that the outlay depends on the specific policy and program of the Government which is virtually impossible to forecast by means of extrapolation.