CHAPTER 10 PROJECT EVALUATION

TABLE OF CONTENTS

TABLES AND FIGURES

CHAPTER 10

PROJECT EVALUATION

10.1 ECONOMIC ANALYSIS

10.1.1 General

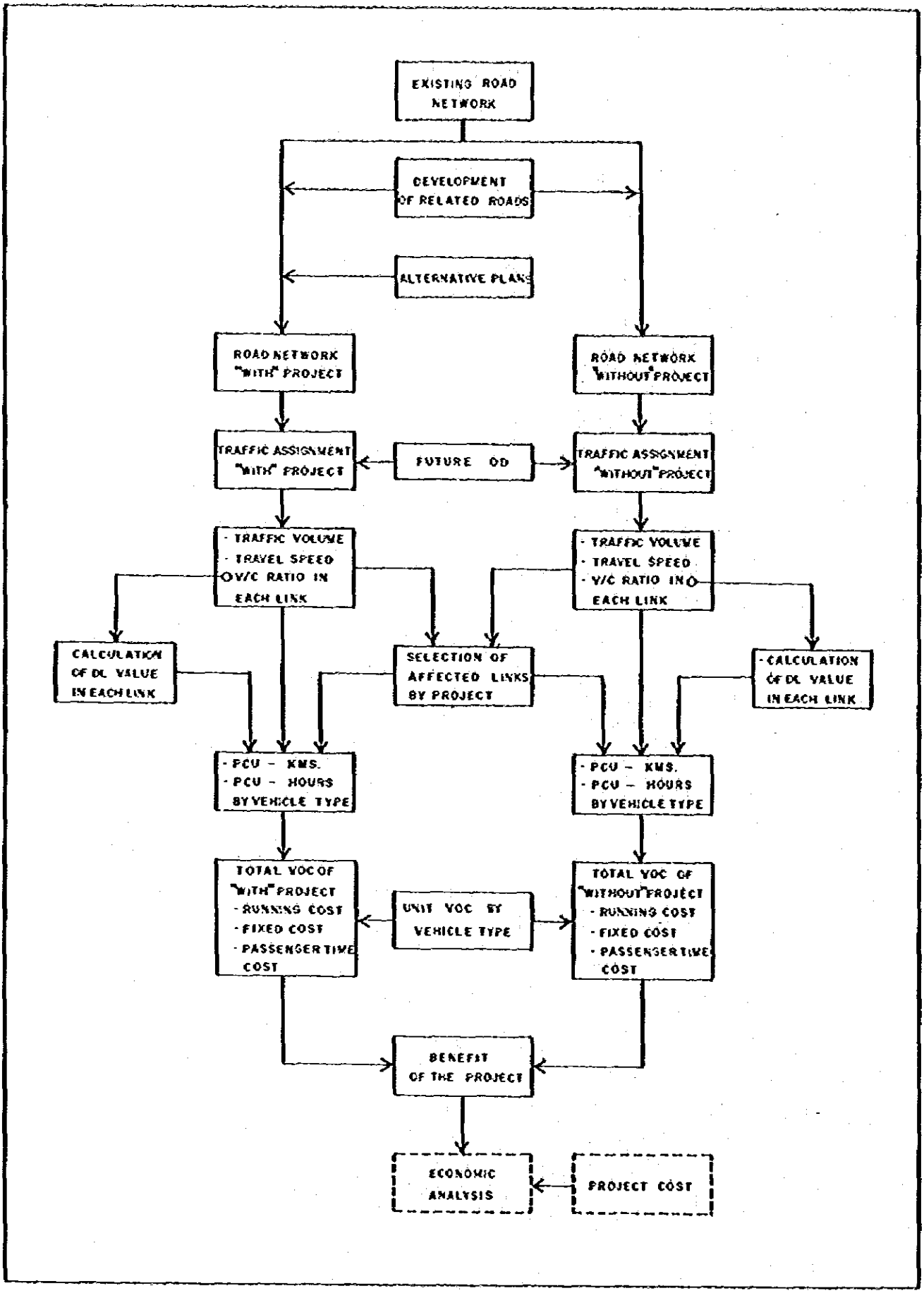
The purpose of the conomic analysis is to determine the viability of the project roads including their phases of development. In Section 6.6, the formulation of alternative plans was discussed giving emphasis to the following points:

* the project roads should function with the road network of NCR as a system
* the project roads should not worsen the present environmental condition but would rather be a catalyst toward the urbanization of the area with an atmosphere of sound and orderly environment; and
* the project roads should be implemented in different phases and stages in accordance with the traffic demand and that the cost of the different phases and stages are within the financial capability of the government to implement the project. Considered in the phasing/staging of the projects are:
    - the different phases/stages of the project as to which should be the most economical plan
    - the initial as well as succeeding phases/stages of the project should produce the greatest traffic impact and the contribution to the regional and national economy.

Figure 10.1--1 shows the different alternatives of the different phases and stages of the project.

The procedures for the quantification of benefits that would accrue from the implementation of the project were patterned after the present practice of the MPWH as incorporated in the "Highway Planning Manual" though with some adjustments to suit present conditions in urban area. The quantified benefits were purely from the savings in traffic costs by comparing the effectiveness of the road network of the DIZ with or without the project roads. Traffic costs mean the cumulative monetary spendings of traffic by vehicle type on the road network incorporating road and traffic elements which deviate from ideal road conditions. Due to the nature of the project roads, involving mostly new construction on a potential area for urbanization whose development is languid due to accessibility problem, the developmental effect of the project roads were included in terms of traffic cost savings to the generated traffic.

FIGURE 10.1-1 GENERAL PROCEDURE IN THE BENEFIT CALCULATION



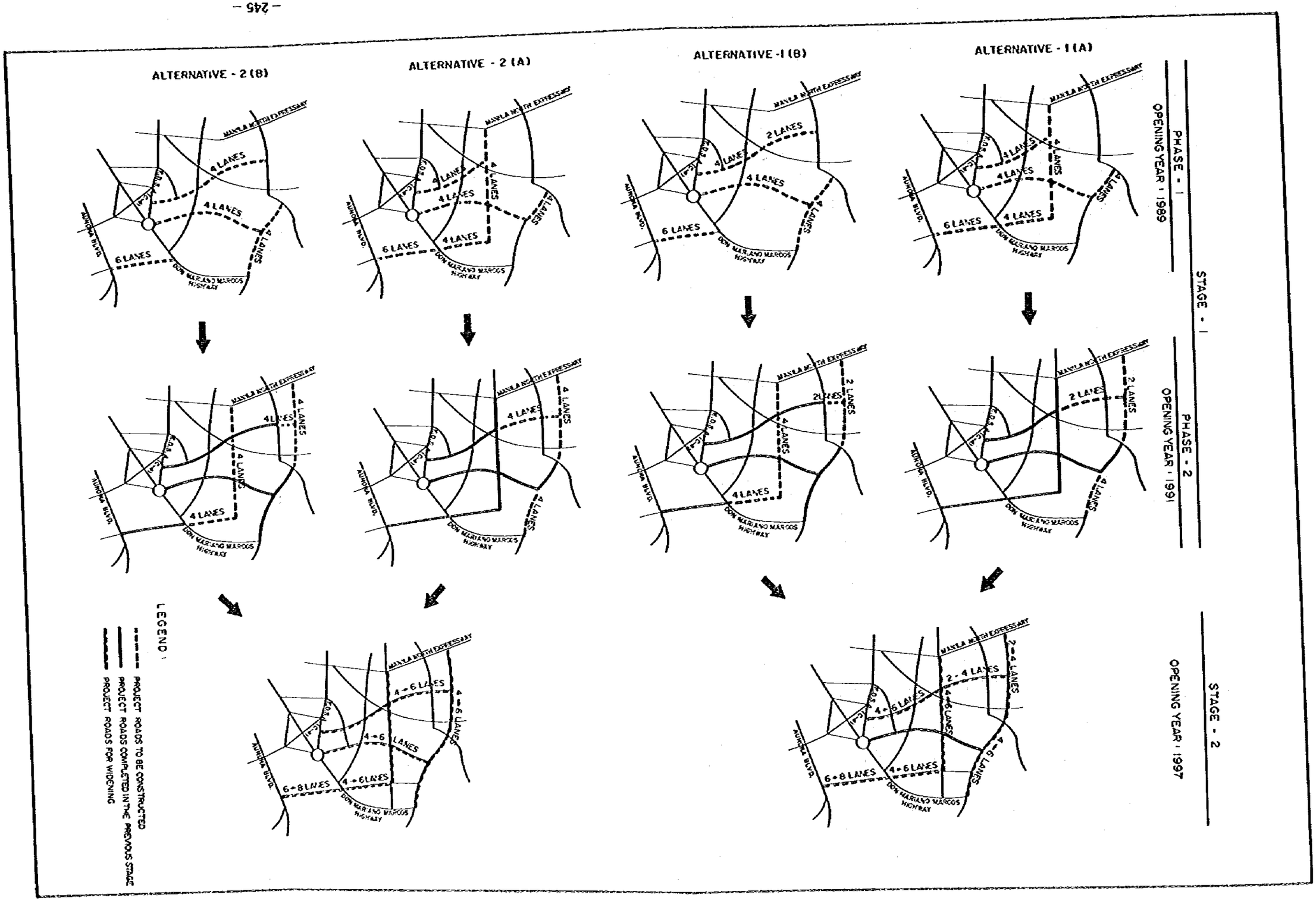


FIGURE 10.1-2 ALTERNATIVE PLANS

During the Study and the operational period of the initial stage of the project (1982-2008), there are other related road projects being constructed, committed, planned or programmed for implementation. The timing of implementation of these related projects were based mainly on the plans and programs of MPWH as well as the five-year program from 1983-1987 incorporated in the Capital Investment Folio (CIF) for Metro Manila which was agreed upon during the course of the Study. In the calculation of the benefits of the project roads, the traffic impact of these related roads were included for both with or without the project. The difference in traffic costs with and without the project is then the benefits derived from the completion of the project roads to be used in the economic evaluation.

The project costs for the different alternative plans were subdivided into foreign cost, local cost and taxes. For the economic study, taxes which are only a transfer of payment within the national economy were excluded. The foreign component costs were subjected to shadow pricing using 18% (as prescribed in the MPWH Manual).

10.1.2 Traffic Cost

The basic traffic costs are defined as the costs incurred by vehicles using roads under conditions as follows:

- good pavement condition;
- a lane width of at least 3.00 meters;
- flat gradients; and
- minimum roadside friction

The basic traffic costs consist of the following:

a. Vehicle Operating Costs (VCC)

   - Running Costs – part of the vehicle operating costs which varies directly with the number of kilometers operated.
   - Fixed Costs – part of vehicle operating costs which varies directly with operating time.

b. Passenger Time Costs – value of passengers' time including the time value for drivers of private cars.

On the basis of the traffic survey conducted for the project and from previous transportation studies in Metro Manila,the following representative vehicles were used in the establishment of the traffic cost:

- Light car, premium gasoline

-- Jeepneys, MacArthur, diesel

-- Large bus, diesel

-- Medium truck, diesel

The details of the basic traffic costs are discussed in Appendix 10.1.1 and are summarized below:

Traffic Cost by Vehicle Types

Vehicle Type	Basic Running Costs Vehicle/km.	Basic Fixed Costs Vehicle/hour	Basic Passenger Time Costs Vehicle/hour
Light Car	0.9704	1.74	6.77
Jeepneys	0.6053	9.36	5.62
Large Bus	1.8209	18.70	21.75
Medium Truck	1.6850	15.19	–

10.1.3 Benefits

The construction of the project roads which will complete the major roads in the DIZ and make the road network function as a system will change the traffic pattern in the area. The major roads in the DIZ are presently functioning individually making most of these sections congested not only during peak hours but also during the day. When the project roads will be opened to traffic, there will be a more balanced utilization of road spaces, i.e., roads that are presently underutilized will be having more traffic, the roads that are presently saturated will experience traffic decongestion and the existing sections of the project roads will improve their level of service. The beneficiaries of these effects are:

* Traffic that presently uses the existing sections of the project roads with and without the project. This traffic will experience saving in traffic cost due to improve level of service.

* Traffic that will be attracted to the project roads. This traffic will realize faster travel compared to their old congested and circuitous routes.

* Traffic that would remain on affected major roads. This traffic will enjoy the decongestion effect due to the diversion of some traffic using the existing roads to the project roads.

To determine the traffic cost with and without the project roads, the road network was first adjusted incorporating the present road and traffic elements that give rise to vehicle operating costs. For this Study, only the roadside friction and the level of service were used in the adjustment (see dL method discussed in Appendix 10.1.2).

The adjustment of the network also includes the construction of other related roads in the area. The expected construction schedule of these related roads are presented in Figures 10.1–3 and 10.1–4. With the project roads, Alternative Plans 1(A), 1(B), 2(A) and 2(B) including the future stages of the project were incorporated in the road network. This adjusted road network for the four alternative plans was then the basis in the traffic assignment study. The traffic assignment was conducted, through a computer, for the following periods:

1989 – the assumed opening year of Phase 1, Stage 1;

1991 – the assumed opening year of Phase 2, Stage 1; and

1997 – the assumed opening year of Stage 2

During the traffic assignment, the total vehicle-kilometer and the total vehicle-hours for each type of vehicle, i.e. light cars, jeepneys, large buses and medium trucks, were estimated during the said periods with and without the project roads. By applying the basic traffic costs on the estimated vehicle-kilometers and vehicle-hours, traffic costs with and without the project were estimated. The difference between the traffic costs with and without case is the benefit accruing from the construction of the project. Table 10.1–1 shows the estimated benefits by Alternative Plans and Figure 10.1–5 shows the graphical presentation of the benefits.

10.1.4 Cost-Benefit Analysis

Each of the alternative plans was subjected to economic analysis using the following assumptions:

- The opportunity cost of capital at 15 percent
- Benefit calculation is 20 years after the construction of Phase I, Stage 1.
- Shadow price of the foreign component by an additional 18%.
- No salvage value to the road structure after the study period.

The streams of costs and benefits of the different Plans are shown in Tables 10.1–2 to 10.1–3 including their economic evaluation. The results of the economic evaluation are as follows:

Alternatives	Net Present Value (₱ Million)	B/C Ratio	IRR (Percent)
Plan 1 (A)	1,748.7	4.26	44.9
Plan 1 (B)	1,720.5	4.35	46.3
Plan 2 (A)	1,763.6	4.10	44.0
Plan 2 (B)	1,741.7	4.17	45.2

The tabulation shows that all the Alternative Plans are all economically feasible. The degree of viability of all the plans, is practically the same.

FIGURE 10.1--3 EXPECTED ROAD CONSTRUCTION SCHEDULE

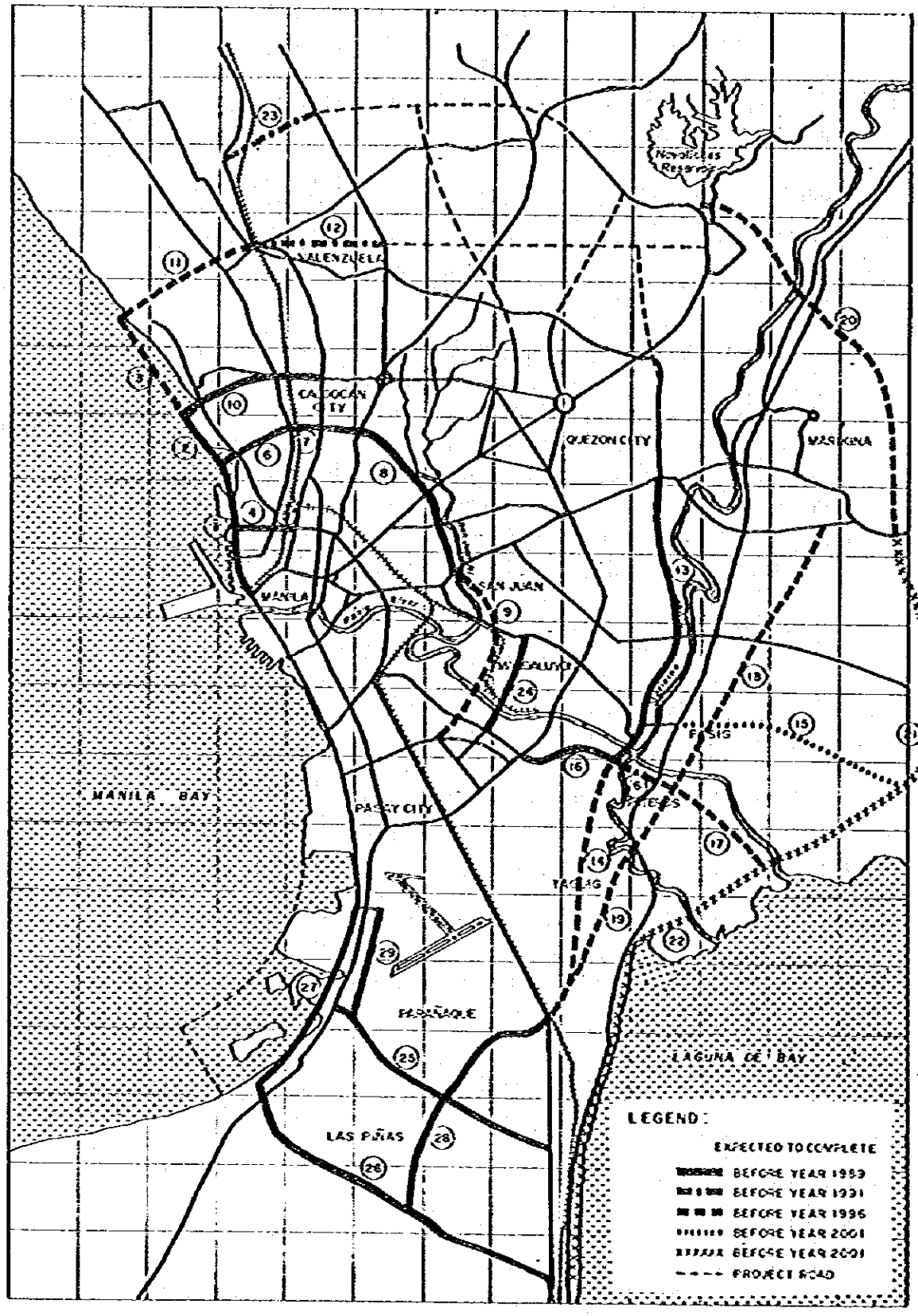
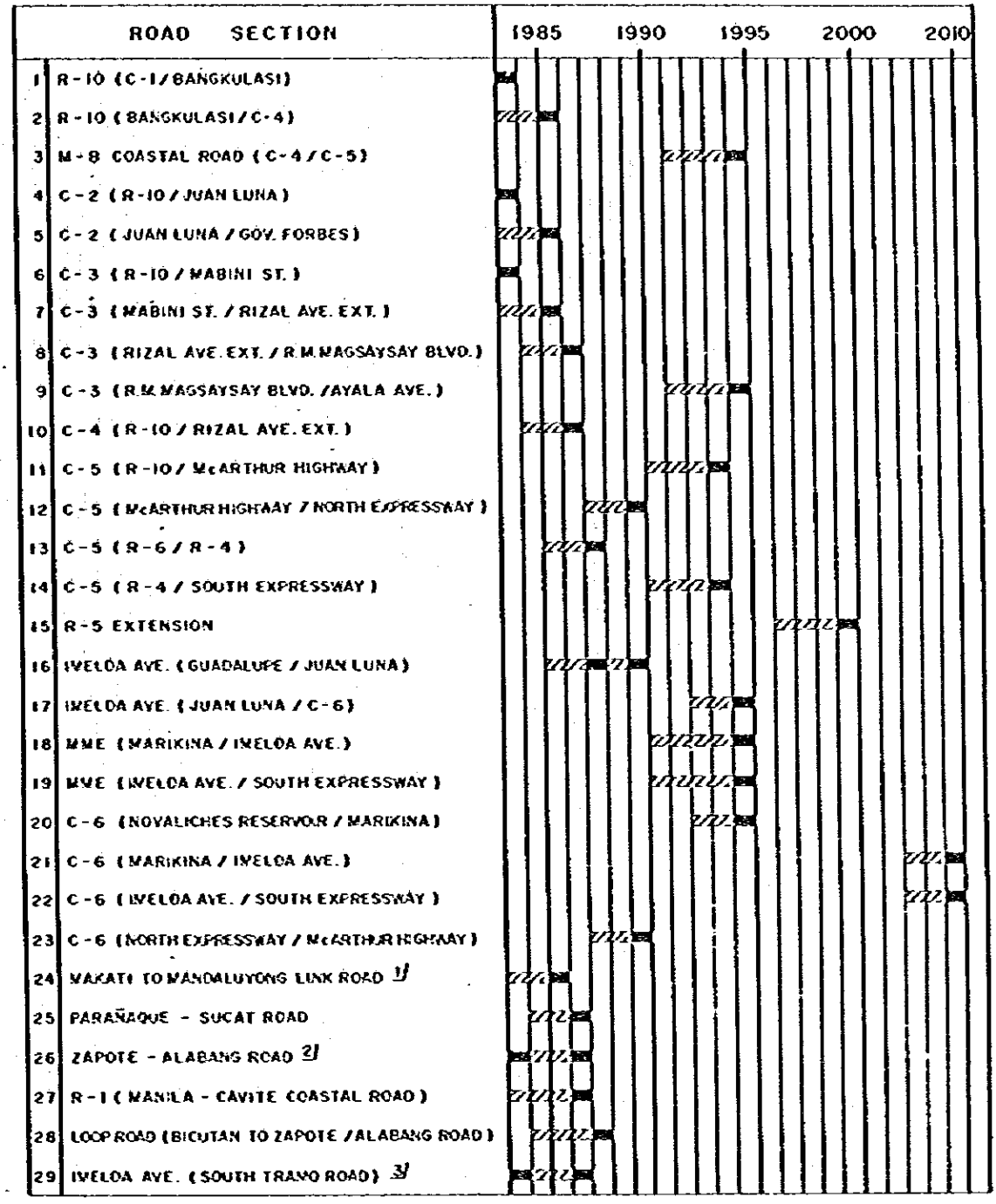


FIGURE 10.1-4 EXPECTED ROAD CONSTRUCTION SCHEDULE



1/ SEGMENT 1 - MID 1984, SEGMENT 2 & 3 - 1986

2/ ON-GOING - 1984, STAGE-I OF SOUTHERN PACKAGE - 1987

3/ STAGE 1 - 1984, STAGE 2 & 3 - 1987

TABLE 10.1–1 ESTIMATED BENEFITS BY ALTERNATIVE SCHEMES

(₱ Million, at 1982 price)

Plan	1989	1991	1997
Plan 1 (A)	512.3	633.5	937.6
RC	142.3	178.1	384.9
FC	213.2	271.1	327.0
TC	156.8	184.3	225.7
Plan 1 (B)	445.2	633.5	937.6
RC	111.2	178.1	384.9
FC	191.7	271.1	327.0
TC	142.3	184.3	225.7
Plan 2 (A)	512.3	646.7	977.5
RC	142.3	169.0	413.8
FC	213.2	283.9	333.5
TC	156.8	193.8	230.2
Plan 2 (B)	457.6	646.7	977.5
RC	113.8	169.0	413.8
FC	196.8	283.9	333.5
TC	147.0	193.8	230.2

RC = Running Costs
FC = Fixed Costs
TC = Passengers Time Costs

FIGURE 10.1-5 TRAFFIC COSTS IN DIZ

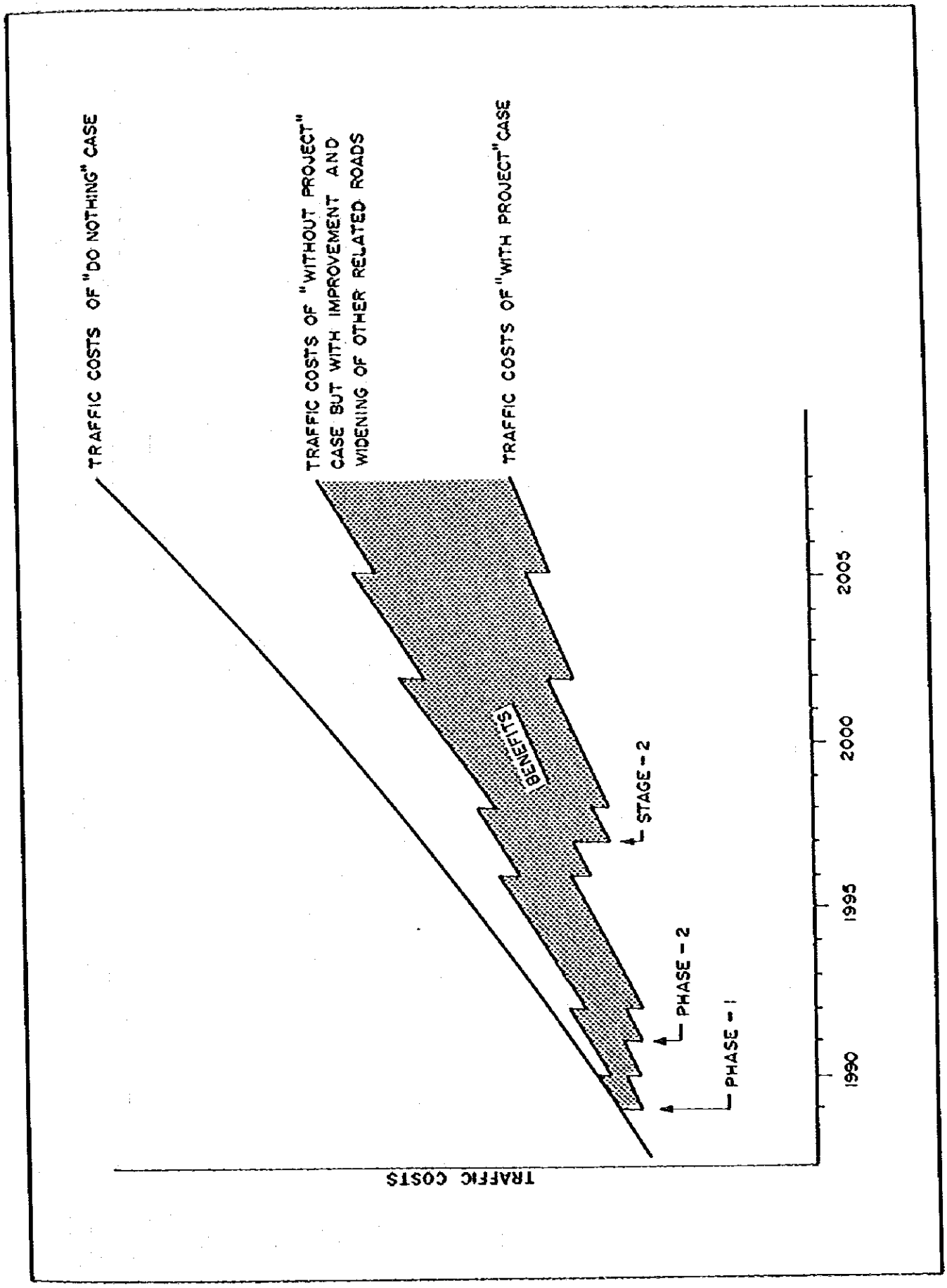


TABLE 10.1–2 ECONOMIC COST–BENEFIT STREAMS (ALTERNATIVE–1)

(₱ Million, 1982 constant)

	PLAN 1 (A)				PLAN 1 (B)			
	COST			BENEFIT	COST			BENEFIT
	Const.	Maint.	TOTAL	TOTAL	Const.	Maint.	TOTAL	TOTAL
1984	9.2		9.2		9.2		9.2	
1985	92.4		92.4		83.8		83.8	
1986	156.3		156.3		123.3		123.3	
1987	172.7		172.7		132.1		132.1	
1988	150.5		150.5		134.7		134.7	
1989	61.4	1.2	62.6	430.4	112.9	1.0	113.9	376.7
1990	40.9	1.2	42.1	448.3	87.3	1.0	88.3	392.4
1991		1.6	1.6	532.5		1.6	1.6	532.5
1992		1.6	1.6	554.2		1.6	1.6	554.2
1993	7.7	1.6	9.3	576.7	7.7	1.6	9.3	576.7
1994	2.6	1.6	4.2	600.1	2.6	1.6	4.2	600.1
1995	179.1	1.6	180.7	624.4	179.1	1.6	180.7	624.4
1996	179.1	1.6	180.7	649.7	179.1	1.6	180.7	649.6
1977		1.8	1.8	752.9		1.8	1.8	752.9
1998		1.8	1.8	788.4		1.8	1.8	788.4
1999		1.8	1.8	825.6		1.8	1.8	825.6
2000		1.8	1.8	864.5		1.8	1.8	864.5
2001		1.8	1.8	907.0		1.8	1.8	907.0
2002		1.8	1.8	951.6		1.8	1.8	951.6
2003		1.8	1.8	999.3		1.8	1.8	999.3
2004		1.8	1.8	1,047.4		1.8	1.8	1,047.4
2005		1.8	1.8	1,098.8		1.8	1.8	1,098.8
2006		1.8	1.8	1,152.8		1.8	1.8	1,152.8
2007		1.8	1.8	1,209.4		1,8	1,8	1,209.4
2008		1,8	1,8	1,268.8		1,8	1.8	1,268.8
TOTAL	1,051.9	33.6	1,085.5	16,282.7	1,051.8	33.2	1,085.0	16,173.1
at 15% Discount	530.3	5.6	535.9	2,284.6	507.9	5.3	513.2	2,233.7

NPV = 1,748.7
B/C = 4.26
IRR = 44.9%

NPV = 1,720.5
B/C = 4.35
IRR = 46.3%

TABLE 10.1-3 ECONOMIC COST-BENEFIT STREAMS (ALTERNATIVE-2)

(PMillion, 1982 constant)

	PLAN 2 (A)				PLAN 2 (B)			
	COST			BENEFIT	COST			BENEFIT
	Impl.	Maint	TOTAL	TOTAL	Impl.	Maint.	TOTAL	TOTAL
1984	10.8		10.8		10.8		10.8	
1985	92.9		92.9		84.3		84.3	
1986	156.9		156.9		129.1		129.1	
1987	173.5		173.5		139.9		139.9	
1988	151.1		151.1		140.5		140.5	
1989	96.9	1.3	98.2	430.4	139.8	1.1	140.9	387.1
1990	76.4	1.3	77.7	448.3	114.1	1.1	115.2	403.2
1991		1.8	1.8	545.2		1.8	1.8	545.2
1992		1.8	1.8	567.3		1.8	1.8	567.3
1993	7.3	1.8	9.1	590.3	7.3	1.8	9.1	590.3
1994	2.5	1.8	4.3	614.2	2.5	1.8	4.3	614.2
1995	170.0	1.8	171.8	639.1	170.0	1.8	171.8	639.1
1996	170.0	1.8	171.8	665.1	170.0	1.8	171.8	665.1
1997	1.8	1.8	1.8	783.2	1.8	1.8	1.8	783.2
1998		1.8	1.8	817.7		1.8	1.8	817.7
1999		1.8	1.8	853.8		1.8	1.8	853.8
2000		1.8	1.8	891.3		1.8	1.8	891.3
2001		1.8	1.8	932.6		1.8	1.8	932.6
2001		1.8	1.8	975.9		1.8	1.8	975.9
2003		1.8	1.8	1,021.2		1.8	1.8	1,021.2
2004		1.8	1.8	1,068.5		1.8	1.8	1,068.5
2005		1.8	1.8	1,118.0		1.8	1.8	1,118.0
2006		1.8	1.8	1,169.7	1.8	1.8	1.8	1,169.7
2007		1.8	1.8	1,223.8		1.8	1.8	1,223.8
2008		1.8	1.8	1,280.4		1.8	1.8	1,280.4
TOTAL	1,108.3	35.0	1,143.3	16,636.0	1,108.3	34.6	1,142.9	16,547.6
at 15% Discount	562.9	6.0	568.9	2,332.4	543.9	5.8	549.7	2,291.4

NPV = 1,763.6
B/C = 4.10
IRR = 44.0%

NPV = 1,741.7
B/C = 4.17
IRR = 45.2%

10.1.5 Sensitivity Analysis

A sensitivity test was conducted to determine the risk of the project in terms of the following factors:

1) Construction Cost (+20%)
2) Traffic Volume (± 20%)
3) Construction Cost (+20%)
   Traffic Volume (-20%)
4) Discount Rates at 12% and 18%

The result of the sensitivity analysis shown is in the tabulation below:

TABLE 10.1-4 SENSITIVITY TEST

	Plan 1-A	1-B	2-A	2-B
1) 20% Increase in Construction Cost				
NPV	1,642.60	1,618.90	1,651.00	1,632.90
B/C	3.56	3.63	3.42	3.48
IRR	40.00	41.20	39.20	40.10
2) 20% Increase in Traffic Volume				
NPV	2,434.10	2,390.60	2,463.30	2,429.10
B/C	5.54	5.66	5.33	5.42
IRR	52.70	54.20	51.80	53.10
3) 20 Decrease in Traffic Volume				
NPV	1,063.30	1,050.40	1,063.80	1,054.30
B/C	2.98	3.05	2.87	2.92
IRR	35.70	36.70	34.80	35.70
4) Construction Cost (+20%), Traffic Volume (-20%)				
NPV	957.30	948.80	951.20	945.50
B/C	2.49	2.54	2.39	2.44
IRR	31.50	32.40	30.70	31.40
5) In a case of 12%				
NPV	2,560.40	2,522.00	2,591.20	2,561.00
B/C	5.28	5.36	5.07	5.14
6) In a case of 18%				
NPV	1,213.60	1,193.70	1,218.70	1,203.60
B/C	3.51	3.59	3.37	3.44

10.2 FINANCIAL ANALYSIS

10.2.1 General

The published planning manuals of MPWH do not specifically set a guideline on financial analysis of road investment, which international financing institutions like OECD, UNDP, IBRD, etc.[1/] define and broadly used. This analysis tries to present a flexible schedule for the implementation of the project (as well as the on-going, committed and/or programmed projects), taking into consideration the resource capability of the government. The financial requirement of the project, which will come from the national infrastructure fund will be analyzed with the following procedures:

1) A time series simulation of investment cost;

2) A possible measurement of financial resources; and

3) An analytical appraisal of the first two.

This is rather more analogous to financial programming than to financial analysis. The preparatory work needs careful study of the following data:

1) Economic productivity which forms the core of the national financing capability;

2) Strategic allocations of the financial resources by sectors both at national and regional levels; and

3) Budgetary allocations to different government agencies. MPWH will be directly responsible for the project.

However, because of the difference of pricing standard and inconsistencies of data between major indicators as shown in Table 10.2–1, a preparatory work was undertaken to establish a conversion factor from constant price to current one. Such conversion is indispensable for the projection of the medium and long range program, since the financial program of MPWH are in current prices and on short-term basis. The key indicators necessary for this analysis are the GNP, GDP and NCR's GRDP as presented in Table 10.2--2. The conversion factors were obtained from a regression analysis and are briefly discussed below:

1/ A typical example can be seen in the co-edited instructions, by I.M.D. Little and J.A. Mirrless, entitled Project Appraisal and Planning for Developing Countries, Heineman, London, 1974 and Manual of Industrial Project Analysis for Developing Countries, OECD, Paris, 1968.

YEAR	CONVERSION FACTOR	CASE					
Y	X	1	2	3	1'	2'	3'
1973	1.1763				0.2144	0.9852	0.9566
1975	1.6674				0.9600	1.6002	1.5442
1979	2.4893				2.4512		
1982	3.5270				3.5696		
1983	3.8802				3.9424	4.0602	3.8946
1987	5.4806				5.4336	5.2902	5.0698
1990					6.5520	6.2127	5.9512
2000					10.2800	9.2877	8.8892

Note: Vertical lines show the years included in the analysis.

$$x\,(y) = \alpha + \beta y \qquad \text{where,}$$

$$\alpha N + \beta \sum_{i=1}^{N} yi = \sum_{i=1}^{N} xi$$

$$\alpha \sum_{i=1}^{N} yi + \beta \sum_{i=1}^{N} yi^2 = \sum_{i=1}^{N} xi \cdot yi$$

$$r^2 = 1 - \frac{Sxy^2}{Sx^2} = 1 - \frac{\sum_{i=1}^{N} xi^2 - \alpha \sum_{i=1}^{N} xi - \beta \sum_{i=1}^{N} xi \cdot yi}{\sum_{i=1}^{N} xi^2 - \frac{1}{N}\left(\sum_{i=1}^{N} xi\right)^2}$$

Cases	Parameters		Co-relation Coefficient	Years in the Analysis
	α	β	r	
1	– 27	0.3728	0.9989	1979–83 & 87
2	– 21.4623	0.3075	0.9867	1972–78 & 87
3	– 20.4908	0.2938	0.9922	1972–83 & 87

Based on the result of the above analysis, the conversion factors under Case I were adopted due to higher co-relation coefficient of 0.9989.

10.2.2 Infrastructure Funds of NCR

There are several development plans prepared for Metro Manila of which, the most recent are the Five-Year Development Plan, 1983-1987 prepared by NEDA, the Regional Development Framework Plan (RDFP), 1983-1992 and the Capital Investment

TABLE 10.2-1 COMPARISON OF AVAILABLE INFORMATION

		NATIONAL 5-Year Plan	NCR MMC RDFP	NCR MMC CIF
A)	1983-1987 GNP p.a. growth ratio	16.4% current (6.5% 1972 constant)	--	13.9-16.1% current
B)	NCR GRDP p.a growth ratio	5.9% 1972 constant	6.4% 1972 constant	--
C)	Inflation p.a ratio	9%	9%	10%
D)	Infrastructure finance requirement for 1983-1987	₱133 Billion 1981 constant	₱32 Billion current	₱30 Billion 1982 constant
E)	Infrastructure resources for 1983-1987	₱133 Billion 1981 constant	₱15-23 Billion current	₱13-22 Billion current
F)	Highways finance requirement for 1983-1987	₱28.7 Billion 1981 constant	₱7.4 Billion current	₱3.1 Billion 1982 constant
G)	F/E or D	21.5%	24%*	10%
H)	MPWH 1983 Budget for NCR	₱954 Million current	₱1,531 Million (7,656/5) 1982 constant	₱735-1,072 Million (1,470/2) (2,143/2) current
I)	MPWH Cash Support for NCR	₱340 Million	--	--
J)	MPWH 1987 Budget for NCR	--	₱1,531 Million 1982 constant	₱1,348-1,966 Million (2,696/2) (3,932/2) current
K)	Annual Base Cash Support Increase Ratio for 1983-1987	14.3%	--	0.36-0.53% of GNP by year

* Bigger share forwards to Water Supply II and LRT I.

TABLE 10.2–2 COMPARATIVE STREAM OF KEY INDICES AT CURRENT AND CONSTANT PRICES

YEAR	GNP		GDP		GRDP, NCR	
Year	Current	Constant at 1972 Price	Current	Constant at 1972 Price	Current	Constant at 1972 Price
1979	220.935	88.755	218.616	87.386	59.990	27.971
1980	265.00	92.600	265.300	92.694	82.640	29.940
1981	305.500	96.100	305.800	96.189	97.803	31.347
1982	352.700	100.000	353.400	100.222	113.791	32.983
1983	408.200	105.200	408.600	105.285	133.981	34.982
1984	472.611	113.000	473.459	113.000	155.530	37.031
1985	556.200	120.900	555.438	120.750	179.149	39.201
1986	642.995	128.800	641.105	128.550	204.995	41.497
1987	749.200	136.700	747.000	136.399	233.258	43.928
1988	841.118	149.100	889.485	153.370	267.685	46.798
1989	987.669	161.500	1,008.132	163.336	305.623	49,857
1990	1,140.048	174.000	1,138.266	173.983	347.366	53.114
1991	1,281.794	185.102	1,281.058	185.290	388.674	56.248
1992	1,438.650	197.132	1,437.603	197.332	434.243	59.567
1993	1,610.354	209.944	1,609.080	210.157	483.200	63.081
1994	1,798.363	223.588	1,796.787	223.815	536.428	66.803
1995	2.004.010	238.119	2,002.089	238.361	594.250	70.744
1996	2,228.787	253.594	2,226.485	253.852	657.031	74.918
1997	2,474.319	270.075	2,471.594	270.350	725.149	79.338
1998	2,742.351	287.627	2,739.156	287.920	799.021	84.019
1999	3,034.774	306.320	3,031.047	306.631	879.973	88.976
2000	3,357.448	326.228	3,349.320	326.559	966.759	94.226

Remarks For methodological approach, formula and related calibration, refer to Appendix 10.2 explanatory notes 2)

Sources:
1) 1981 Philippine Statistical Yearbook, NEDA
2) Five-Year Philippine Development Plan, 1983–1987 Technical Annex. NEDA, May 1982
3) 1978–1980 Regional Economic Accounts, February 1982 with Revised Regional Estimates as of November 1980, NAS, NEDA
4) Metropolitan Manila Capital Investment Folio Study, Final Report. MMC OCP November 1982
5) Capital Investment Folio, Working Paper 17, Regional Economy. MMC OCP May 1982

Folio (CIF), 1982-1987, both prepared by Metro Manila Commission. There are also some financial program for NCR as published by MPWH's Annual Report CY 1979-1981, the Capital Outlay of Highway CY 1981-1986, and the 1983-1987 Infrastructure Program for NCR.

The estimated infrastructure requirement for NCR including highways and its financial resource capability in which the MPWH monetary program is incorporated are shown Tables 10.2–3 and 10.2–4. The highways requirement, as stated by the Five-Year Plan and CIF, is some one-tenth of the total infrastructure requirement in which the figures indicated therein are at 1982 constant and current prices. Since no available data for the conversion of the constant price to current one, the factors estimated in the regression analysis discussed in the previous section were used.

10.2.3 Highway Funds for NCR

The analysis of the Tables 10.2–2 to 10.2–4 results in the estimation of the marginal sharing of the NCR's GRDP to National GDP up to NCR's Highway requirements to NCR's Infrastructure requirements as tabulated below:

	NCR GRDP/ National GDP	NCR Infrastructure Fund/NCR GRDP	NCR Infrastructure Requirement/ NCR GRDP	NCR Highways Requirement/ Infrastructure Requirement
1982	32.20%	n. a.	3.36%	5.25%
1983	32.79%	1.94%	5.16%	6.62%
1984	32.85%	1.91%	5.27%	9.96%
1985	32.25%	1.93%	5.32%	11.87%
1986	31.98%	1.92%	5.39%	12.25%
1987	31.23%	1.96%	5.11%	10.36%
Average				
1982–1987	32.2%		4.9%	9.4%
1983–1987	32.2%	1.9%	5.2%	10.2%

The computed average growth rates will be applied for the projection of NCR's infrastructure funds, and highways requirements from 1988 to year 2000 as indicated in Table 10.2–5.

However, an attempt had been made to study the budgetary trend with an assumption that the capability of MPWH relies on the cash-ceiling base. Such assumption has been made because no constant trend can be traced out of its budgetary records as shown below except the 1982 data.

TABLE 10.2--3 NCR FINANCIAL RESOURCES FOR INFRASTRUCTURE

(Million Pesos)

		1983	1984	1985	1986	1987	1983–1987
1) National Agencies							
Low	A	1,800	2,000	2,300	2,600	3,000	11,700
	B	1,640	1,650	1,730	1,780	1,860	8,660
High	A	3,000	3,500	4,100	4,700	5,500	20,800
	B	2,730	2,890	3,080	3,210	3,420	15,330
2) Local Government and MMC, NCR							
Low	A	170	200	220	240	260	1,090
	B	150	160	160	160	160	790
High	A	220	250	290	340	400	1,500
	B	200	210	220	230	250	1,100
3) Total							
Low	A	1,970	2,200	2,520	2,840	3,260	12,790
	B	1,790	1,810	1,890	1,940	2,020	9,450
High	A	3,220	3,750	4,390	5,040	5,900	22,300
	B	2,930	3,100	3,300	3,440	3,670	16,440
Average	A	2,595	2,975	3,455	3,940	4,580	17,545
	B	2,360	2,455	2,595	2,690	2,845	12,945

Remarks : A is Current Prices
B is 1982 Constant Prices

Source : Metropolitan Manila Capital Investment Folio Study, Final Report, MMC, OCP, November 1982

TABLE 10.2-4 ESTIMATION FOR NCR INFRASTRUCTURE EXPENDITURE

(₱ Million at 1982 constant price)

Sector	1982	1983	1984	1985	1986	1987	1983-1987	% [1]
Water Supply	1,225	1,211	778	669	1,116	1,060	4,834	16.2
Sewerage & Sanitation	280	590	376	687	586	712	2,951	9.9
Drainage & Flood Control	226	213	239	224	223	189	1,088	3.7
Environmental Sanitation	25	20	30	53	69	50	222	0.7
Highways [2]	201	389	598	723	752	602	3,064	10.3
	(201)	(458)	(817(	(1,139)	(1.354)	(1,234)	(5,002)	(10.5)
Transportation	978	931	582	400	162	113	2,188	7.3
Telecommunication	–	4	3	2	4	1	14	0
Social Infrastructure	33	43	54	56	58	53	264	0.9
Shelter	677	2,322	3,187	3,077	2,909	2,908	14,403	48.4
Public Building	182	155	155	163	161	123	757	2.5
TOTAL	3,827	5,878	6,002	6,054	6,040	5,811	29,785	100.0
	(3,827)	(6,920)	(8,203)	(9,531)	(11,050)	(11,911)	(47,615)	(100)

[1] % of Total
[2] Figures in ( ) are in current price convertibly calculated as described in this Chapter

Sources:

Regional Development Framework Plan 1983–1992
MMC, OCP, November 1982

Metropolitan Manila Capital Investments Folio Study,
Final Report, MMC, OCP, November 1982

TABLE 10.2–5 CORRELATION OF FUNDS, REQUIREMENT AND MPWH CASH SUPPORT FOR NCR HIGHWAYS

(Million Pesos)

YEAR	NCR Fund for Infra structure	NCR Infra-structure Require-ment	Highways Require-ment	MPWH Cash Allocation NCR (In Thousand Pesos)		
1979	–	–	–		171,797 ($4,963)	
1980	–	–	–		134,713 ($2,965)	
1981	–	–	–		207,867 ($2,977)	
1982	–	3,827	201		235,205 ($3,981)	
1983	2,595	6,920	458		340,000 ($4,000)	
1984	2,975	8,203	817		388,620	
1985	3,455	9,531	1,139		444,190	
1986	3,940	11,050	1,354	Low	507,710	High
1987	4,580	11,911	1,234	Estimate	580,320	Estimate
1988	5,086	13,920	1,420	665,970		691.020
1989	5,807	15,892	1,621	760,340		783,190
1990	6,600	18,036	1,842	864,210		884,280
1991	7,385	20,211	2,062	966,970		995,200
1992	8,251	22,581	2,303	1,080,300		1,116,800
1993	9,181	25,126	2,563	1,202,100		1,250,000
1994	10,192	27,894	2,845	1,334'600		1,395,900
1995	11,291	30,901	3,152	1,478,400		1,555,300
1996	12,484	34,166	3,485	1,634,600		1,729,700
1997	13,778	37,708	3,846	1,804,000		1,920,000
1998	15,181	41,549	4,238	1,988,000		2,128,000
1999	16,719	45,759	4,667	2,189,000		2,355,000
2000	18,368	50,271	5,128	2,405,000		2,602,000

Sources: Regional Development Framework Plan 1983--1992. MMC OCP November 1982

Metropolitan Manila Capital Investment Folio Study, Final Report. MMC OCP November 1982

MPH Annual Report CY 1979 to 1981

MPWH Infrastructure Program CY 1982, September 1981

1983 MPWH Infrastructure Program, NCR

	(A) Highways Budget Grand Total	(B) Cash Ceiling Among (A)	(C) For NCR Budget Among (A)	(D) Cash Ceiling Among (C)
1979	n. a.	n. a.	n. a.	171,797 ($4,963)
1980	n. a.	n. a.	n. a.	134,713 ($2,965)
1981	7,253,605 ($46,924)	2,062,904 ($46,924)	613,466 ($3,810)	196,477 (3,810)
				207,867 ($2,977)
1982	7,115,218 ($76,414)	2,252,158 ($76,414)	598,262 ($3,981)	235,205 ($3,981)
				235,205 ($3,981)
1983	10,106,483 ($441,822)	3,037,251 ($106,722)	953,950 ($44,960)	340,000 ($4,000)

Remarks: Underlined figures are obtained from MPWH Annual Report

Other are quoted from Capital Outlay Program.

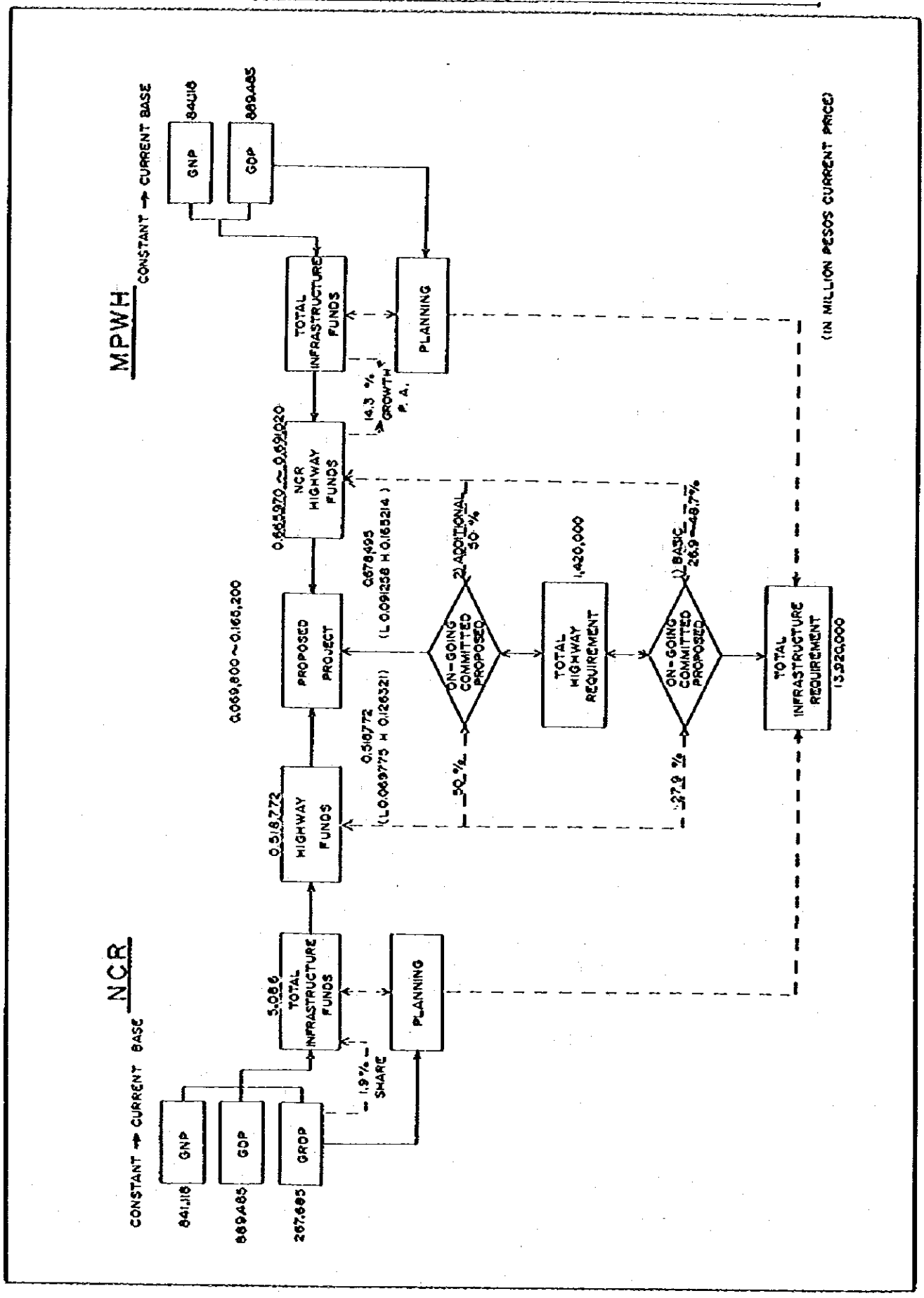
Units are ₱1,000

Based from such information, the range of the budget ceiling is some 28% to 32% of highways total budget and around 32% to 39% cash ceiling of NCR budget. MPWH cash allocation for NCR highways for 1983-1987 is assumed to increase at the level of 14.3% per annum as disclosed by the Five-Year Plan in its cash disbursement program for infrastructure requirement. Beyond the period of the Plan, the ceiling perspective would be drawn within the frame of GNP, GDP and NCR GRDP referring from the above sharings in which the high and fow estimations are based on the GDP growth ratio and NCR GRDP, respectively as shown in Table 10.2–5.

10.2.4 Limitation for a Possible Allocation

The allocation includes the whole requirements either on-going and/or committed projects and newly proposed ones. The Study must, therefore, made to analyze it from two views. Figure 10.2–1 shows the basic procedures for the estimation.

FIGURE 10.2–1 BASIC PROCEDURE FOR THE ESTIMATION OF POSSIBLE ALLOCATION FOR HIGHWAYS IN NCR
(in a Case of 1988 Estimate)



a) Basic Constraints

The ratios indicated below suggest an expected basic limitations to the project requirement. No project, particularly the newly proposed ones, can enjoy the full support of their requirement. The ratios indicate the necessity to cut-down the requirement from the range of some 30% to 50% or to segmentally defer time-wise-input up to 2 to 3 times.

Year	NCR Fund for Infra to Highway Requirement Ratio (%)	MPWH Cash Ceiling to Highway Requirement Ratio (%)	
1984	27.5%	47.6%	
1985	33.0%	39.0%	
1986	34.4%	37.5%	
1987	26.9%	47.0%	
		Low Estimate	High Estimate
1988	27.9%	46.9	48.7
1989	27.9%	46.9	48.3
1990	27.9%	46.9	48.0

Source: Table 10.2–5

b) Additional Limitation

In a case of newly proposed requirement, it should be appropriate to expect an additional handicap derived from on-going and/or committed project. A cumulative average ratio of yearly proposed input, as shown in RDFP and CIF reports against the total, shows roughly 50%. This suggests the necessity of some 30% to 50% cut-down or 2 to 3 times deferment as the basic limitation must add further 50% curtailment or 3 to 5 times segmentally deferment.

Based on such assumptions and calculations made, the NCR's cash ceiling and possible allocation with low and high estimates have been calibrated as shown below. The MPWH cash ceiling has been drawn from the sectoral financial allocations for highways and the NCR ceiling was estimated from the region's productivity in which the latter includes the MPWH portion for NCR highways financing.

NCR's FIVE--YEAR HIGHWAY INVESTMENTS PROGRAM, 1983- 1987

(In current price)

	RDFP Highway Estimate			CIF Highway Estimate		
	Committed	Proposed	Total	Committed	Proposed	Total 1/
1983	484	25	509	420	38	458
1984	245	916	1,161	604	213	817
1985	232	1,688	1,920	424	715	1,139
1986	–	1,964	1,964	232	1,122	1,354
1987	–	1,721	1,721	8	1,226	1,234
1983--1987	961	6,134	7,275	1,688	3,314	5,002

Unit = ₱ Million

1/ Source: Table 10.2--4

Note: Discrepancy has been noted between the two reports by MMC

Year	MPWH			MMC		
	Ceiling	Possible		Ceiling	Possible	
		Low	High		Low	High
1984	388,620	52,269	94,629	296,310	39,854	72,151
1985	444,190	59,744	108,160	412,873	55,531	100,545
1986	507,710	68,287	123,627	482,650	64,916	117,525
1987	580,320	78,053	141,308	474,488	63,819	115,538
1988	678,495	91,258	165,214	518,772	69,775	126,321
1989	771,765	103,802	187,925	592,314	79,666	144,228
1990	874,245	117,586	212,879	673,860	90,634	164,085
1991	981,085	131,956	238,894	753,270	101,315	183,421
1992	1,098,550	147,755	267,497	841,602	113,195	204,930
1993	1,226,050	164,904	298,543	936,462	125,954	228,028
1994	1,365,250	183,626	332,438	1,039,584	139,824	253,139
1995	1,516,850	204,016	369,353	1,151,682	154,901	280,435
1996	1,682,150	226,249	409,604	1,273,368	171,268	310,065

Figures of MPWH ceiling after 1988 are the mean-average of Low/High indicated in Table 10.2--5

10.2.6 Possible Allocation for the Project

The table below indicates limited funds/requirement vis-a-vis by alternative schemes of the project investment cost. A yearly investment requirement is escalated at 9.5% per annum, as the midpoint of inflation 9% per year estimated in the 5-year Development Plan 1983-87 and 10% forecasted in MMC's CIF for the same period as shown in Appendix Table 10.2-1.

Based on the low estimation, no schemes are within the estimated allocation. However, only Plan 1-B can stay within the high allocation.

	Possible Allocation Low 1/	High 2/	Plan 1-A	1-B	2-A	2-B
1984	39.9	94.6	4.5	4.5	5.3	5.3
1985	55.5	108.2	18.9	7.7	119.2	108.0
1986	64.9	123.6	144.5	118.9	144.9	122.6
1987	63.8	141.3	154.8	122.6	155.4	128.3
1988	69.8	165.2	163.3	162.1	163.8	166.7
1989	79.7	187.9	74.0	123.8	104.7	146.9
1990	90.6	212.9	38.6	82.5	72.2	107.8
1993	126.0	298.5	8.6	8.6	8.2	8.2
1994	139.8	332.4	3.1	3.1	3.0	3.0
1995	154.9	369.4	274.8	274.8	260.7	260.9
1996	171.3	409.6	308.4	308.4	292.9	292.9

1/ Based on the low estimate of MMC

2/ Based on the high estimate of MPWH

10.3 PROJECT EVALUATION

10.3.1 Approach

The formulated Alternative Plans have been subjected to evaluation from the view point of economic, financial and traffic impact as well as its contributions to the regional economy. The result of the evaluation will be the basis in the selection of the plan to be adopted. The following criteria were used for the evaluation:

Economic Indicators: IRR, NPV, and BC ratio

Financial Requirement: Amount of annual investment in relation with the NCR's annual road budget.

Traffic Impact: Total running distance in PCU-Km, total running time in PCU-hours, length of roads with a volume/capacity ratio over 1.0 and 1.5, average volume-capacity ratio (V/C), and impacts on existing related roads.

Contributions to Regional Economy: Contribution to GRDP, and quantity of gasoline saved.

10.3.2 Economic Indicators

The economic evaluation including the sensitivity test conducted on the different alternative plans indicated that Alternative 1 (B) as the most viable plan in terms of B/C ratio of 4.35 and IRR of 46.3%. The priority ranking is the same when the different alternative were subjected to sensitivity analysis. It is therefore concluded that a conservative plan with a radial type of road development in the initial phase just enough to cater to the traffic need of the area have a distinct advantage over the other alternatives.

Economic Evaluation

	NPV (₱ Million)	B/C	IRR (%)
Plan 1 (A)	1,748.7	4.26	44.9
Plan 1 (B)	1,720.5	4.35	46.3
Plan 2 (A)	1,763.6	4.10	44.0
Plan 2 (B)	1,741.7	4.17	45.2

10.3.3 Financial Assessment

The estimated financial requirement of the different alternative plans based on the recommended implementation schedule should be within the projected highway budget for the NCR less the on-going and committed highway projects. Tabulated below are the high and low estimates of the annual possible allocation for the project and the annual financial requirements of each plans.

Million Pesos at Current Price

Year	POSSIBLE ALLOCATION			REQUIREMENT 1/			
	NCR Total	PROJECT Low	PROJECT High	Plan 1(A)	1(B)	2(A)	2(B)
1984	338.6	39.9	94.6	4.5	4.5	5.3	5.3
1985	441.2	55.5	108.2	18.9	7.7	119.2	108.0
1986	507.7	64.9	123.6	144.5	118.9	144.9	122.6
1987	580.3	63.8	141.3	154.8	122.6	155.4	128.3
1988	678.5	69.8	165.2	163.3	162.1	163.8	166.7
1989	771.7	79.7	187.9	74.0	123.8	104.7	146.9
1990	874.2	90.6	212.9	38.6	82.5	72.7	107.8
1993	1,226	126.0	298.5	8.6	8.6	8.2	8.2
1994	1,365	139.8	333.4	3.1	3.1	3.0	3.0
1995	1,517	154.9	369.4	274.8	274.8	260.7	260.9
1996	1,682	171.3	409.6	308.4	308.4	292.	292.9

1/ Requirement includes local currency component and tax, but excludes foreign currency component

An analysis of the tabulation indicates that yearly requirements of all alternative plans exceed the low estimate of the available funds during construction. Comparing the investment requirements of the different plans with the high estimate of the possible highway funds, alternatives 1 (A) and 2 (A) are higher than the available funds while alternatives 2 (B) barely made it. Alternative 1 (B), on the other hand, has an annual investment requirement within the projected available highway funds. Alternative Plan 1 (B) is therefore found financially feasible for implementation from 1985 to 1991.

10.3.4 Traffic Impact

The traffic impacts of the different alternative plans are basically the same providing a road network that would improve the traffic condition in the area. Shown in Tables 10.3--1 and 10.3--2 are the traffic assessments of the road network in the DIZ for years 1989 and 2000, respectively.

For the traffic assessment in year 1989, the proposed opening year of the different alternative plans of Phase I, Stage 1, the average volume-capacity (V/C) ratio of the road network in the DIZ would improve from 0.88 without Phase I to about 0.75. Evaluating each link of the road network without the project, there are about 76.2 kilometers having a V/C ratio of more than 1.0 and about 36.1 kilometers with V/C ratio more than 1.5. The roads that would be congested heavily are the General Luis Road, Tandang Sora Avenue, Quirino Highway including the newly improved Don Mariano Marcos Avenue. With the project, there are about 38.9 to 46.7 kilometers with a V/C ratio more than 1.0 and about 9.0 to 9.6 kilometers more than 1.5 and the roads that would still be congested are the Quirino Highway, General Luis Road and in some cases, the Tandang Sora Avenue. Comparing the different alternatives, Plans 1 (B) and 2 (B) would provide a more balance network with a V/C ratio of 0.51 to 0.86 for the project roads and 0.82 to 1.43 for other related roads. Plans 1 (A) and 2 (A) have high variation in the level of service with 0.39 to 0.91 for the project roads and 0.77 to 1.35 for other related roads. The traffic assessment shows that Plan B would provide a more balance road network in the DIZ.

The traffic assessment of the road network in year 2000 shows that Alternatives 1 and 2 would provide the same level of service to the future demand in the DIZ. The only difference is that Alternative 2 having more lanes would have a V/C ratio of 0.53 to 0.73 as compared to Alternative 1 with 0.71 to 0.86 but the traffic impacts of both alternatives to other related roads are practically the same.

Based on the above, Alternative 2 (b) would provide a slightly better road network in the DIZ.

10.3.5 Contribution to Regional Economy

The quantified benefits are in the form of vehicle operating costs and passenger time cost. These benefits have either direct or indirect contribution to the regional and national economy. The direct impact is the savings in fuel consumption (gasoline and diesel) from the running cost of the vehicle operating costs. In the opening year of Phase 1, Stage 1, in 1989, the quantified savings in fuel consumption under Plan A would be about 167,700 barrels composed of 122,000 gasoline and 45,700 diesel, amounting to about ₱124.40 million (1982 market price). For Plan B, the savings in 1989 amount to about 139,400 barrels equivalent to about ₱102.3 million. In 1991, the completion year of Stage 1, fuel saving would amount to about 204,500 and 210,200 barrels for Alternative 1 and 2, respectively. Shown in Table 10.3--3 are the

TABLE 10.3-1 TRAFFIC ASSESSMENT IN 1989

	WITHOUT CASE	ALTERNATIVE 1		ALTERNATIVE 2	
		(A)	(B)	(A)	(B)
* Total PCU Kms/day (1,000)	14,068 (1.00)	13,238 (0.94)	13,438 (0.96)	13,238 (0.94)	13,414 (0.95)
* Total PCU Hours/day (1000)	551 (1.00)	441 (0.80)	451 (0.82)	441 (0.80)	449 (0.81)
* Average V/C Ratio	0.88	0.75	0.75	0.75	0.74
* Total Length of Road Section with 1.0 or more V/C Ratio (Kms)	76.2	38.9	46.7	38.9	45.1
* Total Lenght of Road Sections with 1.5 or more V/C Ratio (Kms)	36.1	9.6	9.0	9.6	7.7
* V/C Ratio of Project Roads					
C-5 (Republic/Luzon)	-	0.62	–	0.62	-
C-5 (Katipunan Ave.)	–	0.91	0.85	0.91	0.85
C-6	–	0.39	0.51	0.39	0.51
Mindanao Avenue	–	0.55	0.86	0.55	0.65
Visayas Avenue	–	0.57	0.61	0.57	0.61
* Impact on Related Roads					
Traffic Volume (1,000 PCU)					
EDSA (C-4)	120.0	101.3	108.2	101.3	108.6
Tandang Sora Ave.	19.0	12.2	15.9	12.2	15.8
Gen. Luis Road	21.8	17.5	18.6	17.5	18.4
Quirino Highway	38.2	28.1	31.9	28.1	31.5
MNDR	75.1	71.9	65.1	71.9	64.6
Don Mariano Marcos Avenue	129.2	74.7	88.8	74.7	88.7
V/C Ratio					
EDSA (C-4)	0.91	0.77	0.82	0.77	0.82
Tandang Sora Ave.	1.46	0.94	1.22	0.94	1.22
Gen. Luis Road	1.68	1.35	1.43	1.35	1.42
Quirino Highway	1.39	1.06	1.19	1.06	1.18
MNDR	0.99	0.95	0.86	0.95	0.85
Don Mariano Marcos Avenue	1.44	0.84	0.99	0.84	0.99

TABLE 10.3–2 TRAFFIC ASSESSMENT IN YEAR 2000

	WITHOUT CASE	ALTERNATIVE 1	ALTERNATIVE 2
Total PC Kms/day (1,000)	21,783 (1.00)	20,383 (0.84)	20,327 (0.83)
Total PCU Hrs/day (1,000)	820 (1.00)	557 (0.68)	550 (0.67)
Average V/C ratio	1.11	0.89	0.86
Total Length of Road Sections with 1.0 or more V/C Ratio (Kms)	87.6	51.2	45.8
Total Lenght of Road Sections with 1.5 or more V/C Ratio (Kms)	33.0	6.1	5.1
V/C Ratio of Project Roads			
C–5 (Republic/Luzon)	–	0.74	0.73
C–5 (Katipunan Ave.)	–	1.13	1.13
C–6	–	0.86	0.71
Mindanao Avenue	–	0.67	0.58
Visayas Avenue	–	0.71	0.53
Impact on Related Roads			
Traffic Volume (1,000 pcu)			
EDSA (C–4)	165.3 (1.00)	125.2 (0.76)	124.3 (0.75)
Tandang Sora Ave.	28.9 (1.00)	13.7 (0.47)	14.0 (0.48)
Gen. Luis Road	26.3 (1.00)	11.2 (0.43)	11.4 (0.43)
Quirino Highway	68.3 (1.00)	38.5 (0.56)	37.2 (0.54)
MNDR	119.7 (1.00)	84.4 (0.71)	83.7 (0.70)
Don Mariano Marcos Avenue	152.7 (1.00)	98.6 (0.65)	98.1 (0.64)
V/C Ratio			
EDSA (C–4)	1.15	0.87	0.86
Tandang Sora Ave.	2.22	1.06	1.08
Gen. Luis Road	2.03	0.87	0.88
Quirino Highway	1.42	0.80	0.78
MNDR	1.05	0.74	0.73
Don Mariano Marcos Avenue	1.23	0.81	0.80

fuel savings for the different alternatives during the opening year of Phase 1 and Stages 1 and 2. This means a maximum of 3% savings in the nationwide petroleum products consumption at 1982 prices (details were discussed in Appendix 10.3.5).

In terms of monetary value of the savings in fuel consumption, of which about 60% of the value represents the foreign cost. This foreign cost savings could contribute to the international trade deficit of the country or dollar outflow of foreign currency.

The amount of foreign cost savings in the opening year of Stage 1 would amount to about U.S. $10.3 million and expected to increase more than twice after completion of Stage 2 in 1999.

TABLE 10.3–3 FUEL SAVINGS OF THE PROJECT

YEAR	PLAN	PREMIUM GASOLINE Q	PREMIUM GASOLINE A	DIESEL Q	DIESEL A	TOTAL
1989	1A, 2A	19,392 (122.0)	101,809 (61,085)	7,265 (45.7)	22,606 (14,016)	124,415 (75,101)
	1B	15,289 (96.2)	80,271 (48,163)	6,472 (40.7)	20,133 (12.482)	100,404 (60,645)
	2B	15,956 (100.4)	83,767 (50,260)	6,576 (41.4)	20,460 (12,685)	104,227 (62,945)
1991	1	21,082 (132.6)	110,679 (66,407)	11,435 (71.9)	35,552 (22,042)	146,231 (88,449)
	2	22,341 (140.6)	117,296 (70,378)	11,055 (69.6)	33,045 (20,488)	150,341 (90,866)
1977	1	27,928 (175.7)	146,620 (87,972)	16,696 (105.0)	51,920 (32,190)	198,540 (120,162)
	2	29,620 (186.4)	155,503 (93,302)	18,485 (116.3)	57,482 (35,639)	212,985 (128,941)

Q : Quantity; Thousand liters (thousand barrels)

A : Amount ; In thousand, 1982 market price
( ) Foreign portion

10.3.6 Recommendation

On the basis of the results of the project evaluation, the different alternative plans could be arranged according to their rank on each of the criteria used in the evaluation as shown below:

PRIORITY MARKING OF ALTERNATIVE PLANS

CRITERIA	Plan 1 (A)	1 (B)	2 (A)	2 (B)
1) Economic Evaluation	2nd	1st	4th	3rd
2) Financial Assessment	3rd	1st	4th	2nd
3) Traffic Impact	4th	2nd	3rd	1st
4) Contribution to the National Economy	4th	3rd	2nd	1st

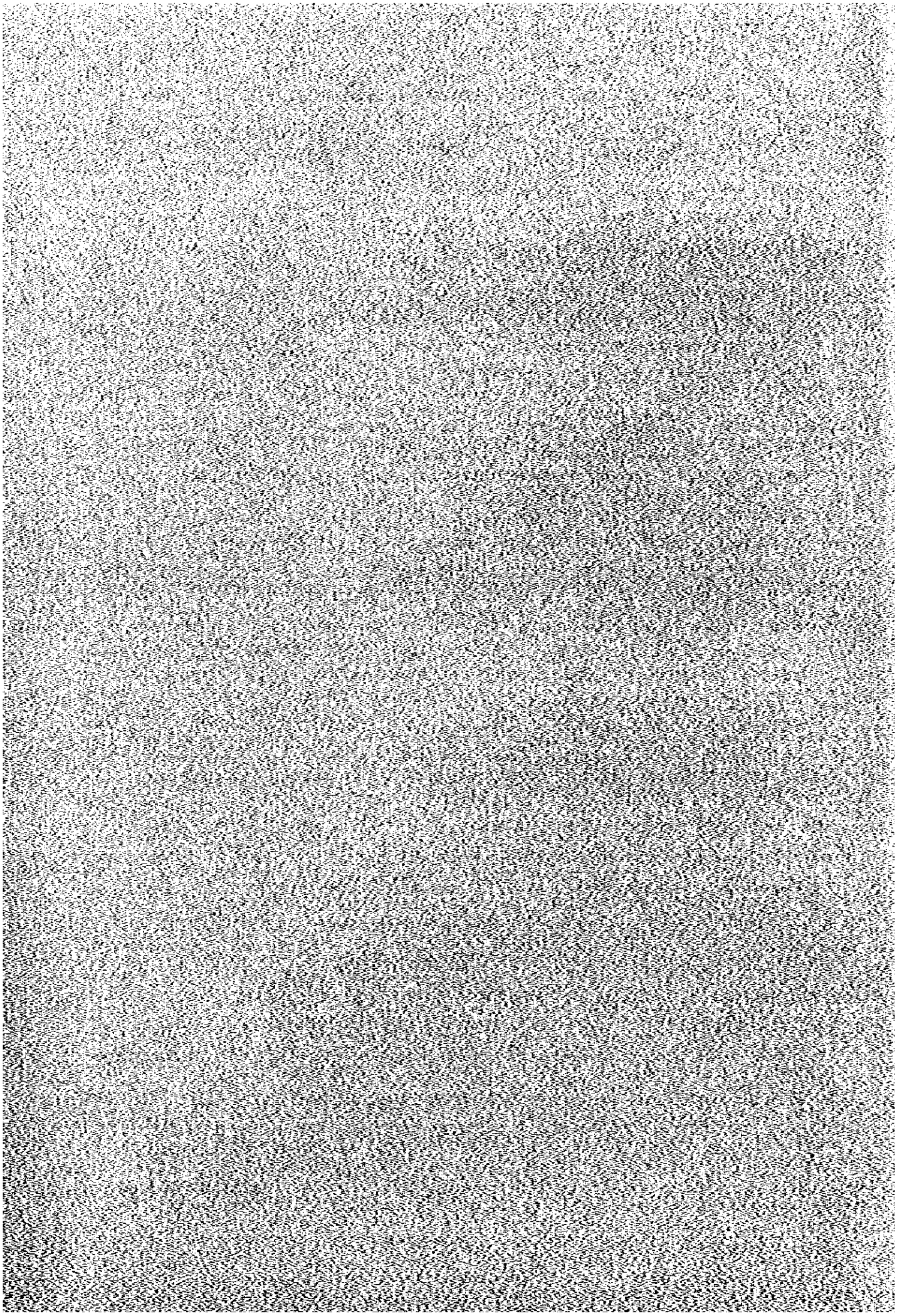
The tabulation shows that Plans 1 (B) and 2 (B) are the most viable plans for the project. If the criteria used were given weights, the most important would be the financial assessment, followed closely by the economic evaluation, then the contribution to the national economy and the traffic impact in that order. In the economic assessment, Plan 1 (B) is the first priority though the other three are not far behind. In terms of financial assessment, only Plan 1 (B) satisfies the high estimates of the annual possible allocation for the project. Furthermore, if the cash flow of the investment up to the completion of Stage 2 in current prices, including escalation, were converted to present values using a discount rate of 15%, the present opportunity cost of capital in the country, Plan 1 (B) would be about ₱46.7 million less than Plan 2 (B). This difference in the total capital investment could be utilized for other developmental projects. For the last two criteria, where Plan 2 (B) obtained the first priority, Plan 1 (B) or the other two remaining plans would offer basically the same impact as Plan 2 (B).

In view of the above, it could clearly be concluded that Plan 1 (B) would provide the greatest overal impacts to the region as well as to the nation in general.

CHAPTER 11 PROJECT IMPLEMENTATION

TABLE OF CONTENTS

FIGURE



CHAPTER 11

PROJECT IMPLEMENTATION

The project evaluation in the previous Chapter recommended that the Project be implemented under Alternative 1 (B). On this basis, a project implementation program was prepared.

11.1 DETAILED ENGINEERING

The detailed engineering design for Stage 1, which will require 16 months, should be undertaken at the earliest possible time, taking into full consideration the ultimate stage features to avoid, as much as possible, double investment during the succeeding stages.

Stage 2 construction includes widening of roadways as well as construction of grade separation at major intersections, therefore, the projected traffic demand in this Study should be re-assessed during the operational phase of Stage 1. Sixteen-month period will be required to complete the design in this Stage.

The detailed engineering costs at 1982 price were estimated as follows:

Unit: Million Pesos

	Foreign	Local	Tax	Total
Stage 1	7.54	3.39	1.64	12.57
Stage 2	6.34	2.85	1.38	10.57

11.2 RIGHT-OF-WAY AND PROPERTY ACQUISITION

Since land acquisition can be a serious obstacle to road construction in urban areas, MPWH's close contact with and full coordination of relevant offices of Quezon City, Caloocan City and Municipality of Valenzuela, as well as the Human Settlements Regulatory Commission, MHS, and the Metro Manila Commission, be maintained to enforce strict control over the development activities on and along the proposed routes of the project roads.

The full road right-of-way width of the ultimate stage should be acquired in Stage 1. After the limits of the right-of-way had been established during the detailed engineering phase, land and property acquisition should start for the road sections included in Plan 1 (B).

Estimated cost of land and property acquisition were estimated as follows:

	(1982 price)
Phase 1	161.50 million pesos
Phase 2	85.44 million pesos
TOTAL	246.94 million pesos

In view of the limitation of funds, land and property acquisition will require about five (5) years to complete with a one-year lead time before construction. This is possible in view of the existing and reserved right-of-way of the roads included in Plan 1 (B), i.e.

- Katipunan Avenue as part of C–5 – existing
- Fairview as part of C–6 – existing
- Mindanao Avenue – existing from North Avenue to Culiat Creek and reserved right-of-way from Culiat Creek up to the point south of Quirino Highway
- Visayas Avenue – existing from Elliptical Road to Tandang Sora Road

The land and property acquisition in Phase 2 of Stage 1 would not pose any problem as the area traversed by the project roads are existing (Luzon Avenue), acquired (Republic Avenue from Quirino Highway to Don Mariano Marcos Avenue) and the rest are on a sparsely developed areas.

During the course of land and property acquisition, close dialogue with people affected should be made to facilitate the work. Assistance from other Government agencies is also necessary, such as the National Housing Authority for the relocation of squatter families and the Ministry of Human Settlements and the Metro Manila Commission to provide priority preference for affected families in government housing projects.

11.3 CONSTRUCTION

1) Stage Construction

The Project should be implemented in two (2) stages, namely Stage 1 and Stage 2. Stage 1 involves the construction of the project roads with minimum improvement, 6 lanes for the Katipunan Avenue and 2 to 4 lanes to the remaining projects just enough to service the traffic demand in the area for the next five years. Stage 2 involves the upgrading and widening of the project roads including grade separation on selected major intersections.

Stage 1 will be further sub-divided into Phases 1 and 2. In Phase 1, radial roads will first be developed, then the rest of the Project Roads will be constructed in Phase 2. Immediately after the completion of Phase 1, Phase 2 will follow.

Estimated construction costs were as follows:

Million Pesos (1982 Price)

	FOREIGN	LOCAL	TAX	TOTAL
STAGE 1				
Phase 1	138.21	71.94	36.22	246.37
Phase 2	96.73	50.35	25.34	172.42
Sub-total	234.94	122.29	61.56	418.79
STAGE 2	192.16	110.71	49.71	352.58
T O T A L	427.10	233.00	111.27	771.37

2) Division of Construction Segments

In view of the scale of the Project, each stage should be implemented by several contracts. This, however, should be re-assessed during the actual engineering design period. The proposed construction segments are as following table.

About six (6) months will be required for tendering, i.e. from advertisements to award of contract. Construction period of each stage is estimated three (3) years for Phase 1 of Stage1, two (2) years for Phase 2 of Stage 1 and two (2) years for Stage 2.

CONSTRUCTION SEGMENT	CONSTRUCTION COSTS
Phase 1 of Stage 1 (4–contract segments)	
* C–5 (Katipunan Avenue)	46.85
* C– 6 (Quirino Highway to Don Mariano Marcos Avenue)	51.46
* Mindanao Avenue (North Avenue to General Luis Road)	73.07
* Visayas Avenue (Elliptical Road to C–6)	74.99
Phase 2 of Stage 1 (4–contract segments)	
* C–5 (Republic Avenue–A)	48.25
* C–5 (Republic Avenue–B)	48.25
* C–5 (Luzon Avenue)	25.89
* C–6 (MNE to Quirino Highway) and Mindanao Avenue (General Luis Road to C–6)	50.03
Stage 2 (7-Contract segments)	
* C–5 (Republic Avenue–A)	63.71
* C–5 (Republic Avenue–B)	63.71
* C–5 (Luzon Avenue)	47.00
* C–5 (Katipunan Avenue)	25.00
* C–6 (MNE to Quirino Highway)	56.66
* C–6 (Quirino Highway to Don Mariano Marcos Avenue)	43.11
* Mindanao Avenue and Visayas Avenue	52.89

11.4 FUND PREPARATION

1) Foreign Funds

As discussed in the financial analysis, Chapter 10, financial assistance from a foreign country or an international financing institution will be necessary. Early negotiation of loans from foreign countries or international financing institutions should be made to fund the detailed engineering as well as the actual construction.

Estimated amounts of foreign loans which are equivalent to the foreign currency component, were as follows:

FOREIGN FUND REQUIREMENT

(1982 Price)

	MILLION ₱	(MILLION $)
STAGE 1		
Detailed Engineering	7.54	(0.88)
Phase 1 Construction	138.21	(16.17)
Phase 2 Construction	96.73	(11.32)
Phase 1 Supervision	8.87	(1.04)
Phase 2 Supervision	6.21	(0.73)
Sub-Total	257.56	(30.14)
STAGE 2		
Detailed Engineering	6.34	(0.74)
Construction	192.16	(22.48)
Supervision	12.70	(1.49)
Sub-Total	211.20	(24.71)
GRAND TOTAL	468.76	(54.85)

2) Local Funds

The Government should make available the following local funds to implement the Project:

LOCAL FUND REQUIREMENT

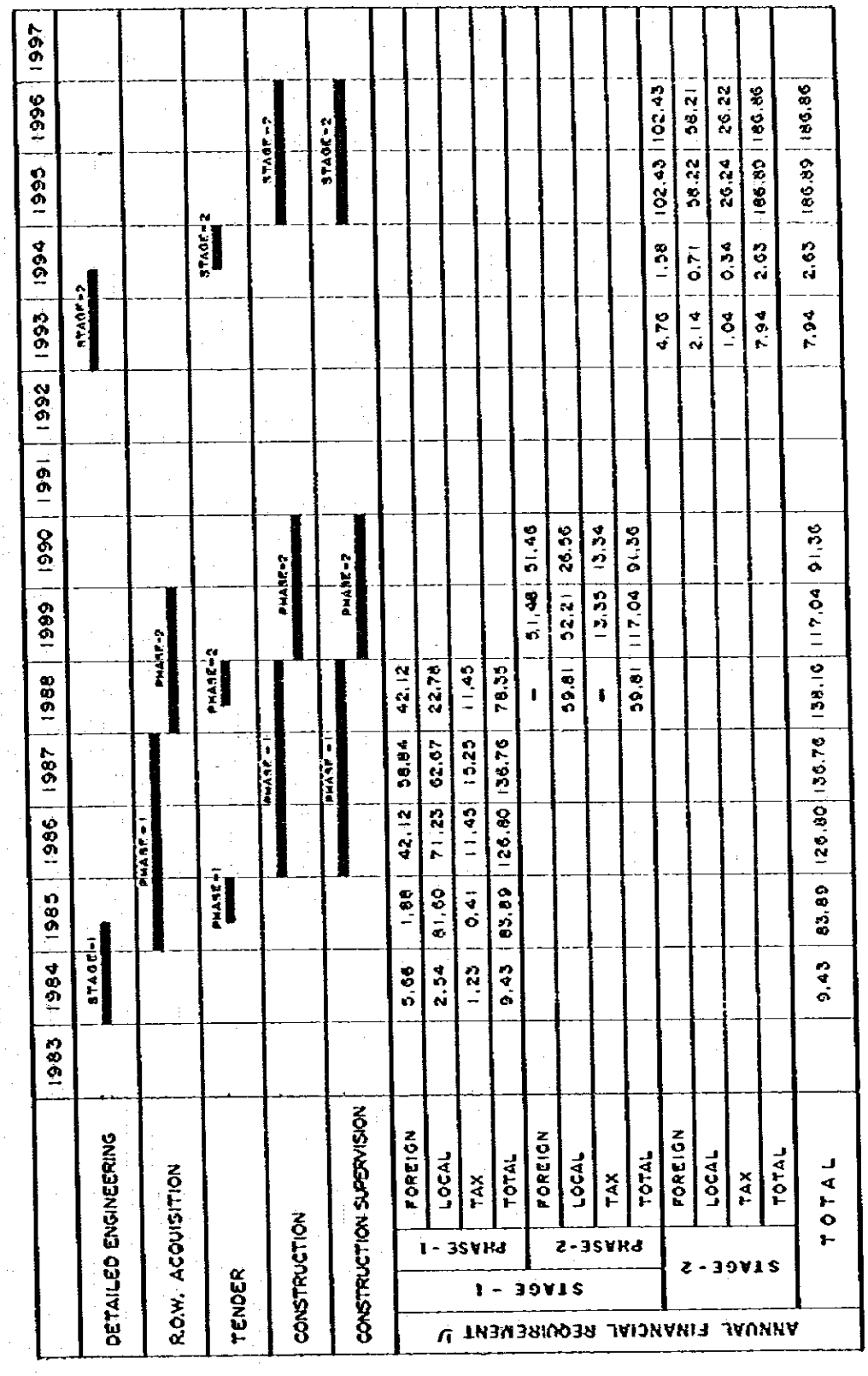
Unit: Million (1982 Price)

	LOCAL CURRENCY COMPONENT	TAX	TOTAL
STAGE 1			
Phase 1			
Detailed Engineering	3.39	1.64	5.03
Right-of-Way Acquisition	161.50	–	161.50
Construction	71.94	36.22	108.61
Supervision	3.99	1.93	5.92
Sub-total	240.82	39.79	280.61
Phase 2			
Right-of-Way Acquisition	85.44	–	85.44
Construction	50.35	25.34	75.69
Supervision	2.79	1.34	4.13
Sub-total	138.58	26.69	165.27
Sub-Total			
Detailed Engineering	3.39	1.64	5.03
Right-of-Way Acquisition	246.94	–	246.94
Construction	122.29	61.56	183.85
Supervision	6.78	3.28	10.06
TOTAL	379.40	66.48	445.88
STAGE 2			
Detailed Engineering	2.85	1.38	4.23
Construction	110.71	49.71	160.42
Supervision	5.72	2.75	8.47
TOTAL	119.28	53.84	173.12
GRAND TOTAL			
Detailed Engineering	6.24	3.02	9.26
Right-of-Way Acquisition	246.94	–	246.94
Construction	233.00	111.27	344.27
Supervision	12.50	6.03 18.53	18.53
TOTAL	498.68	120.32	619.00

11.5 IMPLEMENTATION SCHEDULE

Based on the previous discussion in this Chapter, the overall implementation schedule was developed as shown in Figure 11.5–1.

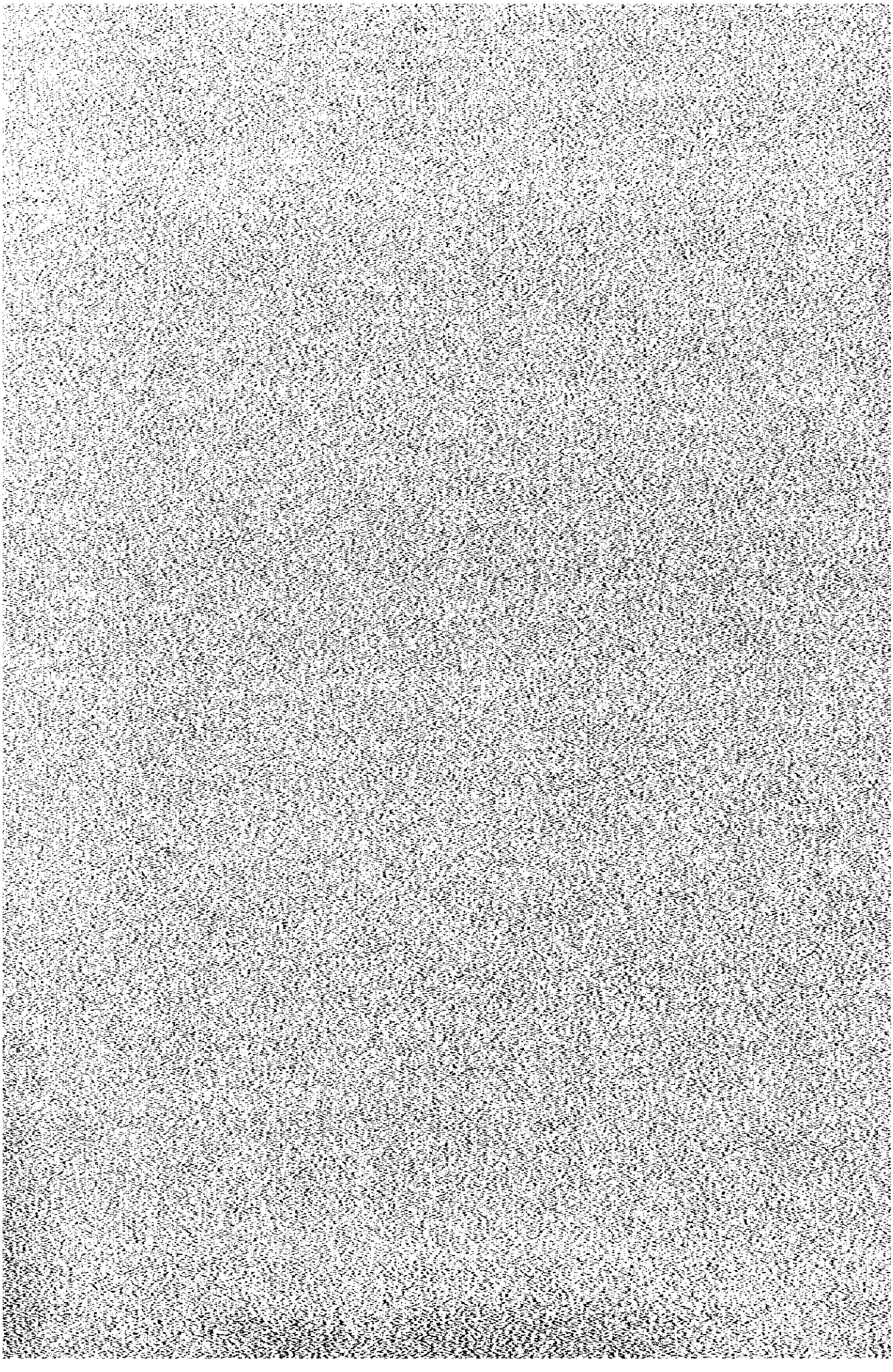
FIGURE 11.6-1 IMPLEMENTATION SCHEDULE



CHAPTER 12 RECOMMENDATIONS

TABLE OF CONTENTS

TABLES AND FIGURES



CHAPTER 12

RECOMMENDATIONS

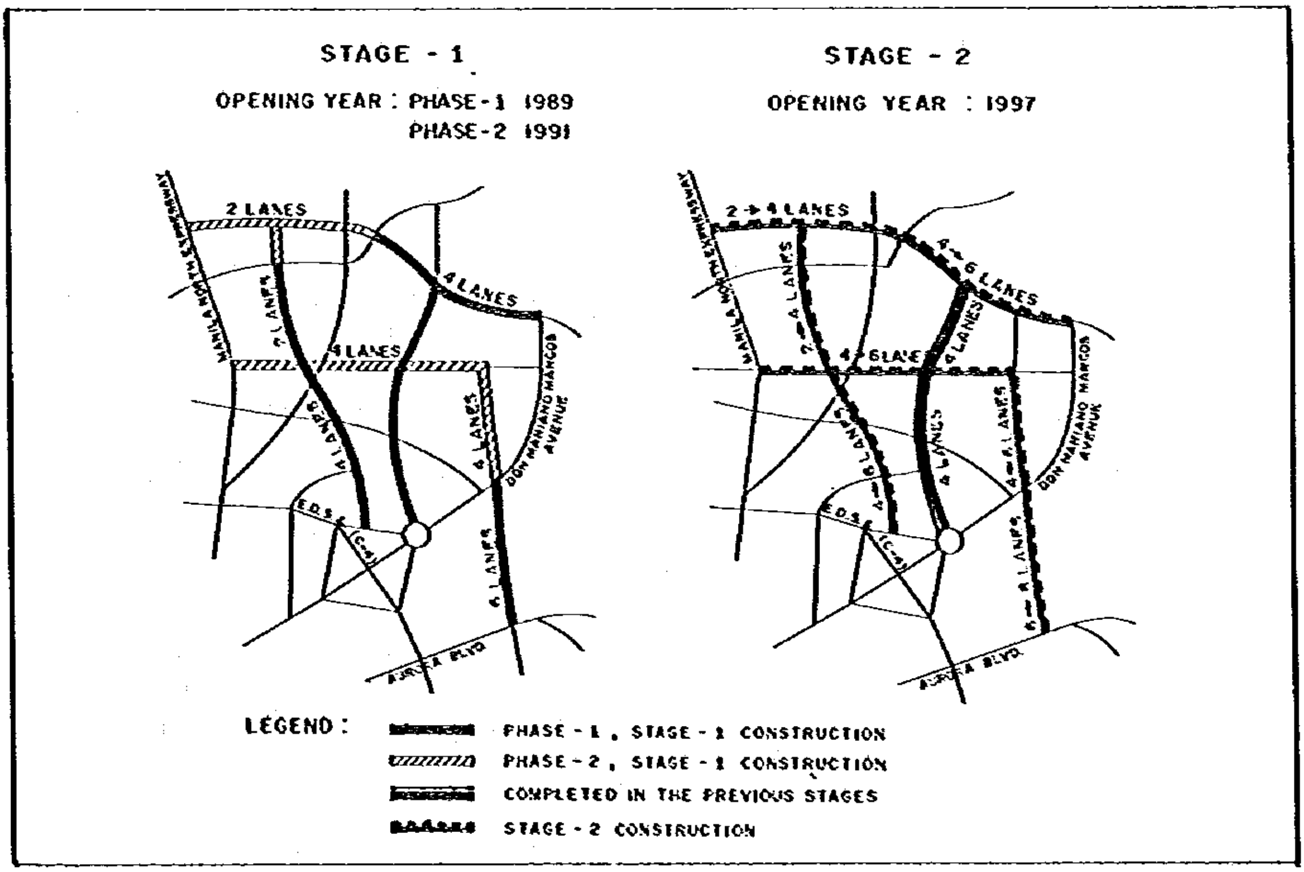
12.1 CONCLUSION

The result of the project evaluation shows that the alternative plans considered for the project roads are all economically feasible; provides a road network that would decongest existing heavily travelled roads; assists in the development of the DIZ into a sound and healthy urban area and indirectly contributes to the development of the regional as well as the national economy.

Originally, there were three (3) alternative plans considered for the project roads. The first is a conservative plan aiming at the least investment, the second is an extensive road development requiring the biggest amount of investment while the third is the intermediate plan of the first two. Due to the financial requirement of the project, the second was discarded and the remaining two were subdivided into two types, a circumferential type of road development and the other is a radial type. As the combinations of Plans 1 and 2 with different lane numbers and plans A and B with different priority emphasis either circumferential or radial roads were formulated. The four alternatives, namely, Alternatives 1(A), 1(B), 2(A) and 2(B), were evaluated economically, financially, traffic impact in the area, and its contribution to the regional and national economy.

Taking into consideration all the factors mentioned above, Alternative 1(B), when implemented would achieve the goals of the project roads equally well as the other plans with lesser burden on the NCR's annual road budget.

FIGURE 12.1-1 RECOMMENDED PLAN



12.2 RECOMMENDATIONS

12.2.1 Project Roads

a. The project which is in accordance with the road network plan of the NCR and supportive to the strategic development plan of the DIZ should be implemented as early as possible for the much needed acessibility and systematic development of the area.

b. The project be implemented under Alternative 1(B) which initially requires the minimum improvement level for the realization of the goals of the project. The table below summarizes the different stages and phases of the project.

TABLE 12.2–1 NECESSARY NUMBER OF LANES

ROAD SECTION	NO. OF LANES STAGE 1 PHASE 1	STAGE 1 PHASE 2	STAGE 2
C–5			
Republic Avenue	–	4	6
Luzon Avenue	–	4	6
Katipunan Avenue	6	–	8
C–6			
MNDR–Quirino Highway	–	2	4
Quirino Highway to Don Mariano Marcos Avenue	4	–	6
Mindanao Avenue			
North Avenue to C–5	4	–	6
C–5 to General Luis Road	2	–	4
General Luis Road to C–6	–	2	4
Visayas Avenue			
Elliptical Road to C–6	4	–	4

c. The design be in accordance with the proposed role and function of the project roads. The proposed role and function of the project roads are:

- C–5 will be a major road that will provide a balanced distribution of traffic and serves as a spine in the orderly urbanization of the area. The design of the different sections of this road should be compatible with the land use along its length.

-- Katipunan Avenue with several universities and colleges mixed with residential areas.

-- Luzon Avenue mostly with subdivisions. The proximity of the New Far Eastern University would attract other institutional uses along its length.

-- Republic Avenue will be an important road that leads to Batasan Pambansa. Aesthetics be a special consideration in the design of this section of C-5.

* C-6 function is the same with that of C-5. The whole length of C-6 project traverses large and small scale subdivisions but proliferation of industries is expected along its length.

* Mindanao and Visayas Avenues belong to a secondary major road providing direct link between the DIZ and the urban centers of Metro Manila. Typical land use along its length are residential houses.

d. The following investment funds be made available for the project implementation:

TABLE 12.2-2 INVESTMENT PROGRAM (Million pesos, 1982 prices)

	Stage 1		Stage 2	Foreign Currency	Local Currency	Taxes	Total
	Phase 1	Phase 2					
1984	9.43			5.66	2.54	1.23	9.43
1985	83.89			1.88	81.60	0.41	83.89
1986	126.80			44.12	71.23	11.45	126.80
1987	136.76			58.84	62.67	15.25	136.76
1988	78.35	59.51		44.12	82.59	11.45	126.80
1989		117.04		51.48	52.21	13.35	117.04
1990		91.36		51.46	26.56	13.34	91.36
1991							
1992							
1993			7.94	4.76	2.14	1.04	7.94
1994			2.63	1.58	0.71	0.34	2.63
1995			186.89	102.43	58.22	26.24	186.89
1996			186.86	102.43	58.21	26.22	186.86
TOTAL	435.23	268.21	384.32	468.76	498.68	120.32	1,087.76

e. The project should be implemented according to the following schedule:

Detailed Engineering for Stage 1	1984-1985
Acquisition of Road Right-of-Way	1985-1989
Construction of Phase 1	1986-1988
Construction of Phase 2	1989-1990
Detailed Engineering for Stage 2	1993-1994
Construction of Stage 2	1995-1996

f. In case there would be a big discrepancy between the projected and the actual highway funds of NCR, the phasing and staging of the project be adjusted accordingly. The adjustments be in line with the development trust of the government, i.e.,

- To decongest the existing major roads in the area, the Mindanao and Visayas Avenues extensions should be given priority;
- To provide a major access to the Batasan Pambansa from the west, the section of C–5 along the Republic Avenue from the MNE to Don Mariano Marcos Avenue whose ROW has long been acquired will serve this purpose and at the same time provide the development along the route.
- To provide the accessibility need of the expected industrialization on the fringes of NCR, the C–6 project should be considered.

The emphasis here, is that the projects could be implemented by subdividing the different phases into several segments for implementation if there would be some problems in the funding of the project, or Stage 1 could be implemented immediately if it could be accommodated in the NCR highway budget.

g. Since land acquisition can be a serious obstacle to road construction in urban areas, MPWH's close contact with and full coordination of relevant offices of Quezon City, Caloocan City, and Municipality of Valenzuela, as well as the Human Settlements Regulatory Commission, MHS and the Metro Manila Commission be maintained to enforce strict control over development activities on and along the proposed routes of the project roads.

h. Acquisition of the full road right-of-way be undertaken after completion of the detailed engineering.

i. Financing institutions be anticipated to fund the detailed engineering and if possible, the actual construction.

12.2.2 Related Roads

a. Existing Roads

(1) In view of the difficulty to further widen Quirino Highway, Tandang Sora Avenue, and General Luis Road due to heavy roadside development, their existing road spaces be utilized effectively to the fullest extent.

(2) In line with the projected traffic demand, the Don Mariano Marcos Avenue should be widened to 6-lanes in 1990 and to 8-lanes in year 2000 due mainly to the urbanization of the DIZ including the Batasan Pambansa and the Capitol Hills Urban Land Reform Zone Projects.

(3) MNE be upgraded to a 6-lane road before year 2000.

(4) Aurora Boulevard, which is one of the most congested roads even if with the project, will be difficult to widen due to heavy built-up commercial establishment along the road. The road network in the vicinity of Aurora Blvd. should be assessed to find how they may complement the capacity of the Boulevard.

(5) North Avenue, which joins with Mindanao Avenue, be upgraded in the future to its ultimate section within its 30.00 meter right-of-way.

b. New Roads

To maximize the effectiveness of the project roads as well as efficient use of resources, the construction of the following roads be seriously considered:

C–5:

Section from MNE to MacArthur Highway

Section from Aurora Boulevard to Rodriguez Avenue

C–6:

Section from the Don Mariano Marcos Avenue eastward

Section from MNE to MacArthur Highway

Republic Avenue:

Section from Luzon Avenue to Don Mariano Marcos Avenue

Congressional Avenue:

End of Congressional Avenue to Visayas Avenue

Luzon Avenue Extension:

Section from Republic Avenue to C-6

12.3 PROJECT IMPACTS

12.3.1 Traffic Impacts on Other Majro Roads

The serious traffic congestion predicted to occur on the existing roads in the years 1989 and 2000, without the project ("Without" Case), will substantially be improved by the implementation of this Project ("With" Case). In 1989, the opening year of Phase 1, Stage 1, the average level of service of the road network "With" and "Without" cases are 0.75 and 0.88, respectively. The total length of congested roads in the network without case with V/C ratio more than 1.0 is about 102.3 kilometers compared to only about 55.7 kilometers with the project. For year 2000, even with the implementation of other related roads, the average V/C without project would increase to 1.1, meaning most of the major roads in the DIZ will heavily be congested compared with the project of only 0.89, the road network could still accommodate the traffic demand in the area. Shown in the tabulation below is the traffic impact of the project.

TABLE 12.3–1 TRAFFIC VOLUME

(1,000 PCU/day)

MAJOR ROADS	1989				2000			
	Without	With	Decrease		Without	With	Decrease	
EDSA (C–4)	120.0	108.2	11.8	(10%)	165.3	125.2	40.1	(24%)
Tandang Sora Avenue	19.0	15.9	3.1	(16%)	28.9	13.7	15.2	(53%)
Gen. Luis Road	21.8	18.6	3.2	(15%)	26.3	11.2	15.1	(57%)
Qurino Highway	38.2	31.9	6.3	(16%)	68.3	38.5	29.8	(44%)
MNE	75.1	65.1	10.0	(13%)	119.7	84.4	35.3	(29%)
Don Mariano Marcos Avenue	129.2	88.8	40.4	(31%)	152.7	98.6	54.1	(35%)

12.3.2 Developmental Imapct

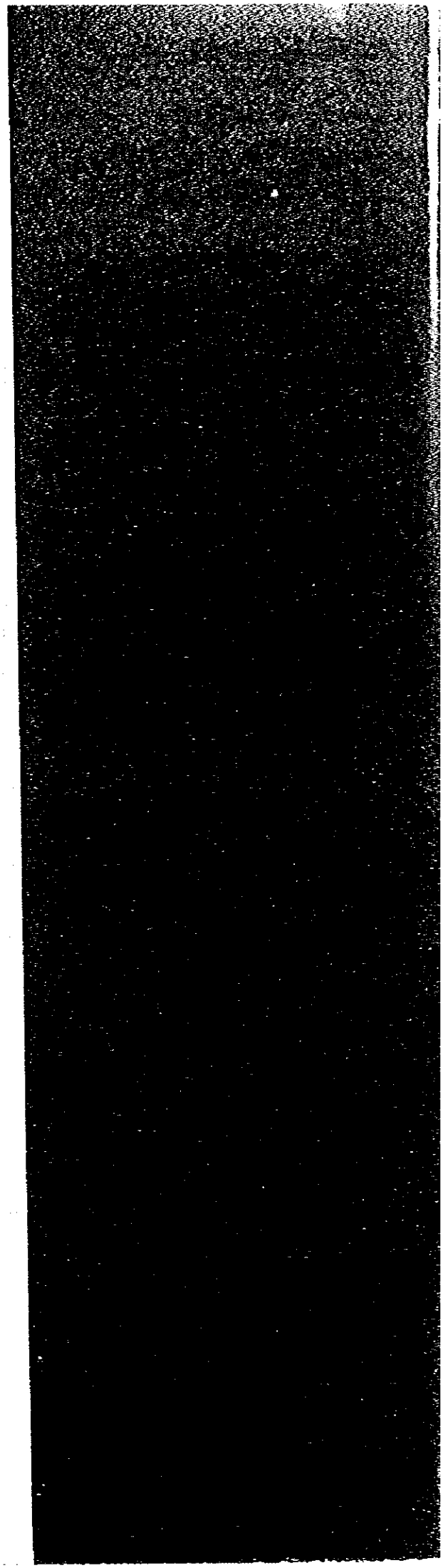
The DIZ is under the strong development pressure, however, development is rather stagnant in most areas of the DIZ except on the adjacent areas to the existing roads, due mainly to the problem of accessibility.

The Project Roads, when implemented, will provide direct and even access to most areas of the DIZ, thereby accelerating the urbanization of the DIZ in a sound and orderly manner.

12.3.3 Contribution to National and Regional Economy

The rate of return of the investment of the project roads was estimated at 46.3%. This return of the investment are from the benefits of the project that have either direct or indirect contribution to the regional and national economy. The direct impact is the savings in fuel consumption (gasoline and diesel) from the running cost of the vehicle operating costs. In the opening year alone of Phase I, Stage 1 in 1989, the quantified savings in fuel consumption is about ₱104.4 million, ₱146.2 million in 1991 and ₱198.5 million in 1997, all in 1982 market price.

In terms of monetary value of the savings in fuel consumption, about 60% of the value represent the foreign cost. This foreign cost savings could contribute to the international trade deficit of the country or dollar outflow of foreign currency. The amount of foreign cost savings in the opening year of Stage 1 would amount to about U.S. $10.3 million and expected to increase more than twice after completion of Stage 2 in 1997.



JICA