PART V

ENVIRONMENTAL IMPACT STUDY

PART V. ENVIRONMENTAL IMPACT STUDY

Close assessment of the environmental impact of RTR Line No.1 project, and consequently preparations of mitigation against evil facets foreseen should preferably be made. The environmental impact the RTR Line 1 project will possibly create will be broad and deep, involving ecology, socio-economy, land use and other sectors.

In Chapter 1, an impact study is made over the general environment, and in Chapter 2, impact on the land uses is discussed in detail as RTR Line 1 will carry the most significant weight on the land uses. So that the Project can be accepted from the environmental viewpoint, the Philippine Government should take pertinent measures before its implementation. Matters concerning the land uses are also taken up in detail in Chapter 2.

CHAPTER 1 ENVIRONMENTAL PROBLEMS

1.1 ORIGINAL PLAN AND ALTERNATIVE PLANS

A preliminary engineering design of the planned route and the status quo of physical environment have been discussed in detail in Part IV. Alternative structures and route planning and inherent problems have also been discussed in Part IV.

An alternative plan in which the improvement of transportation system is to be limited to partial reconstruction and development of the existing public transport system will undoubtedly run counter to the needs of MMA's population for more improved, advanced transport, reduction of travel time, and safe and reliable travel. Another alternative plan which intends to introduce a light transit system is expatiated in the appendices. But it will be inadequate to serve 7.50 million of population for the year 2000 and 5.70 million for the year 1987.

The cost of the Project amounting to as much as US$547 million may happen to be appropriated for the improvement of infrastructure planned for the various sectors and places in the Philippines.

But it might possibly invite traffic paralysis in the entire MMA and degradation of city life efficiency, and this kind of external diseconomy would in the worst case surpass the investment cost, passing a heavy burden on to the national economy.

1.2 IMPACT OF PROJECT IMPLEMENTATION

Some impact of the Project will tak shape even during its implementation. Some other will reveal itself when the Project is in operation.

Probable items of impact are as follows.

A. During construction work
   1. Physico-chemical natural environment (soil, water, air, etc.)
   2. Biological environment (plant, animal, etc.)
   3. Human sphere (living environment, sphere of production and consumption, etc.)
   4. Socio-economic sphere (community, urbanization, commercialization, etc.)
   5. Communication and transportation

B. After putting into operation

1. Field of human activities
2. Socio-economic sphere
3. Communication and transportation

The major influence of the Project on the environment is given below, along with measures against evils.

(1) There will be no particular impact on the ecosystem - plant and animal.

(2) During the project implementation, the construction of underground structures will lower the ground water level and disrupt the ground water systems.

Measures

Tokyo has already experienced similar problems resulting from the construction of underground structures.

In order not to lower the ground water level, preliminary investigations should be carried out thoroughly to prepare proper construction methods.

(3) There is a fear of damaging the monument in Welcome Rotonda during construction.

Measures

The structures falling on the planned route should be carefully protected.

(4) There is a fear of damaging the underground structures such as utility supply lines and resultant paralysis in supply of water and electricity.

Measures

Before setting about the construction work, underground structures should be located closely, and construction work should be conducted with utmost attention in order not to damage power line and water supply line.

(5) Traffic congestion and other living inconveniences will be caused by road excavation over a long period of construction.

Measures

It is not possible to make up for traffic congestion and living inconveniences completely. But such inconveniences may be moderated by proper arrangements of construction schedule, including provision of detours.

(6) Irritating noises, exhaust gas, dust and other environmental pollution concomitant with the construction work will possibly invade the life and the existing structures.

Measures

These cannot be compensated for perfectly, but may be abated if the construction is conducted under proper management in a proper way.

(7) During construction work, workers and their families will squat and develop a slum, thus possibly disorder the vested communities.

Measures

The contractors to whom the work is teamed should prepare for their employes all the necessary accommodations, withdraw such temporary facilities after work, and also should take care to prevent conflict between the workers and inhabitants.

(8) Inflow of workers will overshadow the existing public service facilities and degrade public health and hygiene.

Measures

The contractors are expected to benefit enough from their construction assignments, and should spare due part for making up the necessary facilities.

(9) The construction work necessitates a great deal of materials and supplies, and at the same time will incur waste disposal problems and markup of commodity prices.

Measures

Construction waste should be disposed of to prevent traffic congestion, and the productivity and marketing functions should be harmoniously incorporated into the construction program in order to peg the market.

(10) If the entire line is buried underground, there will be no problem. But, if the line has an elevated structure, locally as it may be, the amenity will be degraded by the shade, electric wave interference, noise and vibration.

Measures

The interference with sunshine and electric waves cannot completely be compensated for, but noise and vibration may be reduced to a minimum if a proper design is used. In fact, the modern technology asserts itself to be practically sufficient to prevent adverse effects on the environments.

1.3 FAVOURABLE EFFECTS

Physical

(1) The planned line will strengthen the capacity of transportation between Quezon and Taft, making it possible to handle a massive volume of passengers.

(2) The planned line will greatly promote urbanization along the corridor.

Cultural

(3) The planned line will decentralize city functions and push forward the construction of institutional facilities in the peripherals.

(4) The planned line will provide the inhabitants along it with a means of access to social and cultural activities.

Environmental

(5) The inhabitants along the planned line will benefit from increased accessibility and conveniences rendered and will expand their sphere of activities.

(6) The inhabitants along the planned line will be relieved of noises, vibration and exhaust gas from automobiles as the traffic volume on the Quezon Boulevard and the Taft Avenue will decline.

Even if the planned line is of the elevated type, it will be less noisy and vibrating than the automobiles.

(7) Capability of conveying large traffic volume within a scheduled time by the planned line will bring about immeasurably large amounts of benefits due to saving in transit time.

Economies

(8) Not only the areas spreading along the planned line, but the MMA as a whole will

be relieved of traffic congestion. Not only railway users, but also the car drivers will save running time and cost and will be relieved of various other external diseconomies.

(9) This large project will go a long way toward industrial development in various sectors. Through its construction, the local industries will develop techniques and skills and promote specialization, and will bring about impact on various sectors.

(10) The prices of land along the planned line will rise.

(11) By the implementation of the project, many will enjoy employment opportunities through the construction period.

CHAPTER 2 CORRIDOR IMPACT STUDY FOR LAND USE

2.1 GENERAL CONCEPTION

In general, a close relationship exists between the urban transport system and land use. Of various urban transport facilities, rapid transit railway attracts commercial and business activities around its stations. MMA will be no exception and when RTR Line No.1 is constructed, changes in land use and urban activities will develop around the stations on its route. This is because Line No.1 will bring about high frequency of services with high reliability of time schedule, high accessibility to each district covered by the line and thus bring about all the ingredients necessary for commercial and business activities. These have already been corroborated by the investigations and studies made so far.

Purposes and objectives of this study are to forecast the changes in land use occuring after construction of RTR Line No.1, to analyse the detail resultant problems, and to present guidelines for better land use.

In addition, U.P. is taken up for a case study of new development, while F.E.U. and Tutuban are selected for redevelopment study, and the city planning of these districts is envisaged.

At the end of this Chapter, a method of plowing back to the public the profits from the integrated development of land and RTR is suggested.

2.2 PRESENT AND FUTURE LAND USES ALONG RTR LINE NO. 1

2.2.1 Areas Receiving Impact from the Construction of RTR Line No. 1

RTR Line No.1 is assumed to have an influence over an influence area of some 1 km along both sides of the line. The reasons are as follows.

(1) The people within the area 500 m or shorter away from each station can easily get to the station on foot. This means that the stations on the line will largely influence the mobility of the population and the land use.

(2) Within a doughnut area 500 m to 1 km apart from the station, the demographic pattern and land uses will also be influenced to a comparatively high degree in keeping with the amplification of feeder network transport system.

(3) Even in the areas 1 km or more apart from the station, the movement of people and land uses will change depending on the adjustment of the feeder transport system, but the degree of the influence of the station will be less compared with the areas (1) and (2) above.

For these reasons, the areas (1) and (2) are taken as an influence area of the station.

Table. 5.2.1 Existing Conditions of Land Uses for the Influence Area on RTR Line No. 1

Name of Station	Classified Station	Land Uses (ha)					Population Density (Persons/ha)		Population (Persons)	Daytime Workers		Daytime Students		Workers by Industries (%)		
		Total	Residential	Commercial	Institutional	Others	Population/ Total Area	Population/ Residential Area		Number of Workers	Density (workers/ ha)	Number of Students	Density (Students /ha)	Primary	Secondary	Tertiary
1. M.D.A. 2. M.I.A.	A															
3. BACLARAN 4. NORTH BACLARAN	B	1,232 100%	639 52%	74 6%	59 5%	460 37%	147	284	181,331	58,991	48	*50,540	*117	0	17	83
5. LIBERTAD 6. BUENDIA	C															
7. VITOCRUZ 8. SAN ANDRES	C	307 100	171 56	100 32	36 12	0 0	267	480	81,996	28,340	92	38,070	124	0	0	.100
9. GENERAL HOSPITAL 10. PIZAL PARK 11. ADUANA	D	494 100	154 31	129 26	117 24	94 19	36	117	17,952	103,393	209	65,080	132	1	20	79
12. DIVISORIA	E	394 100	218 56	72 18	20 5	84 21	537	971	211,711	66,247	168	24,430	62	3	12	85
13. TUTUBAN	F	300 100	103 34	150 50	47 16	0 0	411	1,196	123,170	100,162	334	94,800	316	1	0	99
14. F.E.U. 15. U.S.T.	G	338 100	136 40	101 30	77 23	24 7	310	771	104,902	109,503	324	176,500	522	0	6	94
16. ANTIPOLO 17. WELCOME ROTONDA	H	697 100	538 77	91 13	38 6	30 4	480	622	334,775	59,598	86	76,670	110	0	0	100
18. SANTO DOMINGO	I	438 100	326 75	50 11	30 7	32 7	88	119	38,705	25,006	57	13,580	31	0	0	100
19. ROOSEVELT 20. DELTA 21. QUEZON	J	1,430 100	1,173 82	84 6	63 4	110 8	141	171	200,992	66,062	46	55,770	39	1	6	93
22. CAPITAL CENTER 23. U.P.	K	1,490 100	645 43	13 1	266 18	566 38	42	97	62,600	32,249	22	22,350	15	1	0	99
TOTAL		7,120 100	4,103 58	864 12	753 10	1,400 20	191	331	1,358,125	649,551	436	617,790	98	1	7	92

2.2.2 Existing Land Uses

Table 5.2.1 lists the regional activities such as land uses and population in the influence area, and may be summarized as follows.

(1) The influence area of RTR Line No.1 has a population of 1,243 thousand or a population density of 197 persons/ha for the total area. The population density per residential area is a comparatively high 330 persons/ha. The daytime employed population is 638 thousand and the daytime employed population density is 101 persons/ha of total area, and is as high as 751 persons/ha in the commercial areas.

(2) The residential area accounts for 60%of total area, the commercial area for 14% and the institutional area for 11%.

(3) Around the stations of Tutuban, Divisoria and F.E.U., the population density is well over an almost bursting point of 1,000 persons/ha of residential area. Following these are Baclaran and U.S.T. where the population density is above 500 persons/ha of residential area.

Beside, Tutuban and F.E.U. are fostering commercial and business areas. The entire belt from Baclaran Station all the way to Welcome Rotonda Station is densely built-up.

2.2.3 Classification of Station Front and Features of Land Uses

From the 1971 study on the status quo analysis of land use, population density, daytime employed population density and transport network, the station fronts may be generally classified as follows.

Pattern A

Stations: The future Manila Domestic Airport (MDA) and Manila International Airport(MIA)

Features: These stations serve passengers, visitors and also workers at MIA and MDA.

Pattern B

Stations: Baclaran, North Baclaran

Features: These are significant as connecting points with major roads. Baclaran provides a connection of transport to the southern part of MMA, while North Baclaran has a knot with Highway No.54. Baclaran has a regional shopping center and also the famous Baclaran Church.

Pattern C

Stations: Libertad, Buendia, Vito Cruz, San Andres

Features: These are stations primarily undertaking regional services. Both resident population density and daytime employed population density are comparatively high, suggesting that these are a mixed area of commerce and residence. The commercial and business quarters are for the most part developing along Taft Avenue.

Pattern D

Stations: General Hospital, Rizal Park, Aduana

Features: These are located to serve well-developed civic centers. In front of Rizal Park Station are Manila City Hall, Rizal Park, etc. to form well-developed city quarters. In Aduana, where Manila International Marine Port is present, maritime activities are proliferating.

Pattern E

Station : Divisoria

Features: Quite unlike the three stations in pattern D. This station is a terminal station of buses and jeepneys serving the northern and eastern parts of MMA, and serves as the hub of wholesale and retailing businesses in MMA. With Tondo as a hinterland, this area is thriving as a mixed community of residence and commerce. For example, the resident population density is 971 persons/ha of residential area, and the daytime employed population density is 920 persons/ha of commercial and business area.

Pattern F

Station : Tutuban

Features: This station is tied directly to Tutuban Station of PNR. Its station front is similar to that for Divisoria. However, the area is highly in the nature of business function. Along with F.E.U. Station, Tutuban holds an important place in Downtown Manila. The population density is extremely high.

Pattern G

Stations: F.E.U., U.S.T.

Features: Both stations form educational quarters with universities accommodating a great number of students. F.E.U. and U.S.T. are both with high population density, and the student density is particularly conspicuous.

Pattern H

Stations: Antipolo, Welcome Rotonda

Features: Antipolo is a station located at the intersection with PNR, while Welcome Rotonda is a station situated at an important junction of Quezon Blvd. extension. The areas thriving with these stations at centers are also known for their high population density. The population density is 622 persons/ha of residential area. The residential quarters account for 77% of these areas, and the daytime employed population is not so high.

Pattern I

Station : Santo Domingo

Features: This station is located at the junction of the inner circumferential road (C-3) and a radial road. 75% of the area is occupied by residential quarters, and the population density is a moderate value of 119 persons/ha of residential area.

Pattern J

Stations: Roosevelt, Delta, Quezon

Features: The residential area accounts for 82% of the total area, the highest value among the places along RTR Line No.1. Near Quezon Station, the circumferential road C-4 and a radial road are intersecting each other, providing potential for urbanization.

The population density is as low as 171 persons/ha of residential area.

For all these stations which lie within the circumferential road, city functions are not so developed since the daytime employed population is as small as 46 persons/ha.

Pattern K

Stations: Capital Center, U.P.

Features: The land use around these station is noticeably a green belt surrounding such important civic facilities as university and government departments.

The population density is very low with 97 persons/ha of residential area.

2.2.4 Prospective Land Uses

The future land use plan for the entire MMA has been discussed in detail in Chapter 2 of Part II.

Now let us see the future of the influence areas of Line No.1 according to that plan.

(1) According to Fig. 2.2.6 in Chapter 2 of Part II, the accessibility index as of 1971 is in inverse proportion to the distance from CBD, while that for the year 1987 is markedly high in the zones along the RTR Line No. 1.

As a result, there are seen changes in land use as shown in Tables 5.2.2 and 5.2.3. The main features are described as follows.

(2) Although the total population along the Line No.1 will remain almost unchanged, a large change will occur in the zonal distribution of population. Namely, the population in the densely populated CBD will decline gradually, moving toward the suburbs along the Line No.1 where the accessibility index is high.

(3) In 1987, there will be residential zones showing a persistently high density of population.

It is desirable to reduce this high level of population density from the viewpoint of amenity, but it will necessitate vast investment.

For this reason, the study team set a density for the influence area which is considered feasible if the city planning is made properly.

(4) The daytime employed population along the Line No.1 increases in proportion to the accessibility index. This tendency holds true to CBD Area and any other places including suburbs.

This tells of the fact that the construction of RTR Line No.1 has a great impact on the redistribution of the daytime employed population.

Table. 5.2.2 Land Uses for the Influence Area on RTR Line No. 1 in 1987

Name of Station	Classified Station	Land Uses (ha)					Population Density (Persons/ha)		Population (Persons)	Daytime Workers		Daytime Students		Workers by Industries (%)		
		Total	Residential	Commercial	Institutional	Others	Population/ Total Area	Population/ Residential Area		Number of Workers	Density (workers/ ha)	Number of Students	Density (Students /ha)	Primary	Secondary	Tertiary
1. M.D.A. 2. M.I.A.	A	1,232	651	99	51	431	129	244	158,600	51,940	42	42,500	34	0	1	99
3. BACLARAN 4. NORTH BACLARAN	B	100%	53%	8%	4%	35%										
5. LIBERTAD 6. BUENDIA	C															
7. VITOCRUZ 8. SAN ANDRES	C	307 100	148 48	100 33	33 11	26 8	241	500	74,000	81,980	267	15,840	52	0	0	100
9. GENERAL HOSPITAL 10. RIZAL PARK 11. ADUANA	D	494 100	60 12	138 28	120 24	176 36	36	300	18,000	122,210	247	4,920	10	0	7	93
12. DIVISORIA	E	394 100	222 56	73 19	20 5	79 20	317	563	125,000	73,470	186	22,560	57	0	13	87
13. TUTUBAN	F	300 100	101 3	150 50	47 16	2 1	210	624	63,000	123,420	411	17,280	58	0	0	100
14. F.E.U. 15. U.S.T.	G	338 100	113 33	101 30	93 28	31 9	222	664	75,000	218,970	648	171,050	506	0	3	97
16. ANTIPOLO 17. WELCOME ROTONDA	H	697 100	550 79	91 13	38 5	18 3	423	537	295,100	129,380	186	123,180	177	0	0	100
18. SANTO DOMINGO	I	438 100	352 80	50 12	30 7	6 1	321	400	140,800	47,150	108	30,940	71	0	0	100
19. ROOSEVELT 20. DELTA 21. QUEZON	J	1,430 100	1,152 80	158 11	83 6	37 3	184	228	262,600	81,190	57	72,500	51	0	7	93
22. CAPITAL CENTER 23. U.P.	K	1,490 100	740 50	175 12	530 35	45 3	94	189	139,600	71,000	48	65,540	44	0	0	100
TOTAL		7,120 100	4,089 57	1,135 16	1,045 15	851 12	190	331	1,351,800	1000,710	141	566,310	80	0	3	97

(5) As regards the land use pattern, CBD will have less residential quarters while the areas for commercial and institutional quarters will increase. In the suburbs, the residential quarters, commercial and institutional quarters alike will expand.

2.2.5 Passengers' Impact on Land Use

Under item (1), we have seen the land uses from the entire MMA's point of view. Large influences which might possibly change the land uses in the service area are stations on RTR Line No.1. So far, the land use has been aerial of linear development as represented by transportation corridor since the transportation system is mostly supported by cars, buses and jeepneys. Once RTR Line No.1 is constructed, however, its stations will gather a massive volume of passengers, forcing the existing feeder systems to be reorganized around stations. As a consequence, the flow of persons will change drastically upon the operation of RTR Line No.1. This in turn will build up commercial quarters in the station plazas where people will gather. Along with this, institutional facilities will emerge concurrently.

Here, the floor spaces of these commercial and business facilities to be sited in the front of stations are projected.

The projection follows the steps explained below.

(1) From the rate at which the passenger of RTR Line No.1 makes his appearance in a specific facility (appearance rate, which is an empirical value generally accpeted in Japan in the redevelopment plan of station plazas), the number of persons generated in commercial facilities (Pc) and the number of persons generated in business facilities (P_B) are calculated.

(2) From the calculated number of persons generated in each facility, the floor space required for that particular facility is calculated in the following way.

$$Sc = Pc \times r/m \qquad S_B = P_B \times r/n$$

where, Sc: aggregate floor space of commercial facility

S_B: aggregate floor space of business facility

Pc: number of persons generated in commercial facility

P_B: number of persons generated in business facility

r : appearance rate (1.5)

m : number of persons generated per unity area in commercial facility (an average value of 1.0 person/m^2 derived from department store in Japan is applied)

n: number of persons generated per unity area in business facility (an average value of 0.275 person/m^2 for tenantry building and government office in Japan is taken)

The results of projection are shown in Fig. 5.2.1 and 5.2.2.

Table 5.2.3 Land Uses for the Influence Area on RTR Line No. 1 in 2000

Name of Station	Classified Station	Land Uses (ha)					Population Density (Persons/ha)		Population (Persons)	Daytime Workers		Daytime Students		Workers by Industries (%)		
		Total	Residential	Commercial	Institutional	Others	Population/ Total Area	Population/ Residential Area		Number of Workers	Density (workers/ ha)	Number of Students	Density (Students /ha)	Primary	Secondary	Tertiary
1. M.D.A. 2. M.I.A.	A															
3. BACLARAN 4. NORTH BACLARAN	B	1,232 100%	782 64%	91 7%	64 5%	295 24%	140	221	172,700	62,840	51	49,070	40	0	1	99
5. LIBERTAD 6. BUENDIA	C															
7. VITOCRUZ 8. SAN ANDRES	C	307 100	106 34	100 33	36 12	65 21	190	550	58,300	94,550	308	16,400	53	0	0	100
9. GENERAL HOSPITAL 10. RIZAL PARK 11. ADUANA	D	494 100	37 8	143 29	120 24	194 39	41	550	20,350	157,430	319	5,720	12	0	6	94
12. DIVISORIA	E	394 100	195 50	76 19	20 5	103 26	160	324	63,200	91,620	233	25,120	64	0	12	88
13. TUTUBAN	F	300 100	94 31	150 50	47 16	9 3	172	550	51,700	149,940	500	14,540	48	0	0	100
14. F.E.U. 15. U.S.T.	G	338 100	86 25	101 30	93 28	58 17	140	550	47,300	268,380	794	214,710	635	0	1	99
16. ANTIPOLO 17. WELCOME ROTONDA	H	697 100	563 81	91 13	38 5	5 1	430	532	299,650	155,020	222	147,950	212	0	0	100
18. SANTO DOMINGO	I	438 100	358 82	50 11	30 7	0 0	368	450	161,100	55,030	126	43,110	98	0	0	100
19. ROOSEVELT 20. DELTA 21. QUEZON	J	1,430 100	1,156 81	126 9	74 5	74 5	242	299	345,600	100,070	70	93,820	66	0	4	96
22. CAPITAL CENTER 23. U.P.	K	1,490 100	716 48	105 7	416 28	253 17	99	207	148,000	91,950	62	86,260	58	0	0	100
TOTAL		7,120 100	4,093 57	1,033 15	938 13	1,056 15	192	334	1,367,900	1226,830	172	696,700	98	0	2	98

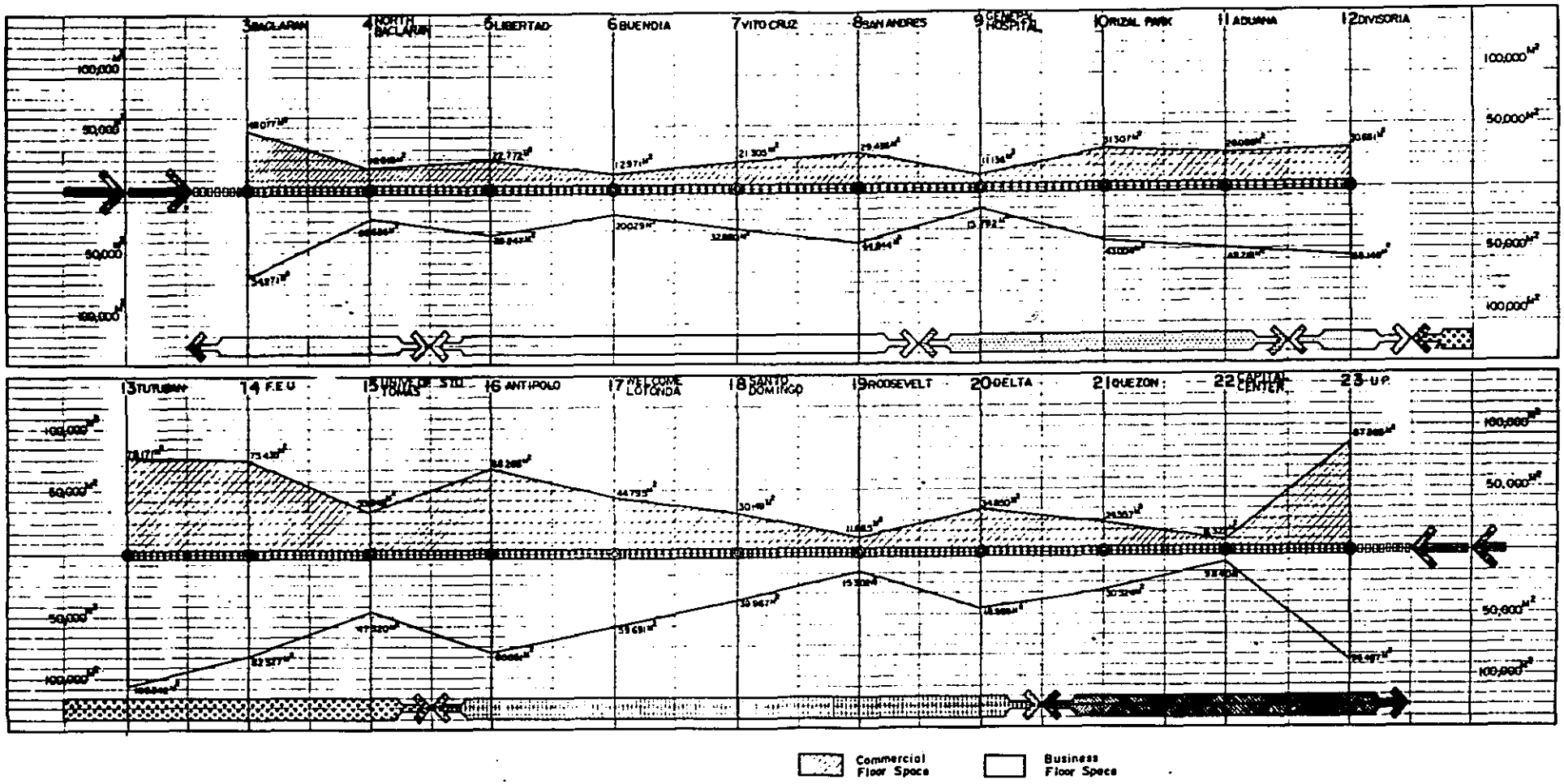


Fig. 5.2.1 Commercial and Business Floor Space within Station Squares in the Year 1987

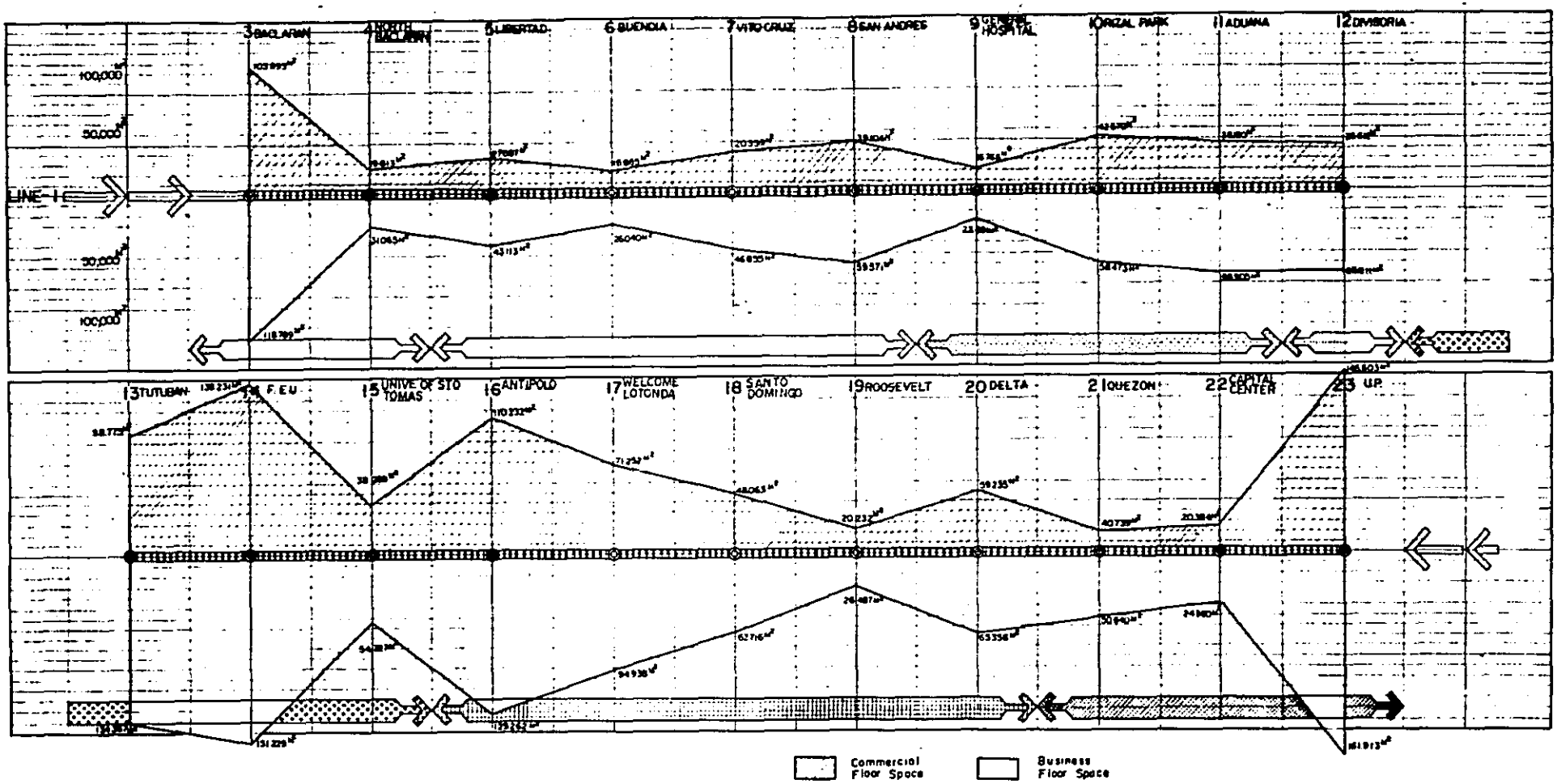


Fig. 5.2.2 Commercial and Business Floor Space within Station Squares in the Year 2000

2.3 DESIGN OF STATION PLAZA

Some stations on the planned line will develop intermodal traffic flowing between RTR system and feeder system. Naturally, it is required to prepare facilities for efficient intermodal transfer. These facilities are called the station plazas.

Since the planned line is an urban rapid transit railway, all stations will not require station plaza. If the feeder mode is "on foot", it is only necessary to amplify the pedestrian ways. So long as the urban rapid transit railway is concerned, many stations come under this type. On the other hand, some specific stations intersecting major roads may have to undertake intermodal transfer (channeling passengers from the railway to bus, jeepney and car and vice versa.). The intermodal traffic has been projected in Part III. The stations requiring plazas are as follows.

A. Baclaran
B. North Baclaran
C. Libertad
D. Welcome Rotonda
E. Santo Domingo
F. Quezon
G. U.P.

In addition, there are stations which have to be designed as an inter-railway transfer station. These are:

A. Tutuban
B. Antipolo

These stations will necessitate plazas covering both RTR and PNR users but detailed description are abbreviated here.

For the calculation of the plaza area, the following formula, which has been generally accepted in Japan, is applied.

$$A = 0.00189 \times 18.3/\overline{X}$$

where, A: area of station plaza, m^2
X: average number of RTR passengers (passengers/day)

The calculated areas are tabulated below.

Name of Station	Area
A. Baclaran	12,500 m^2
B. North Baclaran	4,250 m^2
C. Libertad	5,100 m^2
D. Welcome Rotonda	8,050 m^2
E. Santo Domingo	6,000 m^2
F. Quezon	5,350 m^2
G. U.P.	11,500 m^2

Of these, the station plaza for Baclaran Station is explained below.

(1) As forecast in Part II, the passengers for the year 2000 will amount to as large as 200 thousand a day. At peak hours, the station will have to handle 18.8 thousand an hour of boarding passengers and 3.1 thousand an hour of unboarding passengers.

Of these, 47% will be pedestrian and 53% by vehicle transport. The vehicle transport users will be equally divided between bus and jeepney, each accounting for some 45%. The remaining 10% will be car owners of "Kiss and Ride" or "Park and Ride" mode. Namely, the passengers will be broken down as follows.

	Boarding passengers	Unboarding passengers
On foot	72.2 thousand/day	17.7 thousand/day
By bus	38.2 "	9.0 "
By jeepney	38.2 "	9.0 "
By car	8.5 "	2.0 "

(2) For the above, the car stopping demand is estimated as follows.

Bus	25 vehicles/peak hour	
Jeepney	80 "	
Car	70 "	(for kiss and ride)

In addition, around 50 cars for "park and ride" will have to be provided with parking space.

The values above are designed to be 80% of the station plaza demand expected in 2000.

(3) The parking and stopping facilities required will be as follows.

Bus	3,250 m^2
Jeepney	2,640 m^2
Car	2,100 m^2 (for kiss and ride)
Car	1,500 m^2 (for park and ride)
Subtotal	9,490 m^2
Pedestrian facilities	3,000 - 4,000 m^2
Total:	12,500 - 13,500 m^2

2.4 GUIDELINES FOR STATION FRONT DEVELOPMENT

2.4.1 Guideline for Development

We have discussed in the foregoing the conceivable impact of RTR Line No.1 on the land uses within influence areas, a rough design of station plaza to be required as an intermodal transfer facility, and the present and future of the land uses.

Presented here are guidelines for the development of the influence areas and station fronts which are mapped out according to the data acquired in the foregoing discussions. The guidelines prepared are classified into the following four patterns.

(1) Places which have little or no problems at present in view of city development

plan and which have good amenities should be preserved. (Conserved area)

(2) Places whose land use at present is extremely entangled and where commercial and other activities will continue to grow in the future should be redeveloped for consolidation of urban infrastructure. (Redevelopment area)

(3) Places where there is little vested interest in view of land use and which have high potentials of new development should be newly developed. (New development area)

(4) Places which have little or no problems in view of city development plan, but in future will change drastically in the pattern of land uses, should be developed in a manner to maintain good amentities. (Partial development area)

With these four patterns as a basis, the policies to take for the development and adjustment of the front of each station are given below.

Policy for Station Front Area Development

Station	Development Policy	Description
Future MDA, MIA	Partial development	To be developed under airport development plan
Baclaran & North Baclaran	Redevelopment	This is, and will remain as a commercial area of regional nature, but demand for business facilities is forecast to grow under the influence of Manila-Cavite Reclamation Project. In addition to the above, it will be required to develop a station plaza as a nodal point of traffic, and construct a bus and jeepney terminal. It is, therefore, necessary to carry out redevelopment of the area.
Libertad, Buendia, Vito Cruz, San Andres	Partial Development	As viewed from the point of residential population, this area will remain unchanged for the coming years, but the daytime employed population is expected to grow. For this reason, it is required to carry out a partial development centering around business facilities. A small scale station plaza may be required at Libertad.
General Hospital, Rizal Park, Aduana	Conservation	This area is the administrative center of Manila. The National Government, the Local Government of Manila and Rizal Park are located here, and the current urban environment should be conserved for the future. However, Intromuros in Aduana station area has to be developed partially.
Divisoria	Redevelopment	This area includes extensive commercial facilities and a high density residental area in Tondo. This ultra-high density residental and commercial area is to be redeveloped from the viewpoint of land utilization. This will include the provision of bus and jeepney terminal as well as the rehabilitation of the whole area.
Tutuban, F.E.U.	Redevelopment	See section 2.5.3.

Station	Development Policy	Description
U.S.T.	Partial Development	This is an area djacent to the central business district located with large scale school facilities surrounded by high density residental area. This high density residental area should be partially developed so as to provide a comfortable living environment.
Antipolo, Welcome Rotonda	Partial Development	This area is also a high density residental area which needs partial development to provide a comfortable living environment. At Antipolo, a station plaza and connecting facilities are required as it is a junction with PNR. At Welcome Rotonda which is a nodal point of buses and jeepneys for Cubao, the development of a station plaza is required.
Santo Domingo	Partial Development	As the intersection with the circumferential Road C-3 lies in this area, both the residential population and the daytime employed population are expected to grow as the accessibility increases. This area should therefore be partially developed to construct planned urban facilities to meet the growing demand while maintaining a comfortable living environment.
Roosevelt, Delta, Quezon	Partial Development	Both the residental population and the daytime employed population are expected to grow also in this area as it provides a growing accessibility. A partial development is, therefore, required in this area for the planned construction of residental and commercial facilities. In Quezon, a station plaza for the connection with the circumferential Road C-4 is required.
Capital Center	New Development	As this area is covered by the Government Center Project, the development of peripheral area should be carried out with sufficient environmental arrangement.
U.P.	New Development	See section 2.5.2.

2.4.2 Suggestions for Materialization of Development Policies

Some techniques are indispensable for the promotion of the development according to the guidelines described in the foregoing paragraph. Although providing definite methods for such purposes is out of the scope of the present survey, it may make sense to show some of city planning techniques in Japan by way of reference.

The following are some of techniques practiced in Japan.

1. Method of Controlling Land Use

   1) Approval system for land development

      In principle, the development (changes of lots in size, geography and ecology, etc.) within the places under the city development plan must be subject to the approval by the administrative authorities. This is important for the purpose of protecting such places from reckless development and potential hazards.

2) Restriction of building work and other civil engineering work by zoing system

Restrictions include use of building, use limitations, physical limitations (maximum lot coverage, floor area rating, etc.), structural conditions (fire-proof construction, etc.), prohibition of building (historic, cultural and scenic places) and the like.

In addition, urbanization promotion area and urbanization control area must be designated in order to control building construction.

In this way, the land use plan provided by the administrative authorities must be backed up by legal measures for the purpose of encouraging orderly development of the city.

2. Urban Development Method

1) Land readjustment

The purpose of land readjustment is to exchange and divide land lots for streamlined urbanization, and this is one of the most important basic techniques in materializing the urban development plan. In order to push forward the land readjustment, some legislative measures will be required. (Land Readjustment Law)

The features of this technique are as follows:

* In case public facilities are to be newly constructed or improved, the premises can be acquired by exchange and division of land lots, and unlike the land expropriation, the land owner in due course is not relieved or deprived of his interest.

* Integrated areal developments of both existing and new urban districts is possible.

The participants include individuals (individually or in partnership), cooperatives, local public entities, administrative agencies and public corporations.

The undertakings range over a wide range, the principal undertakings being: 1. rehabilitation from disruptions and damage, 2. reconstruction of city, 3. development of residential quarters, 4. adjustment of peripheral sites of industrial district, and 5. development in relation to other public undertakings.

2) City redevelopment

The city redevelopment includes redevelopment, rehabilitation and conservation. The city redevelopment under a city redevelopment law promotes intensified and healthy use of land lots assigned for urbanization and also encourages the updating and upgrading of city functions. As a technique for the assistance of city redevelopment, there is a method in which the titles, interests, rights and privileges concerning land lots are adjusted by exchange for consolidation and adjustment of land lots, buildings and facilities, whether private or public.

For example, the existing buildings in an intended district are sterilized, and the resultant open space is adjusted for specific purposes to build up public facilities and multistory buildings while the prior land owners, etc. are titled to own adjusted land lots (individual outright ownership, cooperative

ownership, condominium ownership and common element).

(Notes)

1)	Condominium ownership:	The individual outright ownership of a single unit in a multi-unit property together with an interest in the common elements of that property.
2)	Common element:	Land and all parts of a building normally used by all of the owners for their convenience or safety; e.g., facilities such as corridors, elevators, swimming pool, parking lots, etc., in a condominium.
3)	Cooperative ownership:	Ownership that usually takes the form of shares of stock in a corporation owning the entire building and a proprietary lease giving the stockholder/tenant the right to occupy a unit for which he pays a proportional share of the maintenance and operating expenses.
4)	Individual outright ownership:	Also termed "fee simple (or fee absolute)", an estate in real property, by which the owner has the greatest power over the title which is an absolute estate. The owner of the title may dispose of, trade or will as he chooses.

The city redevelopment will follow the steps below.

(a) Basic survey (b) Zoning (c) Designing within assigned zones (d) Financial arrangement (e) Preparation of plans for undertakings, review and decision making (f) Implementation of plans: acquisition of land lots and buildings, relocation, sterilization and adjustment of buildings, construction work.

Laws concerning city redevelopment will include city planning law in which essentials of city planning are provided for, city redevelopment law and residential quarters improvement law which control development undertakings, building standards law which is conductive to the formation of a city with good environmental conditions through building control or approval system and a law controlling industrial activities in the existing cities in order to decentralize city functions.

Of these, the city redevelopment law governs the redevelopment in urban districts which holds the ground of city redevelopment.

Principal purposes of the city redevelopment law are as follows.

(a) To control private rights to some extent for the purpose of promoting city redevelopment (city redevelopment undertakings) in the districts which require redevelopment from the viewpoint of city planning.

(b) To designate planned development districts (complex land use districts) by modifying the city planning law for the purpose of intensive utilization of land from the viewpoint of city planning. To limit the city redevelopment within such designated districts.

(c) To enable the local public entities and city redevelopment cooperation

consiting of local individuals with vested interests in land to participate in the city redevelopment undertakings; to permit private developers to join such local cooperation for the purpose of expediting redevelopment with the help of private funds.

In the present plan, the orientation has been given as classified into conservation, partial development, redevelopment and new development. But, some or all of these should preferably be combined to meet specific plans.

2.5 STATION FRONT DEVELOPMENT PLAN SUGGESTED FOR MODEL STATIONS

2.5.1 General

Tutuban and F.E.U. Districts are selected models for redevelopment as they, though confused in city functions now, are expected to grow on in future in various aspects including commercial activities.

On the other hand, U.P. District is selected as a model for new development because its future development is promising as it is left almost intact.

The following are suggested development plans for these two different districts.

2.5.2 U.P. District

(1) Existing Conditions

This district has a broad expanse with Quezon Memorial and Government Center in the west, the University of the Philippines in the east and with the intersection of Commonwealth Avenue and the University Avenue as its center. The district owns the large-tract national park, Quezon Memorial, and also has widespread institutional quarters, which however, are nothing like so vast as the farmland which occupies a considerably large part in the district.

Namely, outright shortages of commercial and institutional facilities to form the nucleus of the district are perceptible. It should also be pointed out that service machinery to the University of the Philippines and to other institutional organs are meagre.

(2) Policies for Development

U.P. district is located near Quezon which is the political, administrative and academic center of Greater Manila, and its growth is highly promising. The completion of RTR Line No.1 will bring about increased flow of daytime employed population into this district from the neighboring residential areas. To accommodate the surplus population, commercial and institutional facilities must be improved with all possible dispatch.

In view of the breadth of activities this district must cover, it will be of urgent necessity to amplify service facilities to general commercial and institutional quarters, the University of the Philippines and other academic organizations.

Fig. 5.2.3 shows a perspective suggested for the development of U.P. District.

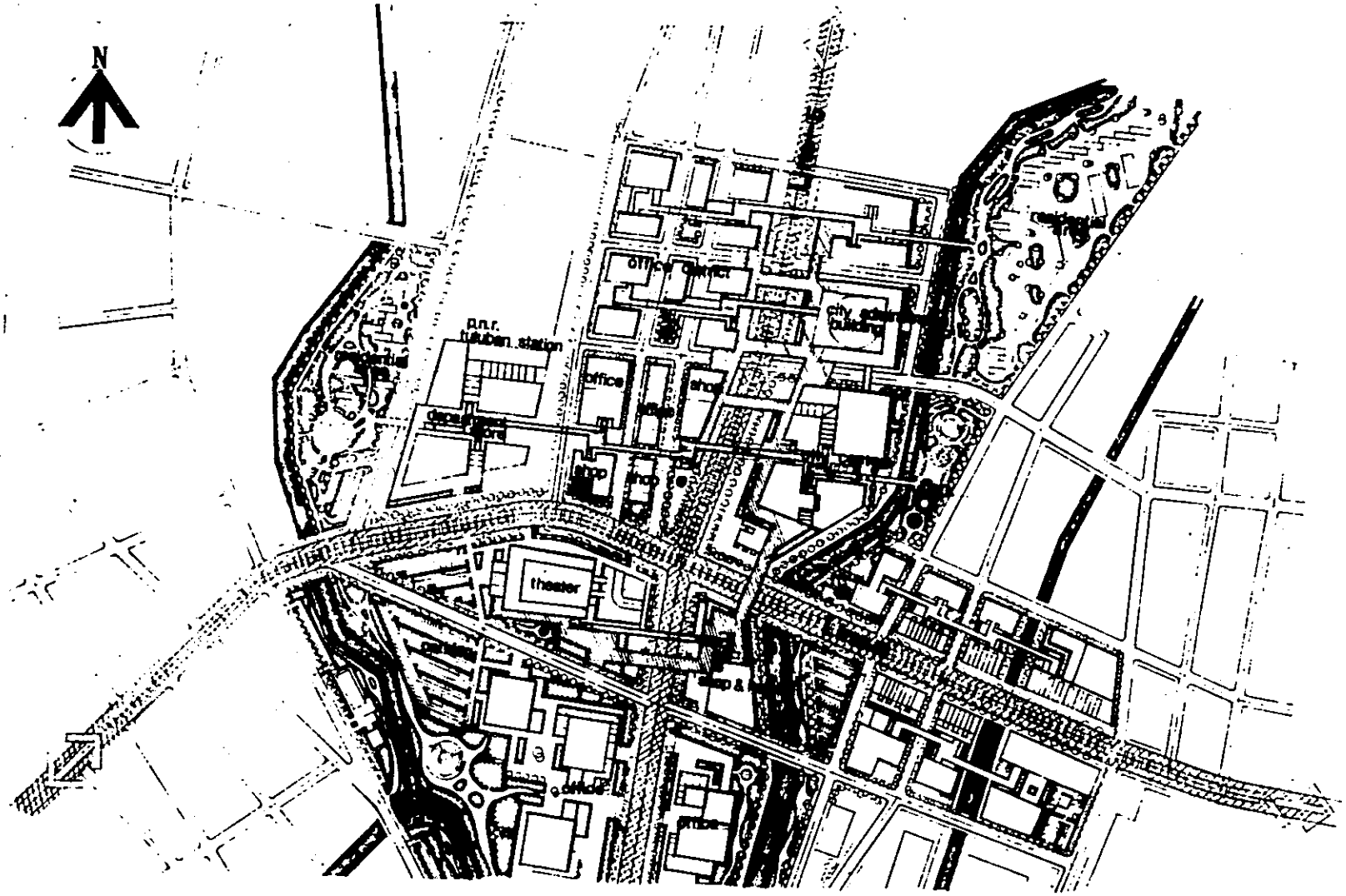


Fig. 5.2.3 Suggested Redevelopment Plan

TUTUBAN 1
Plot Plan S – 1: 2,000

2.5.3 Tutuban and F.E.U. Districts

(1) Present Situation

With Tutuban Station nearly at center, Claro. M. Recto runs from east to west, and Abad Santos from north to south. In the west of this district lies PNR Tutuban Station from which point the railway lines diverge to other parts of the country. Commercial and institutional facilities cluster densely over a comparatively broad range around Tutuban Station, revealing serious entanglement of roads and absolute shortage of open spaces. It should also be pointed out that the district is wanting in the construction of citizen-oriented service machinery such as public facilities, and that the residential quarters in the outskirts of the district are lacking in proper living spaces.

(2) Policies for Development

Tutuban is in a favourable position as the hub of the Metropolitan Manila where the two major roads, Claro. M. Recto and Abad Santo intersect each other. It also has high potentials as commercial and institutional headquarters because the completion of Line No.1 will bring about increase in the daytime employed population.

At present, however, commercial spots are dispersed and there is no nucleus of commerce to speak of. This deprives the district of "urbanity", the most important ingredient of the city, as represented by diversity and abundance, leaving quality buying power to drain into other cities.

For the future growth of the district, it is recommended to nurture positively commercial and institutional quarters as the center of the Metropolitan Manila. To this end, the municipal government should take a positive attitude toward improvement of public facilities and reorganization of land uses which should in no way be left to local store operators' efforts to rationalize and modernize the commercial activities and facilities.

It should also be borne in mind that growth of commercial activities sometimes entail vicious phases of pollution such as pollution by vehicles, and efforts should also be made to maintain green spheres for salubrity and humanity. To care for humane spaces is to make the district beautiful. In the street planning, the paramount precedence should go to the people.

The pedestrian system should be adopted wherever possible in order to separate cars and pedestrians from each other. As regards the peripheral residential quarters, districts where low-story residential houses are located among well-equipped environment and districts where medium- and multi-story houses stand also within good environmental conditions should be designated, and the merits of bringing the places of residence and work close together should be maximized.

A redevelopment plan suggested for Tutuban and F.E.U. Districts is shown in Fig. 5.2.4.

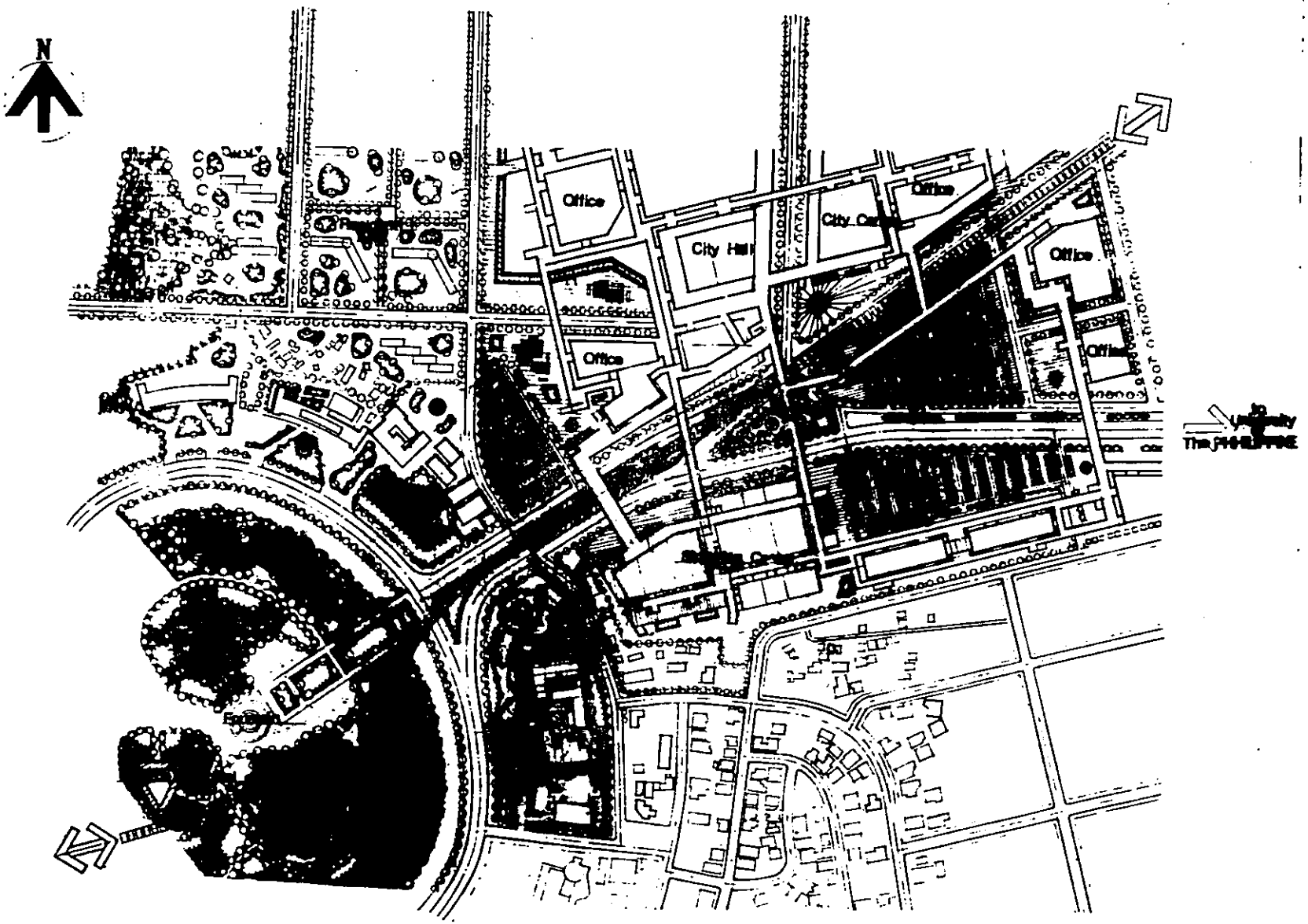


Fig. 5.2.4 Suggested Development Plan

U.P. 1
Plot Plan @ 1:2,000

2.6 SUGGESTED FINANCING SYSTEMS

2.6.1 Direct Plowing-Back System

In this system, the increment of the added value of the real property which is brought about as one of the economic benefits resulting from railway development is to be directly recovered. Namely, it is based on the so-called "beneficiaries-to-pay" principle.

This system can exhibit the highest effect when only a single undertaker performs both railway construction and city development.

The simplest way to realize this is to carry out on a governmental, large-scale basis in a planned manner the method so far employed by private railway companies.

Namely, the right-of-ways as well as neighboring site or sites for newtowns are preempted, and the residential development and railway construction is promoted to pass the costs of railway construction on to the retail prices of housing lots. Even if the undertaker of the city development is different from that of railway construction, it is possible to reflect the railway construction costs in the retail prices of housing lots. One of the merits of this system is that when a public entity is a developer, a proper city development plan including installation of institutional facilities can be pushed forward at the same time, preventing uncontrolled land speculation and diseconomies due to land price rise. Unlike other financing systems, those who should pay are clearly identified and the liability ratio is measurable. Thus, the collection for financing is technically easy.

The following are exemplary plowing-back methods practised in Japan.

a. Private enterprise type - Den-en Toshi Line method

In this method a private company will preempts a large tract where a new development is earmarked and constructs a railway in connection with the development of the area. Then it sells out housing lots to recover the cost invested in railway. The development along the Den-en Toshi Railway Line by Tokyo Kyuko Railway Co., Ltd. is an example of the application of this method.

b. Public sector type - Senpoku Newtown Express Railway method

In this method, a public body develops a newtown and a semi-government body led by that public body builds a railway. This type is worthy of attention in the case of railway development for new housing estates.

The Senpoku Newtown Express Railway of Osaka is an example of development by this method.

c. Joint-venture type - Tama Newtown method

In this method, a public body develops a newtown while a private railway company builds a railway, with or without government subsidy. In the case of the Tama Newtown development project in Tokyo, the railway construction by the private railway company was partially subsidized by the government.

2.6.2 Case Study

In this case study for RTR Line No.1, the feasibility of financing the RTR Line No.1 according to the methods in the preceding section is discussed.

Within the sphere of influence of the RTR Line No.1, U.P. alone remains an underdeveloped area whereas Santo Domingo Station, Quezon Station, Capital Center Station and U.P. Station have much space to be developed in their front.

Taken in this case study is the impact of the rise in land price. The land price is factorized as follows.

(1) Impact of railway construction
(2) Impact of city development project
(3) Natural rise of land price

The impact of the railway construction to which the case in consideration is limited can be measured as follows. The benefits of the railway users are represented by the magnitude of accessibility index, and the relationship between the accessibility and land price is used as a measure to evaluate the effects of the railway construction.

In 1975, the accessibility index and land price of the areas for case study are as shown in the middle column of Table 5.24.

On the other hand, the accessibility indices of the places near the above four stations are calculated in Table 5.2.5 according to the formula defined in Chapter 1., Part II, for the two cases of both in which RTR is not constructed and that in which RTR is constructed. The land price versus accessibility relationship demands the land prices is thus clearly indicated in Table 5.2.4.

Thus, the difference in land price between the two cases (construction and non-construction of RTR) will produce the impact of RTR construction.

On the other hand, the underdeveloped areas within a circle having a radius of 500 m from each of the aforesaid four stations (Santo Domingo, Quezon, Capital Center and U.P.) are as shown in Table 5.2.5. By multiplying these areas by the land price increase due to RTR construction, a ₱1,057 million's worth of development impact is obtained. This amounts to 20% of the total cost of the construction of RTR Line No.1. If this concept is applied to all newly developed and redeveloped areas, the amount of impact will be much greater. Since the impact study has only been roughly discussed, it will have to be carried out in more detail prior to implementation.

Table 5.2.4 Accessibility and Land Price

	Accessibility			Land Price[1] (₱/m²)		
	Construction of RTR(A)	No construction of RTR(B)	A/B	Construction of RTR(A)	No construction of RTR(B)	A/B
Santo Domingo	11.6	8.0	1.45	880	425	2.07
Quezon	11.8	6.9	1.71	943	343	2.75
Capital Center	11.9	4.7	2.53	890	178	5.00
U.P.	11.9	4.7	2.53	890	178	5.00

Note: 1) Values as of 1974.

Table 5.2.5 Financial Benefits of Development

	Existing underdeveloped area (ha)	Increased land price (₱/m²)	Financial benefits of development (10^6 ₱)
Santo Domingo	10	455	45.5
Quezon	50	600	300.0
Capital Center	55	712	391.6
U.P.	45	712	320.4
Total	-	-	1,057.5

Notes: 1) Values as of 1974

2) Existing underdeveloped area means the unutilized land within 500 meters radius around the station.

PART VI

EVALUATION OF THE PROJECT

PART VI EVALUATION OF THE PROJECT

CHAPTER 1 ECONOMIC EVALUATION

1.1 GENERAL

This chapter deals with the evaluation of economic feasibility of RTR Line No.1. The evaluation is made on the basis of the following parts.

1) Passenger volume on RTR Line No.1 and traffic volume in MMA forecast in Part II.
2) Project cost and operation expenses estimated in Part IV.

1.2 PROCESS OF ECONOMIC EVALUATION

1.2.1 Indicators for Economic Evaluation

The evaluation is made using the following indicators which are also employed by the World Bank, the Asian Development Bank, USAID and OECF in Japan.

1) Net present worth (NPW).
2) Benefit cost ratio (B/C ratio).
3) Internal rate of return (IRR).

1.2.2 Economic Life

In this study, the economic life is set to be 30 years. This span is determined to reflect the service life of buildings and structures, cars, electrical and communications equipment. However, the actual service life (project life) is more longer, and in the sensitivity analysis, economic evaluation additionally covers 40 years and 50 years of economic life.

1.2.3 Discount Rate

The discount rate is assumed at 12% in this study in consideration of the interest rate generally applied in the Philippines as well as the opportunity cost of capital.

In the sensitivity analysis, however, the economic feasibility is evaluated separately with the discount rate taken at 8%, 10%, 15% and 20%.

1.3 PLAN FOR CONSTRUCTION AND OPERATION OF RTR LINE NO. 1

1.3.1 Economic Analysis from the Viewpoint of Engineering

The plan for the construction and operation of the RTR Line No.1 has already been discussed in detail in Part IV. Here again, it is summarized from the viewpoint of economic analysis.

For the construction of the RTR Line No.1, it has been proposed to start from U.P. side with the construction from Baclaran side considered as an alternative. For each case, the following construction stages have also been proposed.

	Recommended Alternative (from U.P. side)	Compared Alternative (from Baclaran side)	Year of Commissioning
Stage 1	U.P. - F.E.U.	Baclaran - Rizal Park	1983
Stage 2	F.E.U. - Rizal Park	Rizal Park - U.S.T.	1985
Stage 3	Rizal Park - Baclaran	U.S.T. - U.P.	1987
Stage 4	Baclaran - M.D.A.	Baclaran - M.D.A.	deferred

As regards the structure of the railway, there are two alternatives put under comparative studies, namely (a) partial elevated and (b) all underground. The completion of the section between Baclaran and U.P. in 3 stages from Stage 1 to Stage 3 according to the above schedule is put to comparative economic analysis for all the possible combinations of alternatives.

For reference purpose, the alternatives of implementation of only the following sections in the shortest possible time period was also taken up for economic analysis.

U.P.	-	F.E.U.
U.P.	-	Rizal Park
U.P.	-	Baclaran
U.P.	-	Airport
Baclaran	-	Rizal Park
Baclaran	-	U.S.T.

It will be noted that the possible of construction of Rizal Park - F.E.U. or U.S.T. section is not considered. This is becuase RTR aims primarily at providing the commuter service to ensure smooth flow of the commuting traffic of workers and students generated between districts with concentrated night-time population and those with concentrated day-time population. Another reason is that the construction of this stage alone involves extreme difficulty technically.

1.3.2 Project Cost and Operating Expenses

The annual economic project cost and operating expenses of the project which are obtained through excluding the tax components from the financial project cost and annual operating expenses estimated in Part IV and listed in Tables 6.1.1 and 6.1.2.

Table 6.1.1 Economic Operating Expenses by Year

(Unit: 1000 US$)

Year	From Baclaran		From U.P.	
	All underground	Partial elevated	All underground	Partial elevated
1983	4,307		5,200	
1985	7,800		8,400	
1987	12,307		12,293	
2000	12,307		12,293	

Note: In July 1975 price and excluding taxes.

Table 6.1.2 Economic Project Costs by Year (Original Plan)

(Unit: 1000 US$/year)

Year	From Baclaran		From U.P.	
	All under-ground	Partial elevated	All under-ground	Partial elevated
1976	653	653	653	653
1977	653	653	653	653
1978	5,853	4,560	8,120	5,853
1979	6,787	5,213	9,600	6,093
1980	34,880	28,227	45,093	28,973
1981	79,440	63,187	97,187	77,933
1982	109,160	91,173	126,253	108,000
1983	59,560	58,893	53,787	52,947
1984	101,787	78,667	83,053	75,680
1985	69,160	48,733	53,627	41,613
1986	71,440	54,933	59,880	46,493
Total	539,373	434,893	537,907	444,893

Note: At July 1975 price and excludes taxes.

1.4 TRAFFIC COST FOR BENEFIT CALCULATION

The same traffic costs are adopted in the benefit calculation with no distinction between diverted traffic and non-diverted traffic, and they are determined by referring to "Radial Road to R-10 Feasibility Study (August 1975)" and "Norconsult Reconnaissance Report".

All unit costs appearing in this report are in 1975 price.

1.4.1 Unit Time Cost

The unit time cost is calculated according to the GNP approach method. Namely, it is calculated by dividing the gross annual income in MMA by the number of workers and the number of hours worked. The unit time cost per worker in 1975 was ₱4.3/hr. This value is broken down by trip purpose according to the following assumption.

Commuting to Work	:	1/2 of the unit time cost of worker
Going to school	:	None
Private	:	1/2 of the unit time cost of worker
Work	:	Unit time cost of worker

Table 6.1.3 Elements for Calculation of Vehicle Running Cost

Vehicle Types			Cars	Buses & Jeepney	Truck
Price 1) (1,000 pesos)	Including Tax		28.1	37.5	99.5
	Excluding Tax		21.8	30.2	80.0
2) Deterioration (%)	Distance-Determined	Dependent on road condition	50	50	
		Independent of road condition	10	25	
	Time-Determined		40	25	
	Total		100	100	
2) Lifetimes (1,000 km)	Road Type A 3)		455	700	625
	Road Type B		180	465	395
	Road Type C		180	419	355
	Road Type D		120	282	235
	Road Type E		110	110	215
	Road Type F		110	110	215
	Average of A to F		185	420	355
Annual running distance (1,000 km)			16	78	33
Annual running time (hr.)			2,250	3,000	2,500

Note: 1) Prices as of 1975

2) Based on findings of the Radial Road R-10 Feasibility Study

3) The road types are as defined in sectin 3.4, Part II.

Beneift accruing from the time reduction is considered only for workers and not for students, housewives or unemployed persons because of the poor likelihood of the passengers utilizing the surplus time for productive activities.

The unit time cost of commuting to work is set at one half of the unit time cost of worker because it is assumed that a half of the reduced time would be appropriated to productive activities.

The unit time cost of private trip is set at a quarter of the unit time cost of worker on the assumption the proportion of the employed to the unemployed in the private trips is equal.

The unit time cost is varied not only by the purpose of trip but also by whether cars or buses/jeepneys are used in case that RTR Line No.1 is not constructed. Thus, the unit time cost of car user is set at ₱5.4/hr. which is 25% higher than that of the average transport user, whereas the bus/jeepney passenger's unit time cost is taken at ₱3.2/hr.

The unit time cost per car is calculated from the average number of passengers by type of car as well as the ratio of each trip purpose to all trip purposes combined. The estimated time cost is ₱4.32/vehicle.hour for car and ₱17.7/vehicle.hour for bus/jeepney.

1.4.2 *Unit Running Cost*

The running cost is divided into the distance-determined cost and the time-determined cost.

(1) Distance-determined Unit Running Cost

The unit running cost determined by distance is divided into fuel cost, oil and grease cost, type cost, and maintenance and repair cost. Table 6.1.3 shows the elements required for the calculation of the time-determined running cost of vehicles.

i) Fuel cost

Table 6.1.4 shows the 1975 fuel prices in Manila. The fuel consumption per km varies according to the road condition and speed. The fuel consumption by speed and vehicle type is shown in Table 6.1.5 which is obtained through field test measurements made in Japan.

The fuel cost is calculated by the following equation.

Fuel cost = UCF x FC

where, UCF : Fuel cost per km shown in Table 6.1.4

FC : Fuel consumption at a congestion degree of 1, according to Table 6.1.5

Table 6-1-4. Retail Fuel Prices in Manila (1975)

(Pesos/Liter)

Fuel Types	Automotive Diesel	Regular Gasoline	Extra Gasoline
Price Excluding Tax	0.69	0.75	0.79
Price Including Tax	0.89	1.15	1.21

Table 6.1.5 Correlation between Average Speed and Average Fuel Consumption

(Unit: cc/km)

Vehicle Type km/h	Mini Car (360cc)	Small Car (1200cc)	Medium Car (2000cc)	Small Truck (2-4 ton) gasoline	Heavy Truck (6-8 ton) diesel	Bus (70-86 persons) diesel
4	119	170	245	328	415	421
6	112	160	233	321	410	417
8	104	149	220	311	403	410
10	97	139	208	208	297	400
12	90	130	196	285	375	387
14	85	122	185	273	358	374
16	80	115	175	262	343	362
18	76	109	166	253	332	350
20	73	104	160	244	321	339
22	70	100	154	235	312	329
24	68	96	149	228	303	320
26	66	94	144	220	294	312
28	64	91	140	213	286	303
30	63	88	135	208	280	296
32	61	85	131	202	271	288
34	60	82	127	196	264	282
36	58	80	123	191	258	276
38	57	77	120	186	252	268
40	56	75	116	181	245	262
42	55	73	113	176	240	256
44	54	72	111	173	235	251
46	54	70	108	170	231	246
48	54	69	106	167	227	242
50	53	68	105	165	223	238
52	53	67	103	163	220	235
54	53	66	101	161	218	232
56	54	66	100	161	216	230
58	55	66	99	161	213	228
60	55	65	98	161	211	227
62	56	65	97	162	210	228
64	56	65	97	163	212	230
66	57	66	96	163	214	232
68	58	66	96	164	216	234
70	59	67	95	165	219	237
72	60	67	95	167	222	240
74	61	68	94	170	225	243
76	62	69	94	173	229	246
78	63	70	93	176	233	249
80	65	71	93	179	237	253

Source: Results of field tests carried out in Japan

ii) Oil and grease cost

The 1975 oil and grease prices in Manila are shown in Table 6.1.6.

Table 6.1.6 Oil Prices in Manila (1975)

(Pesos/Liter)

Vehicle Types	Cars	Buses & Trucks
Price Excluding Tax	3.07	2.54
Price Including Tax	3.48	2.95

iii) Tyre cost

The tyre lifetime by road type is calculated by the following equation.

$$L_{pi} = L_{ji} \times AL_p/AL_j$$

where,

L_{pi} : Tyre lifetime by road type in the Philippines.

i : Road type.

L_{ji} : Tyre lifetime by road type in Japan.

AL_p : Average tyre lifetime in the Philippines.

AL_j : Average tyre lifetime in Japan.

The calculation results are shown in Table 6.1.7, together with the tyre set prices.

Table 6.1.7 Tyre Set Prices and Tyre Lifetimes by Road Types (as of 1975)

Vehicle Type	Tyres set prices (pesos)		Tyre lifetimes (1000 km)						
	Including Tax	Excluding Tax	Road Type						Average of A to F
			A	B	C	D	E	F	
Car	750	700	41	61	54	54	51	51	52
Bus/Jeepney	1,810	1,690	55	72	67	64	60	60	61
Truck	4,830	4,510	86	99	91	88	81	81	87

Note: The road types are as defined in Section 3.4, Part II.

iv) Maintenance and repair cost

The maintenance and repair cost referred to here comprises the distance-determined cost and the time-determined cost. Table 6.1.8 shows only the former including the labor and parts costs, disregarding the latter which is relatively small.

Table 6.1.8 Maintenance and Repair Requirements (as of 1975)

Items \ Vehicle Types	Cars	Buses	Trucks
Labor * (hr/yr)	50	200	125
Parts Cost (% of vehicle cost)	2.5	10.0	5.0

Note: Unit labor cost was estimated at 2.7/hr including allowance for basic tools and overhead.

Source: Norconsult Reconnaissance Report.

v) Total running cost

The distance-determined total running cost is the sum total of all the above mentioned cost items and is summarized as shown in Table 6.1.9.

Table 6.1.9 Distance Determined Running Cost of Vehicles
(as of 1975)

(₱/km)

Vehicle Type \ Items of Cost / Road Types		Fuel Costs	Oil Costs	Tyre Costs	Maintenance & Repair Costs	Total
Cars	A	0.079	0.005	0.017	0.017	0.118
	B	0.075	0.003	0.012	0.041	0.131
	C	0.075	0.004	0.013	0.041	0.133
	D	0.075	0.004	0.013	0.051	0.143
	E	0.079	0.004	0.014	0.054	0.151
	F	0.085	0.004	0.014	0.054	0.157
Buses/Jeepneies	A	0.105	0.006	0.029	0.023	0.163
	B	0.097	0.004	0.023	0.037	0.161
	C	0.093	0.004	0.024	0.038	0.159
	D	0.093	0.006	0.026	0.053	0.178
	E	0.097	0.006	0.027	0.056	0.186
	F	0.105	0.006	0.027	0.056	0.194
Trucks	A	0.197	0.008	0.052	0.061	0.318
	B	0.181	0.006	0.046	0.097	0.330
	C	0.175	0.008	0.050	0.102	0.335
	D	0.175	0.009	0.051	0.144	0.379
	E	0.183	0.009	0.056	0.154	0.402
	F	0.203	0.009	0.056	0.154	0.422

Note: The road types are as defined in Section 3.4, Part II.

(2) Time-determined Running Cost

i) Crew cost

The crew cost was calculated separately for bus and truck drivers, bus conductors and cargo loading and unloading labourers for trucks.

The hourly crew cost shown in the Norconsult Reconsult Reconnaissance Report is ₱2 for bus and truck drivers, ₱1 for bus conductors and ₱1 for loading and unloading workers. These values are the 1974 costs in a local district, and they are modified into 1975 price as shown in Table 6.1.10 in consideration of the regional differences and subsequent rises in the crew costs.

Table 6.1.10 Crew Costs (1975 Prices)

(₱/hour)

	Crew Cost
Truck and Bus Drivers	4.3
Conductors	3.4
Truck Labourer	2.2

ii) Maintenance and administration cost

The 1974 value of the annual maintenance and administration cost of vehicles in commercial operation according to the Norconsult Reconnaissance Report is ₱1,000 per vehicle. This is raised to ₱1,150 in veiw of the rises in vehicle costs, and is divided by the annual running time to obtain the hourly maintenance and administration cost.

iii) Sum total of time-determined running costs

The total time-determined running costs is compiled by summing up the above items as shown in Table 6.1.11.

Table 6.1.11 Time Determined Running Costs (as of 1975)

(Unit: Pesos/hour)

Vehicle Types	Crew Costs	Miscellaneous Costs	Time Determined Running Costs
Car	0.00	0.06	0.06
Bus & Jeepney	4.73	0.61	5.34
Truck	5.24	0.81	6.05

1.4.3 Capital Cost of Buses and Jeepneys

The unit retail prices of bus and jeepney are set as shown in Table 6.1.12 on the basis of the data collected during the present survey.

Table 6.1.12 Retail Prices of Bus and Jeepney (as of 1975)

(Excluding Tax)

Vehicle Types	Retail Price(₱)	Share (%)
Jeepney	15,568	66
Small Bus	42,756	17
Large Bus	74,192	17
Average	30,156	100

1.4.4 Accident Cost

It is very difficult to estimate the damages for casualties in traffic accidents. In this report, the average amount paid per person who is killed or wounded in a traffic accidents is obtained from the Japanese statistics of traffic accidents. The amount thus obtained is modified as shown in Table 6.1.13 with account taken of the difference in per capita income between Japan and the Philippines as well as the difference in the income level between MMA and the whole of the Philippines.

Table 6.1.13 Accident Costs (as of 1975)

	Accident Cost (₱)
Per Death	28,800
Per Injury	1,500

1.5 BENEFIT OF RTR LINE NO. 1

1.5.1 General Charcteristics of Economietric Analysis of Benefit

The benefit of RTR Line No.1 can be defined as the difference in the socio-economic cost between the case where the project is implemented and the case where it is not. If the construction is not undertaken, the passengers expected to be diverted to RTR Line No.1 must find some alternative transport means. The existing road transport system consisting of buses/jeepneys and cars is taken up as such alternative transport means.

The following are the beneficiaries of RTR Line No.1.

1. Passengers diverted to RTR Line No.1 (diverted traffic).
2. Passengers not diverted to RTR Line No.1 (non-diverted traffic).
3. Passengers generated by RTR Line No.1 (generated traffic).

The diverted traffic means the traffic consisting of bus passengers and car users who will be diverted to RTR Line No.1 upon its completion. Non-diverted traffic is the traffic who will not be diverted to RTR Line No.1. Even though they will not be diverted, they will receive indirect benefit because the construction of RTR Line No. 1 will make it possible for them to travel quicker.

The generated and induced traffic comprises the traffic to be generated by RTR Line No.1 because of travel time reduction and prompt service of the line and the new traffic generated by the construction of the line. However, the benefit enjoyed by the generated traffic is not taken into consideration in this report.

Some explanation is given below to each of the benefits which the beneficiaries will enjoy after completion of the project.

(1) Diverted Traffic

Benefits derivable from diverted traffic are: 1) reduction in travel time, 2) saving in running cost, 3) saving in capital cost of buses and jeepneys, and 4) decrease in traffic accidents.

a) Reduction in travel time

It is assumed that all passengers given the freedom of selection between the existing route and a new route via RTR Line No.1 would make a choice of the

route to be taken, and that the rate of choice would be determined by the travel time ratios between the two modes as described in modal split in Part II. The difference in travel time between the two modes is the reduced travel time which, if multiplied by the time value, turns into the benefit resulting from the reduction of travel time. Time benefit is not generally considered for countries with a low labour productivity. But it should be taken into account for Metropolitan Manila Area which is featured by an extremely high labour productivity. The varied time value is adopted according to the type of traffic which was divided into the traffic of workers and that of students and the unemployed.

b) Saving in running cost

If RTR Line No.1 is not constructed, buses, jeepneys and cars will be used. Completion of the project dispenses with these vehicles and saves their operational costs including fuel cost, oil cost and tyre cost. These savings constitute the saving in running cost.

c) Saving in capital cost of buses and jeepneys

If RTR Line No.1 is not constructed, the existing transport system in MMA must be expanded to cope with the urban traffic demand. This calls for the introduction of new buses and jeepneys whose capital cost and maintenance and management cost could be reduced by the project.

d) Decrease in accident cost

RTR Line No.1 is expected to have an accident-reducing effect; namely, the number of accidents will be reduced through a decrease in surface vehicle traffic. RTR's accident rate is far lower than that of buses, jeepneys and cars, so that the project is expected to decrease accidents resulting in casualties and damage of property.

(2) Non-diverted Traffic

Non-diverted traffic also will be benefited because the diverted traffic decrease the number of vehicles, mitigating the congestion of road traffic and making it possible for the vehicles to operate more efficiently.

Beneifts from non-diverted traffic include reduction in travel time, saving in running cost and saving in capital cost of buses and jeepneys.

a) Reduction in travel time

Road users receive the benefit of mitigated traffic congestion resulting from the traffic diversion to RTR Line No.1. In order to assess the mitigation of road traffic congestion in terms of travel time saving, the total travel time is calculated both for the two cases that the Line No.1 is constructed and the case that it is not, and the difference will constitute a reduction in total travel time of all traffic on the road network.

b) Saving in running cost

The running cost is divided into the time-determined cost and the distance-determined cost. The latter can be saved but the former does not change very much.

c) Saving in capital cost of buses and jeepneys

Buses and jeepneys are generally operated on the basis of running distance and running time. In large cities, most are operated by the running time and there are few whose operation is based on the running distance. Operation of these vehicles becomes easier because the congestion of road traffic can be alleviated by the traffic diversion to RTR Line No.1 and as a consequence, the vehicle cost can be saved.

1.5.2 Benefit Calculation

(a) Input Data

The data necessary for the calculation of benefits are as follows.

(1) Traffic cost

(2) Interzonal travel time and distance

(3) Number of passengers and traffic volume by transport modes

Of these, (1) and (3) are already known, and the method of determination of interzonal travel time and distance is described here.

The travel time and distance are calculated according to the traffic assignment technique described as follows.

(1) For each link of the networks to which passengers are to be assigned, the relationship between traffic volume and travel time is set beforehand.
In this relationship, the travel time tends to rise with increase in the traffic volume; when the traffic volume exceeds the rated capacity, the travel time increases sharply to check the rise of traffic volume.

(2) A specific O-D traffic volume is assumed on a route of the shortest travel time. Namely, the so-called "all-or-nothing" method is applied for a small portion of the zone-pair traffic volume.

(3) It should be noted however that O-D traffic volume is divided and that for each division, the travel time for each link is recalculated to meet the traffic volume already allocated. Then on the basis of the recalculated travel time, the shortest travel time route is again selected.
This process is repeated until all the O-D traffic volume can be distributed completely.

(4) Vehicular O-D traffic volume is divided into bus O-D traffic volume and car O-D traffic volume.
In the first stage, the bus O-D traffic volume is assigned to the bus network.
In the second stage, the car O-D traffic volume is assigned to the road network.
This is because bus and jeepney traffic cannot change routes depending on the degree of road traffic congestion.

The relationship between the traffic volume and travel speed employed for the traffic assignment is given in Fig. 2.3.6 in Chap. III, Part II. It is prepared according to "Highway Capacity Manual" and Law Concerning Road Structure (Japan)" taking into consideration the results of traffic observation in MMA.

By traffic assignment, the total running kilometers are calculated for the following cases.

	In case of the project being implemented		In case of the project not being implemented	
	Bus/ Jeepney	Car	Bus/ Jeepney	Car
1987 Plan 1	○		○	
1987 Plan 2	○		○	
2000	○		○	

On the other hand, the travel time is calculated by modifying the results of traffic assignment in the following way.

(1) Traffic volume assigned to each link and the time of vehicular traffic generation are used to determine the traffic volume by time zone, and the travel speed by time zone is calculated according to the traffic volume versus travel time relationship given in Fig. 2.3.6 in Chapter 3, Part II. In this way, the daily average travel speed is determined for each link.

(2) The travel speed determined for each link in step (1) above is combined with distance to search out the shortest travel time as an interzonal travel time. The total vehicle-hours will finally be calculated from the travel time and traffic volume of each link.

The traffic occurence time distribution applied is given in Fig. 2.1.1 in Chapt. 1, Part II. The total running vehicle-hours calculated are shown in Table 6.1.4.

Table 6.1.4 Results of Road Traffic Assignment

			In the case of the project being implemented	In the case of the project not being implemented
1987	Plan 1 (PNR improved)	1,000 vehicle-hours	1,996	2,355
		1,000 vehicle-km	31,837	34,479
	Plan 2 (PNR not improved)	1,000 vehicle-hours	2,105	2,503
		1,000 vehicle-km	33,047	35,789
2000		1,000 vehicle-hours	2,841	3,418
		1,000 vehicle-km	46,244	50,556

(b) Calculation of Benefits

A formula for benefit calculation is established, and the results of calculation are indicated for the case where PNR is improved to RTR level according to the original plan for the year 1987 (Plan 1 in 1987). The exchange rate used is US$1 = ₱7.5. All the benefits calculated are in terms of undiscounted 1975 price.

(1) Benefits by Passengers Diverted to RTR Line No.1

1) Bus and jeepney users

i) Time benefit

The time benefit of bus and jeepney users is computed by the following equation.

$$TB = \sum_{ij} P_{ij}^{B} \cdot (t_{ij}^{B.WO} - t_{ij}^{B.W}).V$$

where,

TB : Time benefits

P_{ij}^{B} : Number of users of buses and jeepneys between zones i and j

$t_{ij}^{B.WO}$: Travel time between zones i and j by bus and jeepney when the project is not implemented

$t_{ij}^{B.W}$: Travel time between zones i and j when the project is implemented

V : Time value

The results of calculation show that in 1987, the total travel time will be about 110 thousand passenger-hours for the case where Line No.1 is available and about 310 thousand passenger-hours for the case where Line is not constructed. Saving of time therefore turns out to be about 200 thousand passenger-hours or 10 thousand vehicle-hours.

By multiplying the saving of travel time by the time value, the benefit of travel time saving by the passengers diverted from buses and jeepneys for the year 1987 is estimated at 9,333 thousand US$ a year.

ii) Running benefit

The running benefit of bus and jeepney users is computed by the following equation.

$$RB = \sum_{ij} P_{ij}^{B} \cdot (L_{ij}^{B.WO} - L_{ij}^{B.W}).Rcl + {}_{ij} P_{ij}^{B} (t_{ij}^{B.WO} - t_{ij}^{B.W}) R_{ct}$$

where,

RB : Running benefit

P_{ij}^{B} : Number of bus and jeepney users between zones i and j

L_{ij}^{WO} : Running distance between zones i and j when RTR Line No.1 is not constructed

L_{ij}^{W} : Running distance between zones i and j when RTR Line No.1 is constructed

R_{cl} : Running cost per kilometer

R_{ct} : Running cost per hour

The results of calculation show that in 1987, the saving in the road running distance as a result of the Line No. 1 construction is about 160 thousand vehicle-kilometers and the resulting saving of time turns out to be 20 thousand vehicle-hours. The benefit in 1987 resulting from the saving of running distance amounts to about 1440 thousand US$ a year, while that obtained from the saving of running time amounts to 3680 thousand US$.

iii) Saving of vehicle capital cost

The estimated saving of number vehicles in 1987 is about 660, which will produce a saving in capital cost in value of about 547 thousand US$ for the year.

The number of buses and jeepneys saved is calculated by the following equation on the assumptions shown in Table 6.1.15 which are established based on the data of the Transportation Bureau of Tokyo Metropolitan Government with considerations given of the situation in MMA.

$$St = \sum_{ij} P_{ij}^{B} \left(t_{ij}^{B.WO} - t_{ij}^{B.W}\right)$$

$$Sv = \frac{St}{Mt\ (1.0 + Sr + Rt)}$$

$$Sc = \frac{S_r \cdot B_c}{Lb}$$

where,

Sc : Saving of capital cost of buses and jeepneys

Sv : Saving of the number of buses and jeepneys

St : Saving of time of buses and jeepneys

P_{ij}^{B} : Number of users of buses and jeepneys between zones i and j

$t_{ij}^{B.WO}$: Running time between zones i and j in case RTR Line No.1 is not constructed

$t_{ij}^{B.W}$: Running time between zones i and j in case RTR Line No.1 is constructed

Mt : Daily operation hours of buses and jeepneys per vehicle

Sr : Ratio of standby buses and jeepneys

Bc : Capital cost of buses and jeepneys

Lb : Lifetime of buses and jeepneys

Table 6.1.15 Assumption for Calculation of Saving in Capital Cost

Operation hours (5:00 - 24:00)	19 hours
Daily oepration hour per vehicle	17.1 hours
Time for repair and inspection services	1/3 day/ week
Ratio of standby vehicles	10%
Vehicle lifetime	7 years

2) Car users

i) Time benefit

The time benefit of car users diverted to Line No.1 is obtained by the same equation that is applied to the diverted bus and jeepney passengers.

Car users diverted to Line No.1 will number about 430 thousand in 1987. Since the travel time by Line No.1 is 160 thousand passenger-hours and that by cars is 230 thousand passenger-hours, the saving of time turns out to be about 70 thousand passenger-hours or 40 thousand vehicle-hours, producing an annual benefit of about 9,800 thousand US$ for the year.

ii) Running benefit

The running benefit of the car users to be diverted to Line No.1 is also obtained by the same method as applied to the diverted bus and jeepney passengers.

In 1987, the saving of running distance will be about 2,300 thousand vehicle-kilometers per day and that of running time about 100 thousand vehicle-hours per day. The benefit derived in 1987 from the saving of running distance will amount to about 22,000 thousand US$ a year and that from the saving of running time to about 6,627 thousand US$ a year.

iii) Saving in vehicle capital cost

It is not likely that the car owners will dispose of their cars just because of the construction of Line No.1, nor is it conceivable that potential car owners will refrain from purchasing a car due to the completion of RTR Line No.1. Accordingly, the saving of vehicle capital cost is not taken into account.

3) Decrease in accident cost

Due to the lack of suitable traffic accident data covering MMA, the 1972 accident occurrence rate in Japan is applied to MMA. Further, the occurrence rate adopted is that of an average of all vehicles because it is difficult to classify it by the vehicle type. The rate applied in this report is 0.076 fatality and 4,434 wounded per 1 million vehicle-kilometers. Decrease of accident cost is obtained by the following equation.

The unit accident cost used is obtained by adjusting the value established in "Norconsult Reconnaissance Report" to the 1975 value by making allowance for commodity price increase.

$$SA_c = \sum_{ij} P_{ij}^{C} \cdot (L_{ij}^{WO} - L_{ij}^{W}) \cdot Ar \cdot Ac$$

where,

SA_c : Decrease in accident cost

P_{ij}^{C} : Number of vehicles between zones i and j

L_{ij}^{WO} : Road running distance between zones i and j in case Line No.1 is not constructed

L_{ij}^{W} : Road running distance between zones i and j in case Line No.1 is constructed

A_r : Occurrence rate of road traffic accidents

A_c : Unit accident cost

(2) Benefits by Passenger not Diverted to RTR Line No. 1

The same benefit items as with the diverted passengers are made applicable to those not diverted to Line No.1, but the running benefit which is the function of distance as well as the benefit of decreased in accident cost are not considered because the running distance of non-diverted passengers will present a negligible change whether or not the new line is constructed.

1) Bus and jeepney users

i) Time benefit

The time benefit of bus and jeepney users is computed by the following equation.

$$TB = \sum_{ij} BP_{ij} \cdot (t_{in}^{B.WO} - t_{ij}^{B.W}) \cdot V$$

where, TB : Time benefit

BP_{ij} : Non-diverted trip of bus and jeepney between zones i and j

$t_{ij}^{B.WO}$: Travel time between zones i and j in case RTR Line No.1 is not constructed

$t_{ij}^{B.W}$: Travel time between zones i and j in case RTR Line No.1 is constructed

V : Time value

The number of bus trips not diverted to Line No.1 is estimated to be about 230 thousand. The average speed difference in the entire MMA is only 0.8 km/hr, and the total travel time is about 210 thousand vehicle-kilometers for the case of Line No.1 being constructed and 230 thousand vehicle-kilometers for the case of non-construction in 1987. The saving of time in 1987 thus turns out to be about 20 thousand vehicle-hours a day, which produce an annual benefit of 17,400 thousand US$ for the year.

ii) Time-determined running benefit

The time determined running benefit is calculated by the following equation.

$$RB = \sum_{ij} LP_{ij} (t_{ij}^{B.WO} - t_{ij}^{B.W}) . R_{ct}$$

where, RB : Time-determined running benefit

BP_{ij} : Number of non-diverted trips of buses and jeepneys between zones i and j

$t_{ij}^{B.WO}$: Travel time between zones i and j in case RTR Line No.1 is not constructed

$t_{ij}^{B.W}$: Travel time between zones i and j in case RTR Line No.1 is constructed

R_{ct} : Running cost per hour

When the running speed increases after completion of RTR Line No.1, the operation rate of buses and jeepneys will rise and the crew costs can be saved. The travel time for the two cases of construction and non-construction of Line No.1 can be obtained by distributing to the transport networks just as other benefits.

The time-determines benefit is estimated to be about 20 thousand vehicle-hours, which amounts to 5,240 thousand US$ for the year 1987.

iii) Saving in capital cost of buses and jeepneys

The saving in capital cost of buses and jeepneys is calculated by the following equation.

$$St = \sum_{ij} BP_{ij} . (t_{ij}^{B.WO} - t_{ij}^{B.W})$$

$$Sv = \frac{St}{Mt\ (1.0 + Sr + Rt)}$$

$$Sc = \frac{Sv.\ Sc}{Lb}$$

where,

Sc	:	Saving in bus and jeepney costs
Sv	:	Saving in number of bus and jeepney
St	:	Saving in bus and jeepney running time
BP_{ij}	:	Number of non-diverted trips of buses and jeepneys between zones i and j
$t_{ij}^{B.WO}$	:	Travel time between zones i and j in case RTR Line No.1 is not constructed
$t_{ij}^{B.W}$	:	Travel time between zones i and j in case RTR Line No.1 is constructed
Mt	:	Daily operating hours of buses and jeepneys per vehicle
Sr	:	Ratio of standby buses and jeepneys
Rt	:	Repair and inspection rate of buses and jeepneys
Bc	:	Capital cost of buses and jeepneys
Lb	:	Lifetime of buses and jeepneys

The number of vehicles saved is estimated to be 1,350 and the benefit in value is about 773 thousand US$ in 1987.

2) Car users

i) Time benefit

The time beneift of car users is obtained by assignment calculation just as the time benefit of bus and jeepney users. Since the congestion of road traffic in the entire MMA is heavy, as described previosuly, the average difference in running speed arising from the construction of Line No.1 is only 1.4 km/hr. However, on account of the large volume of car trips which is nearly 3 million, the total running time comes to be about 1,700 thousand hours for the case where Line is constructed and about 1,860 thousand hours for the case where it is not constructed, whereby 160 thousand vehicle-hours can be saved per day, producing an annual benefit of 33,027 thousand US$ in 1987.

ii) Running benefit

The running benefit of car users is obtained in the same manner as that for the bus and jeepney users. As in the case of buses and jeepneys, the increase of running speed results in the increase of operating rate of buses and taxis which leads to the rise of productivity and therefore produces a benefit. The running time saving of 160 thousand vehicle-hours will result in a running benefit amounting to about 9,320 US$ in 1987.

1.5.3 Comprehensive Results of Benefit Calculation

(1) Cases of Benefit Calculation

The following cases are computed according to the method described in the foregoing.

a.	Staged construction plan	a.1 Construction starting from U.P.	1987 (Plans 1 & 2)
		a.2 Construction starting from Baclaran	1987 (Plans 1 & 2)
b.	Implementation in one stage	b.1 Construction starting from U.P.	1987 (Plans 1 & 2) 2000 (Plan 1)
		b.2 Construction starting from Baclaran	1987 (Plans 1 & 2) 2000 (Plan 1)

Note: Plan 1 is the case where PNR is improved to RTR level and Plan 2 is otherwise.

For the benefit calculation, Case a and Case b are newly defined as follows.

Case a: Combination of Plan 2 for the year 1987 and Plan 1 for the year 2000

Case b: Combination of Plan 1 for the year 1987 and Plan 1 for the year 2000

(2) Benefit for the Case of Implementation of Whole Route in One Stage

The benefit expected to be produced in 1987 and 2000 between Baclaran and U.P. is shown in Table 6.1.16.

An overall review of the calculation results discloses that when compared with Plan 1 of 1987, the Plan 2 of 1987 and 2000 will yield a greater benefit in proportion to the increase of Line No.1 users. The benefits of the passengers diverted to Line No.1 account for about 45% of the sum total, of which 75% is derived from the diverted car users. The running benefit and the time benefit account for nearly 40% and 60% respectively of the total amount of benefits, and the saving in capital costs of buses and jeepneys accounts for about 1% of the sum total while the benefit from decrease in accident does not reach even 1%.

(3) Benefit by Section

The benefit derived for each section when only that specific section is implemented is also computed, and the results are as shown in Table 6.1.17.

Table 6.1.17 Undiscounted Benefits by Section for Year 1987 in 1975 Price

(Unit: 1000 US$)

Section (Transportation system / Benefits / Distance (km))	Distance (km)	Case 1 Benefits	Case 1 Benefits/km	Case 2 Benefits	Case 2 Benefits/km
Baclaran - Rizal	6.2	20,693	3,333	31,973	5,160
Baclaran - U.S.T.	12.6	54,013	4,293	70,520	5,600
U.P. - F.E.U.	9.4	52,053	5,533	51,987	5,533
U.P. - Rizal	14.9	72,800	4,880	89,507	6,013
Baclaran - U.P.	21.1	117,387	5,560	132,160	6,267
M.D.A. - U.P.	25.1	12,020	4,787	133,800	5,333

Notes: Case 1 PNR improved to rapid transit level.

Case 2 PNR not improved to rapid transit level.

Table 6.1.16 Undiscounted Benefit by Year for the Recommended Route in 1975 price

(Unit: 1,000 US$/year)

Item \ Year			1987 Case 1	1987 Case 2	2000 (Case 1)
Passenger diverted to RTR Line No.1			54,440	59,920	83,038
Bus/ Jeepney	Time Saving		9,333	10,040	12,616
	Saving in Operating Costs	Running distance determined	1,440	1,800	2,109
		Time determined	3,680	3,973	5,039
	Saving in Capital Costs		547	587	755
Car	Time Saving		9,800	10,467	14,374
	Saving in Operating Costs	Running distance determined	22,000	24,747	35,258
		Time determined	6,627	7,147	10,195
Decrease in Accidents			1,013	1,160	1,692
Passenger not diverted to PTR Line No.1			65,760	73,880	98,692
Bus/ Jeepney	Time Saving		17,400	19,573	24,061
	Saving in Operating Costs		5,240	5,880	7,226
	Saving in Capital Costs		773	880	1,081
Car	Time Saving		33,027	37,053	51,716
	Saving in Operating Costs		9,320	10,493	14,608
Total			120,200	133,800	180,730

Notes: Case 1 - PNR improved to rapid transit railway level by the year 1987.
Case 2 - PNR not improved to rapid transit railway level by the year 1987.

The benefits derivable from the construction plan pressuposing the improvement of PNR are generally lower than those of the case in which no PNR improvement is contemplated. In particular, the benefits of the Baclaran - Rizal section, which will face sever competition from PNR, are expected to be 60% of those obtainable without PNR improvement. Nevertheless, no difference in benefits is expected from the U.P. - F.E.U. section irrespective of the improvement of PNR.

If the PNR improvement is implemented, the benefits per operational kilometer are higher in the U.P. - F.E.U. section and the Baclaran - U.P. section, and the lowest in the Baclaran - Rizal section which produces 60% of the benefits derivable from the U.P. - F.E.U. section. The Baclaran - Rizal section is the lowest even if no PNR improvement is effected.

(4) Benefits by Year

The benefits by section and year obtained through interpolation are shown in Table 6.1.18.

1.6 ECONOMIC ANALYSIS

1.6.1 Economic Analysis of the Proposed Route

The following conclusions can be drawn from Tables 6.1.19 and 6.1.20 showing the results of economic analysis of the original plan.

(1) The two plans, one intended to start construction from the Baclaran side and the other from the U.P. side, are both feasible from the national economic viewpoint, but the latter's economic feasibility indicators are higher than those of the former.

(2) As for the structural aspect, both the underground plan and the partially elevated plan are feasible, but the latter promises a greater feasibility than the former. This is quite natural because the project cost for the all underground alternative is much higher but it produces no quantitative economic benefit increase.

(3) The time schedule of PNR improvement exert not much influence over the economic feasibility of the construction plan. The feasibility indicators of RTR Line No.1 become higher with the delay in the PNR improvement.

Table 6.1.19 Economic Indicators of Proposed Route for Case 1
(PNR improved to rapid transit railway level)

		Discounted Benefits (10^3US$)	Discounted Costs (10^3US$)	Net Present Worth (10^3US$)	B/C Ratio	Internal Rate of Return(%)
From Baclaran	All underground	441,797	290,640	151,157	1.52	17.53
	Partially elevated	441,797	242,555	199,242	1.82	20.43
From U.P.	All Underground	468,345	302,033	166,312	1.55	17.97
	Partially elevated	468,345	253,549	214,796	1.85	21.07

Notes: (1) Discount rate: 12%
(2) Economic life: 30 years

Table 6.1.18 Undiscounted Benefits by Section by Year in 1975 Price

(Unit: 1000 US$/Year)

Transportation system / Stage / Year	Case 1 (PNR improved)						Case 2 (PNR not improved)					
	Baclaran - Rizal	Baclaran - U.S.T.	U.P. - F.E.U.	U.P. - Rizal	Baclaran - U.P.	M.D.A. - U.P.	Baclaran - Rizal	Baclaran - U.S.T.	U.P. - F.E.U.	U.P. - Rizal	Baclarn - V.P.	M.D.A. - U.P.
1983	17,203	44,893	43,116	60,499	97,557	100,247	26,571	58,613	43,061	74,268	109,837	111,201
1984	18,073	47,168	45,453	63,589	105,369	105,293	27,916	61,584	45,396	78,063	115,411	116,852
1985	18,944	49,444	47,656	66,643	107,472	116,893	29,260	64,556	47,596	81,811	121,000	122,503
1986	19,828	51,735	49,848	69,721	112,423	115,216	30,625	67,545	49,784	85,589	126,573	128,153
1987	20,699	54,009	52,051	72,799	117,387	120,205	31,971	70,517	51,985	89,501	132,163	133,804
1988	21,557	56,251	54,212	75,820	122,260	125,196	33,299	73,445	54,144	93,217	137,648	139,357
1989	22,417	58,493	56,372	78,843	127,132	130,185	34,625	76,372	56,301	96,932	143,135	144,912
1990	23,276	60,735	58,532	81,864	132,005	135,175	35,952	79,299	58,459	100,647	148,621	150,467
1991	24,136	62,977	60,693	84,887	136,877	140,165	37,280	82,227	60,617	104,363	154,107	156,020
1992	24,996	65,220	62,853	87,908	141,751	145,155	38,607	85,155	62,775	108,077	159,593	161,575
1993	25,855	67,463	65,015	90,931	146,624	150,144	39,933	88,081	64,933	111,793	165,080	167,129
1994	26,713	69,704	67,175	93,952	151,496	155,135	41,261	91,008	67,091	115,508	170,565	172,684
1995	27,573	71,947	69,336	96,975	156,369	160,124	42,588	93,936	69,224	119,224	176,052	178,237
1996	28,432	74,188	71,496	99,996	161,243	165,113	43,916	96,863	71,407	122,965	181,539	183,792
1997	29,292	76,431	73,657	103,019	166,115	170,104	45,243	99,781	73,565	126,655	187,024	189,347
1998	30,151	78,672	75,817	106,040	170,988	175,093	46,569	102,717	75,723	130,369	192,511	194,901
1999	31,011	80,915	77,980	109,063	175,860	180,084	47,897	105,645	77,881	134,085	197,996	200,455
2000	31,869	83,156	80,139	112,084	180,733	185,073	49,224	108,572	80,039	13,780	203,483	206,009

Table 6.1.20 Economic Indicatorsof Proposed Route for Case 2
(PNR not improved to rapid transit railway level)

		Discounted Benefits (10^3US$)	Discounted Costs (10^3US$)	Net Present Worth (10^3US$)	B/C Ratio	Internal Rate of Return(%)
From Baclaran	All Underground	478,025	290,640	187,385	1.65	18.74
	Partially elevated	478,025	242,555	235,470	1.97	21.74
From U.P.	All Underground	504,573	302,033	202,540	1.67	19.12
	Partially elevated	504,573	253,549	251,024	1.99	22.34

Notes: (1) Discount rate: 12%
(2) Economic life: 30 years

1.6.2 Economic Analysis by Section

Tables 6.1.21 and 6.1.22 show the economic indicators by section in the case that specific section is implemented. From these tables, the following observations may be made

(1) If PNR is improved in an early stage to rapid transit railway level, it will be difficult to satisfy the economic feasibility of implementing only the Baclaran - Rizal Park section. However, if the improvement of PNR is limited to the present program of increasing the capacity to 25 thousand passengers per day, the implementation of this section will be amply feasible.

(2) Even if PNR is improved to rapid transit railway level, the construction of the U.P. - F.E.U. section is feasible and should be carried out as early as possible.

(3) If the construction starting from Baclaran is extended beyond Rizal Park to U.S.T., the construction plan will become economically feasible. This is because the number of users will increase largely by such extension.

(4) The internal rate of return of the U.P. - Rizal Park section is lower than that of the U.P. - F.E.U. section, though the difference is small. This is due to the higher construction costs required for the former section.

(5) The implementation of the entire recommended section of U.P. - Baclaran has the highest feasibility indicators. Construction of this section will produce the greatest effect that can be expected of RTR Line No.1.

(6) The addition of the Baclaran - Airport section will result in a decrease in economic indicators when compared to the implementation of only the U.P - Baclaran section. This is due to the fact that increase in benefit is rather small as compared to the additional project cost required. Thus from the economic point of view it is more desirable that the Baclaran - Airport section is curtailed in the implementation of RTR Line No. 1.

Table 6.1.21 Economic Indicators by Section for Case 1
(PNR improved to rapid transit railway level)

Section Implemented	Discounted Benefits (10^3 US$)	Discounted Costs (10^3 US$)	Net Present Worth (10^3 US$)	B/C Ratio	Internal Rate of Return(%)
Baclaran - Rizal Park	109,600	105,067	4,533	1.04	12.59
Baclaran - U.S.T.	268,267	205,200	63,067	1.31	15.64
U.P. - F.E.U.	236,533	130,933	105,600	1.81	19.75
U.P. - Rizal Park	353,867	220,267	133,600	1.61	18.92
U.P. - Baclaran	554,133	296,667	257,600	1.87	21.79
U.P. - M.D.A.	565,333	342,267	223,067	1.65	19.87

Notes: (1) Discount Rate: 12%
(2) Economic life: 30 years
(3) Partially elevated structure

Table 6.1.22 Economic Indicators by Section for Case 2
(PNR not improved to rapid transit railway level)

Section Implemented	Discounted Benefits (10^3 US$)	Discounted Costs (10^3 US$)	Net present Worth (10^3 US$)	B/C Ratio	Internal Rate of Return(%)
Baclaran - Rizal Park	137,067	105,067	32,000	1.31	15.76
Baclaran - U.S.T.	308,400	205,200	103,200	1.50	17.68
U.P. - F.E.U.	236,000	130,933	105,067	1.80	19.71
U.P. - Rizal Park	394,267	220,267	174,000	1.79	20.56
U.P. - M.D.A.	598,133	342,267	255,867	1.75	20.71

Notes: (1) Discount rate: 12%
(2) Economic life: 30 years
(3) Partially elevated structure

1.7 SENSITIVITY ANALYSIS

1.7.1 Analysis Procedures

The sensitivity analysis is made by varying the following parameters: economic project cost, discount rate, economic life, time benefit, planned population and population distribution pattern.

Taken up in the sensitivity analysis are only the case where PNR is improved to rapid transit railway level, for both the recommended alternative of implementation starting from U.P. side and the compared alternative of that from Baclaran side. The structure presumed is of the recommended partially elevated structure.

1.7.2 Results of Sensitivity Analysis

(1) Economic Cost of the Project

Two cases of economic cost variations are considered; one being 120% of the estimated economic cost and the other is 80% of the same.

The B/C ratio concerning these two cases is shown in Fig. 6.1.1. With a discount rate of 12%, and an economic life of 30 years both U.P. side and Baclaran side alternative produce a B/C ratio of more than 1.38 and their economic feasibility is justified.

(2) Discount Rate

Five discount rates variations of 8%, 10%, 12%, 15% and 20%, are considered. At an economic life of 30 years, even if the discount rate is set at 20%, both alternative are feasible because the B/C ratio is more than 1.0.

(3) Economic Life

The cost-benefit ratio of the alternative of construction from Baclaran side and U.P. side is analyzed in Fig. 6.1.2 with respect to economic life of 10 years, 20 years, 30 years, 40 years and 50 years.

Fig. 6.1.2 indicates that at a discount rate of 12%, the variation of economic life span will not bear great influence upon the B/C ratio. It should be also noted by the way that the economic life limit of RTR Line No.1 is around 10 years.

(4) Time Benefit

In most cases, developing countries do not make much account of the time benefit.

The economic analysis here highly regards the time benefit because the family income in the MMA is considerably high. It should be noted however that the time benefit can be enjoyed not by every person, but by the working people only. Also, the time benefit is graded with the trip purpose.

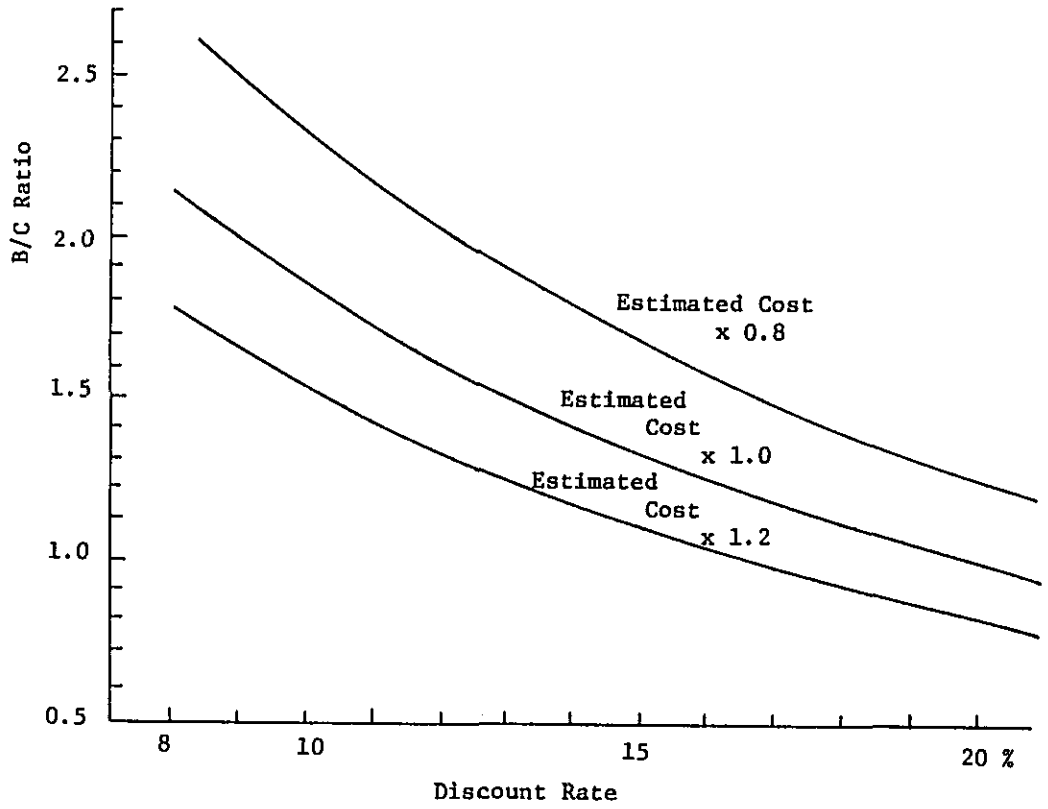
In this report, three variations of the time benefit, namely 50%, 70%, 90% of estimated benefit, were adopted for sensitivity analysis, and the results are shown in Table 6.1.23. From the results it is concluded that both plans are feasible even if the time benefit is reduced drastically by 50%.

(5) Change of Planned Population

In the study, the population is set at 7.50 million for the year 2000 and 5.70 million for the year 1987. In addition, two other cases are computed in sensitivity analysis, the first (case A) being the case that the planned population is reduced to

Fig. 6.1.1 Sensitivity Analysis - Relation between B/C Ratio and Discount Rate at Varied Project Cost

(a) Construction from U.P. side



(b) Construction from Baclaran side

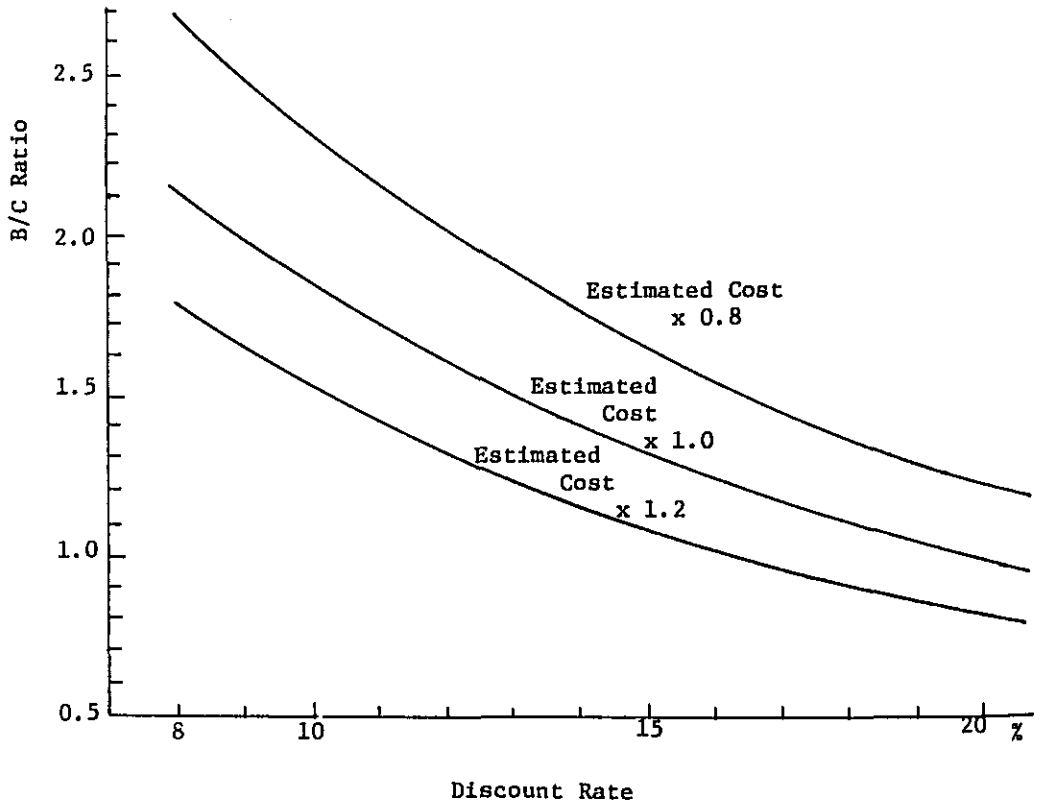
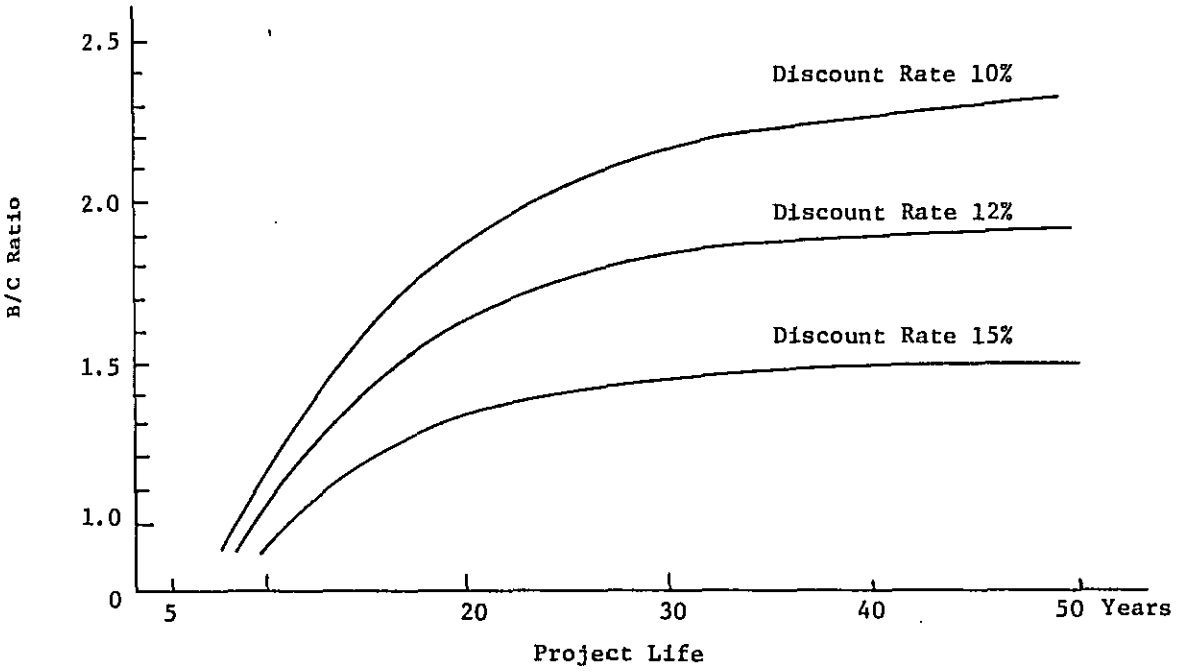


Fig. 6.1.2 Sensitivity Analysis - Relation between B/C Ratio and Project Life at Different Discount Rate

(a) Construction from U.P. side



(b) Construction from Baclaran side

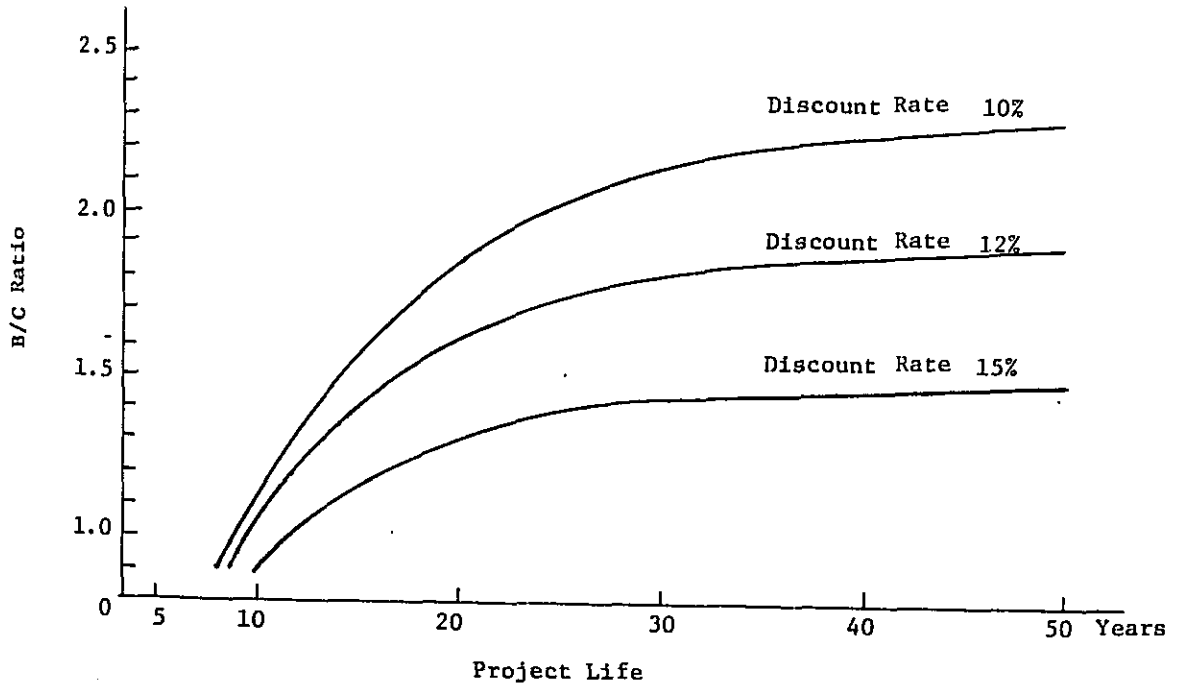


Table 6.1.23 Sensitivity Analysis (Variation in Time Benefit)

	Discounted Benefits (10^3 US$)							Discounted Cost (10^3US$)	Net Present Worth (10^3 US$)			B/C Ratio		
	Time Benefit			Running Benefit	Total Benefit									
	50%	70%	90%		50%	70%	90%		50%	70%	90%	50%	70%	90%
Construction from Baclaran side	125,587	175,827	226,053	181,947	315,880	366,253	416,613	242,560	73,333	123,693	174,067	1.30	1.51	1.72
Construction from U.P. side	133,173	186,440	239,707	192,933	334,867	388,253	441,653	253,547	81,320	134,707	188,107	1.32	1.53	1.74

Note: Project life ; 30 years
Discount rate ; 12%

6.00 million for the year 2000 and 4.60 million for the year 1987, and the second (case B) being that the planned population is reduced to 6.80 million for the year 2000 and 5.10 million for the year 1987. In both cases, it is supposed that the pattern of population distribution will remain unchanged.

The results of economic analysis based on this variation in planned population are shown in Table 6.1.24. It is seen from the results that even in case where the planned population for the year 2000 is 6.00 million, the project remains feasible.

Table 6.1.24 Sensitivity Analysis (Variation in Planned Population)

	Discounted Benefit(10^3US$)		Discounted Cost (10^3US$)	Net Present Worth (10^3US$)		B/C Ratio	
	Case A	Case B		Case A	Case B	Case A	Case B
Construction from Baclaran side	355,560	397,920	242,560	113,013	155,360	1.47	1.64
Construction from U.P. side	377,373	421,773	253,547	123,813	168,213	1.49	1.66

Notes: Case A - Planned population 1987; 4,600 thousand, 2000; 6,000 thousand
Case B - Planned population 1987; 5,100 thousand, 2000; 6,800 thousand

(6) Change of Population Distribution

The pattern of population distribution has a great significance over the users of RTR Line No.1 and their trip length. If the popuplation distribution remains almost unchanged from the existing pattern in spite of efforts to distribute population into the peripherals, the benefits will be affected as shown in Table 6.2.25. The benefits are calculated by reducing the total passenger-kilometers of RTR Line No.1 by making use of the ratio of the average trip length for the year 1971 to that for the design years.

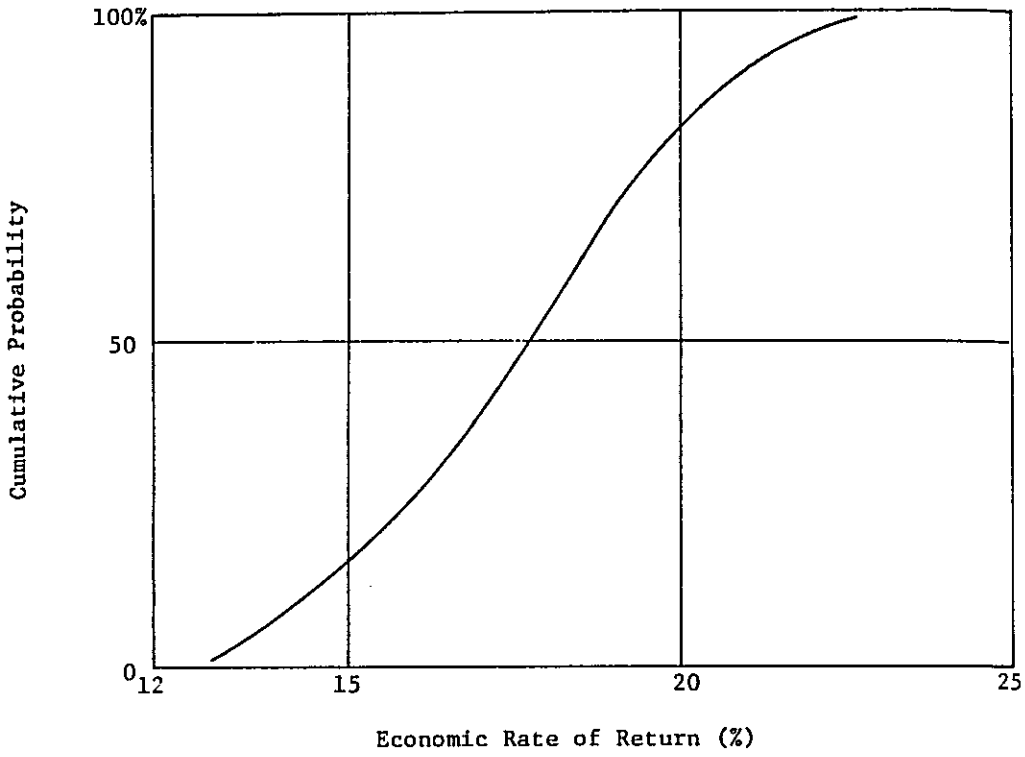
The results show, however, that the project remain feasible irrespective of the pattern of population distribution.

Table 6.1.25 Sensitivity Analysis (Variation in Population Distribution)

	Discounted Benefit(10^3US$)		Discounted Cost (10^3US$)	Net Present Worth(10^3US$)		B/C Ratio	
	Case A	Case B		Case A	Case B	Case A	Case B
Construction from Baclaran side	362,120	440,933	242,560	121,560	198,387	1.50	1.82
Construction from U.P. side	341,666	414,387	253,547	88,107	160,840	1.35	1.63

Notes: Case A - Existing population distribution pattern
Case B - Population distribution pattern of 1987

Fig. 6.1.3 Cumulative Probability Distribution of the Economic Rate of Return



1.8 RISK ANALYSIS

1.8.1 Process of Analysis

In sensitivity analysis the degree of sensitivity is analysed by varying one or two parameters influential to economic indicators. In "risk analysis" the probability of the changes in economic indicators is calculated by combining all varying parameters. The parameters are divided into two categories. One is related to economic costs and the other to benefits. The latter is perticularly given close examination. The parameters and their changes are shown below.

Re project costs ..... The estimated project cost is made to vary in the range of ±20%.

Re benefits ..... a) Total number of population:
The planned population in the keys years is made to vary in the range of ±20%.

b) Distribution pattern of population:
The estimated pattern in the key years is made to vary in the range of 20%.

c) State of traffic facilities:
The case of the construction of RTR Line No.1 only (2) that of both the construction of RTR Line No.1 and the improvement of PNR to rapid transit railway level and (3) construction of No.1 - No.5 and improvement of PNR.

The probability of the occurence of each parameter is assumed to be the same. The analysis is carried only for the recommended alternative according to the recommended stage construction schedule and the economic life is assumed to be 30 years.

1.8.2 Calculation Results and Conclusions

The resultant economic rate of return (ERR) is as shown Fig. 6.1.3. From Fig. 6.1.3, the following conclusions can be made.

(1) The project is feasible because the ERR even in the worst case comes to 12.7% and probability of occurence is only 2%.

(2) The project has very high ERR, with 84% probability of the ERR above 15% and a 18% probability of the ERR being over 20%.

(3) It can therefore be concluded that from the economic point of view the project should be undertaken energetically.

CHAPTER 2 FINANCIAL PLAN

2.1 GENERAL

In the previous section, the results of the preliminary economic analysis indicate that the rapid transit Line No. 1 will be economically feasible, so that at a discount rate of 12% the capital may be recovered from the accrued benefits of the whole national economy.

In this section, an analysis will be made of the financial aspects of the project. The considerations to be made in this regards are the financial costs and the revenue through the operation of the line. The main item of revenue is the fare receipt from the passengers. Any other revenues such as sales at newspaper kiosks or income through station or train advertisement display will be of minor importance. The fare revenue depends greatly on the fare system adopted. A detailed discussion is therefore made in the subsequent section whereby the fare policy, fare structure and fare level are analysed.

The two main financial cost items are the capital investment cost and the annual operating expenses. The capital investment cost on a rapid transit system is enormous and it is generally not possible to recover this investment cost solely through fare revenue, since the fare rate adopted has to be suppressed to maintain competitiveness with other modes of public transport. This fact is common to all rapid transit systems in the world, so that in all countries where rapid transit system is planned and constructed, subsides for the capital investment are made by national, state and/or municipal governments.

The operating expenses, however, are in principle not entitled to subsidies from the government, although there are many instances of reimbursement of deficits in operating expenses by the governments, especially when such deficits are due to the suppression of the fare rate of the system or through concessionary fares made on social welfare ground.

In the case of the Manila rapid transit system, it will be seen in the subsequent sections that although the annual fare revenue will be sufficient to cover the operating expenses, the surplus available for repayment of capital investment is meagre. It should therefore be a basic financial policy that the capital investment cost should be borne by the government through subsidies, while the fare should be so determined that the fare revenue should be sufficient to cover the annual expenses. As a minimum, the interest on the capital cost should be borne by the government, while the capital cost may be repaid through any surplus in fare revenue as well as the depreciation deposit on the investment.

In the subsequent sections of this chapter, full discussion will be made on the determination of fares, the financial costs of the project, and the fare revenue of the rapid transit system in order that a cash flow plan and financial plan may be recommended.

Some examples of subsidies of rapid transit system in the world are listed as follows:

a) Paris: The Automonous Corporation for Parisien Transport (RATP)

(1) Subsidy on capital investment

The RATP is the corporation established for the operation of urban and sub-urban transport in the metropolitan area of Paris. It is an amalgamation of various transport operators, and transport system under the control of the corporation comprise the Metro (subway), suburban express railway lines, corporation owned urban bus lines, the suburban lines of French National Railway and private owned suburban routes.

New capital investment on rapid transit system depends heavily on government subsidy. For the construction of suburban trunk express railway lines, the capital cost is 100% through government subsidy, of which 50% is subsidy of national government and 50% is subsidy of local government. For the extension of the Metro to the suburbs and the new construction of non-trunk lines, the subsidy comes to 60% of the capital cost of which 30% is from the national government and 30% from the local government. The RATP bears the remaining 40%. The 40% borne by RATP is met by a loan from the Prefectual Government of the Paris Region at a low interest rate of 5%.

The only item for which the investment is wholly borne by RATP without subsidy is the purchase of rolling stock.

(2) Subsidy on operating expenses

The Paris Transport Syndicate, the controlling body of RATP has the authority to revise the fare rate so that the revenue will be sufficient to meet annual operating expenses and so application is made to the national government for approval. Should the application for fare revision be rejected by the government, then the deficit due to the rejection is subsidized by the government, the share being 70% by the national government and 30% by the local government. Also, any loss in revenue through concessionary fares for social welfare purposes is also reimbursed in full by the national government. In 1971, the subsidy for operating expenses came to about 46% of the total expenses.

(3) Financial Source

The financial source for government subsidies is secured by the introduction of taxes. At present, there is a public transport benefit tax for the subsidy of deficit in operating expenses and a special tax for equipment for obtaining fund for subsidy in capital investment.

b) London: London Transport Executive (LTE)

(1) Subsidy on capital investment

The LTE is an organization under the Greater London Council formed through the uniting of the former railway, train and bus companies and is responsible for the overall planning and control of operation of the urban public transport system of the Greater London metropolitan area. The Tube (London subway), and the urban bus systems are now the two most important systems under the LTE.

Subsidies on capital investment has been made possible since 1968 through legislation. Any new line construction by the LTE now enjoys 100% subsidy for the capital cost with 75% borne by the national government and the remaining 25% borne by the Greater London Council.

(2) Subsidy on operating expenses.

In principle, the operating expenses of the LTE is not entitled to any government subsidy. However, in practice the deficit through the non-approval of fare revision is reimbursed by the Greater London Council.

(3) Financial source

The subsidy by the national government is made from the ordinary budget of the government while the finance source of the Greater London Council depends on issue of bonds. The interest for the bonds issued is covered by receipt from local tax.

(c) Munich: The Munich Traffic Corporative (MVV)

(1) Subsidy on capital investment

The MVV is a corporative established with the capital from the German federal, state and municipal governments as an administrative corporative for the purpose of unifying the fare system, coordination of operating time schedule of the various modes of urban transport, as well as the planning of the urban transport network.

The capital investment for any new rapid transit line construction of the MVV depends wholly on subsidies at a share of 60% by the federal government, 20% by the state government and 20% by the municipal government. Purchase of rolling stock, however, is not entitled to subsidies.

(2) Subsidy on operating expenses

The MVV is annually operating in a deficit, and the deficit is wholly reimbursed by the municipal government.

(3) Financial source

The federal finance source for the subsidy is from the gasoline tax, of which 0.03 mark per gallon is earnmarked for urban transport projects, The state finance source is from the automobile licence tax. As for municipal subsidy, half of it is from the profit of electricity supply department of the municipal and the remain half is from ordinary municipal tax.

(d) Stockholm: Greater Stockholm Transport Company (SL)

(1) Subsidy on capital investment

The SL was formed through the amalgamation of various urban transport operators in the metropolitan for an unified management of urban transport in the Greater Stockholm region.

For the construction of new subway lines, a subsidy of 50% of the capital cost is received from the national government, while the remaining 50% is financed as a loan from the state government to be repaid through the depreciation cost of the SL budget.

(2) Subsidy on operating expenses

From social welfare considerations, the fare level of the SL transport system is greatly suppressed by the state legislative, and various concessionary fares have to be made to various sectors of the population, and the operation is usually in the deficit. The state bears the full responsibility for reimbursement of all operating deficits.

(3) Financial source

The national subsidy is made from ordinary budget while the loan from the state government is provided by the fund collected from the financial market.

Subsidy for operating deficit by the state however is made from income tax revenue on the principle that the whole population of the state is responsible for the survival of the urban transport system.

(e) New York: New York City Transport Authority (NYCTA)

(1) Subsidy on capital investment

The NYCTA is the body for the operation of the subway system in New York. The capital cost on the construction of any new lines is wholly subsidized at a proportion of 8/12 by the federal government, 3/12 by the state and 1/12 by the city. The city is responsible for the capital cost (capital, interest and depreciation) of the existing facilities.

(2) In principle, the operating expenses is to be covered by fare revenue. However, the city makes compensation for loss of revenue through concessionary fares made for social welfare reasons. The city also bears the cost of maintenance of the station facilities, cost of security maintenance, and the NYCTA share of the employees provident fund.

(f) San Francisco: San Francisco Bay Area Rapid Transit (BART)

(1) Subsidy on capital investment

The BART subway system is a newly built subway system for the purpose of relieving congestion of surface traffic. It is a citizen project, and the capital cost for the construction was mainly borne by the citizen, in the form of increase in real estate tax, sales tax and toll revenue of toll bridges. The federal and state government subsidize for any insufficiency in the fund so collected.

(2) Subsidy on operating expenses

In principle, the operating expense is to be covered by fare revenue, but any deficits may be subsidized by the state through raising of real estate tax.

(g) Tokyo: Teito Rapid Transit Authority (TRTA)

(1) Subsidy on capital investment

The TRTA is the operator of the major part of the subway lines in Tokyo. For the capital investment made by the TRTA for construction of new subway lines, 90% of the direct cost of construction is entitled to partial government subsidy. Of the amount entitled to subsidy, the national and the local governmetn make equal

contribution to 66% of it, while the TRTA bears the cost for the remaining 34%. The Tokyo Metropolitan Government also directly operates some of the subway lines in Tokyo. In this case, the national government does not make any subsidy on the capital cost, but subsidizes the interest to be paid for the bonds issued by the metropolitan government for raising the capital.

(2) Annual operating expenses

The annual operating expenses of the subway lines in Tokyo are not entitled to any subsidies.

(3) Financial source

The government subsidies on the capital investment costs of the subway lines are provided in the annual government budgets.

(h) Seoul: Seoul Subway Corporation

(1) Subsidy on capital investment

The Seoul subway corporation is a public corporation fully under the control of the metropolitan government of Seoul, established for the operation of the urban subway system of the capital of South Korea.

The capital cost for the construction of the subway system is subsidized in full by the Seoul metropolitan government.

Of the capital investment cost for Line No. 1 of the Seoul subway system, the local currency portion came to 49.8%. 50.4% of this portion (or 25.1% of total cost) was financed by the own financial source of the metropolitan government. The remaining of this portion as well as the foreign currency portion were made available as a loan from the national government, which provide a small part from the national budget, and supply the remaining by a loan from foreign source. The loan from foreign source was obtained by the national government at an interest rate of 4.125% and the national government then re-lend this to the metropolitan government at an interest rate of 5%.

(2) Subsidy on operating expense

The corporation does not receive any subsidy for the annual operating expenses, but, according to the cash flow plan, will be able to cover the expenses through the operating revenue. According to the cash flow plan, the interest on the loans for capital investment will also be sufficiently covered through the annual revenue.

(3) Financial source

The own finance portion of capital investment is budgeted through the ordinary account of the metropolitan annual budget for a three years period. The loan from the national government which was to be repaid uniformly over a 20 years period (including a 5 year grace period) was also to be repaid through the annual ordinary account of the metropolitan budget but would eventually be recovered from the operating profit of the system.

i) Hong Kong

The subway system in Hong Kong is still in the pre-implementation stage and although at this stage some concrete financial plan must have been formulated, nothing has yet been put into actual practice.

Here we can only make an analysis of the recommendation on financing made by the consultants in the final planning stage. In the Hong Kong Mass Transit Further Studies Report, the consultants, in discussing the financial source for the project, ruled out the practicability of bodies such as the World Bank or the Asian Development Bank from the point of the special political status and economic standing of the colony. It was also concluded that raising the entire capital requirement from commercial source would be precluded by the low financial rate of return generated by the investment. The recommendation was that effectively, the system must be financed either entirely by Government or by a combination of commercial and Government sources, the commercial investors being protected by special financial conditions.

The three possible methods of financing suggested are as follows.

i) The total capital requirement be financed by the Government from general funds.

ii) The capital cost of civil engineering works would be borne by the Government while the funds required for the mechanical and electrical plant and equipment would be raised on the commercial market, and be amortized through annual revenue.

iii) The first stage would be financed by the previous method while the total cost for subsequent stages would be financed by loan from Government.

It is not yet know at this stage which method of financing will be adopted by the Hong Kong Government. However, it is clear that should any one of the three suggestions by the consultants be adopted, the government will bear a substantial part of the capital cost of the system.

2.2 DETERMINATION OF FARE

2.2.1 General

The fare established for a mass rapid transit system will greatly affect the financial effectiveness of the system. The decision on the fare to be adopted has therefore to be made with careful consideration of all relevant factors. In the determination of the fare, three separate but interrelated items have to be considered.

(1) Fare Policy

(2) Fare Structure

(3) Fare level

Detailed discussion on these items will be made below:

2.2.2 Fare Policy

Ideally, the fare may be so set that the revenue derived will be sufficient to offset all annual expenses and the annual share of capital expenditures and with a little net surplus which may be reserved for future development. However, bearing in mind that the capital investment for an urban rapid transit project is enormous, it is

in practice unlikely that the revenue should be sufficient to cover all costs including the capital expenditures, since a fare determined in reference to the cost will probably become so high as to discourage the popular use of the rapid transit system so that the target revenue can never be achieved.

Since a change in fare structure or fare level will affect the volume of traffic, there is in existence a structure and level of fare which will result in the maximum net revenue. This is the commercially optimum fare structure and level. A fare level above this will result in the loss of both traffic and revenue, and is therefore totally out of the question. The commercially optimum fare structure and level will be the one adopted if the rapid transit system is operated by a purely commercial organization to which the maximum financial effectiveness is the ultimate objective. Under a government or government-sponsored organization to which the objective of relieving congestion on the street is of utmost importance, the fare level may be ste below the optimum level in order to attract more traffic, although this will result in a loss in revenue.

The eventual fare structure and level to be adopted by the operating agency, especially the latter, also depends very greatly on the method and extent of government participation in the financing of the capital expenditures and the subsequent subsidies for operating expenses, since the operating agency will be responsible for obtaining sufficient revenue to cover the remaining portion of the expenditures and expenses.

2.2.3 Fare Structure

Of the fare structure and the fare level, the latter is more closely related to the fare policy determined. The fare level within an established fare structure may be relatively easily altered in accordance with any change in policy or in adjustement against a general rise in price level of commodities. The fare structure, on the other hand may not be readily altered since this will be a move that may affect different group of passengers in different ways. For this reason, the fare structure adopted initially should be such that future basic alternation is not necessary.

The various types of fare structures may broadly be classified into two groups, namely the uniform fare system and the graduated fare system. In the uniform fare system, a uniform charge is levied for all trips made irrespective of the distance or the destination. In the graduated fare system, the charge per trip varies according to the distance, and may again be subdivided into the zone-fare system and the mileage-fare system. With the zone-fare system, a uniform charges is made for trips within a defined zone, but a higher charge is made for an interzonal trip. With the mileage-fare system, the fare increases in propotion to the length of the trip.

Each fare system has its advantages and disadvantages, and the decision on the final system to be adopted cannot be made without due consideration of the various local physical, social, economic and other conditions of the rapid transit system to which the fare system is to be made applicable.

The various factors that have to be taken into consideration in the comparative study of the fare systems are as follows:

(i) The ease or simplicity of operation

(ii) The cost of fare collection

(iii) The convenience to passengers

(iv) The possibility of fare evasion

(v) The total revenue

(vi) The ease of modification of the fare system or fare rate

In the following, a discussion of the merits and demerits of the various system will be made.

(a) Uniform fare system:

(i) Simplicity of operation

This system is most simple in terms of operation. Only one single type of ticket will be necessary, and irrespective of whether ticket dispensing is manual or mechanical, only a small number of sales counters or ticket dispensing machines will be required. The control of the entrance gate is also very simple, since the check is only on whether the passenger is with or without a valid ticket. Instead of using tickets, it is also possible to have turnstiles at the gate, such that a turnstile is activated with the insertion of a coin or a token.

There is no need to carry out checking of ticket in the train against fare evasion.

(ii) Cost of fare collection

The simplicity of operation means that manual labour or ticket dispensing machine can be greatly reduced in number, resulting in a saving in cost. At the exit end, the same saving is also expected. If a turnstile is used instead of tickets, then the exit may be made unmanned, provided sufficient preventive steps are taken against access into the platform from the exit. Fare adjustment facilities are not necessary.

(iii) Convenience to passengers

An uniform fare system eliminates the necessity of the passenger finding out the right fare to his destination. Thus ticket dispensing is sped up. Ticket checking in the train is unnecessary. At the destination, there is no necessity of fare adjustment. All these contribute to make it convenient to passengers.

(iv) The possibility of fare evasion

With sufficient check against illicit access into the paid area, the possibility of fare evasion can virtually be eliminated.

(v) The revenue

Although theoretically it is possible to set all the fare system in such a way that the same revenue may be derived from the same traffic volume, in practice, the uniform fare being a weighted average, tends to be unfavorable to traffic of shorter trip, and a consequent loss of part of the

short-distance passengers. This usually means a loss in revenue as compared to other fare systems.

(vi) The ease of modification of fare system or fare rate

The uniform fare system is usually applicable when the operating mileage is short. However, future extension of mileage of the rapid transit system may render it necessary to rectify the fare system or the fare rate. A switch from the uniform fare system to a graduated fare system will result in different sectors of passengers being affected in different degree. Since all passengers were originally under a same fare, the 'apparent unfairness' will be felt and objection may be expected. If the fare system is maintained with only a revision in fare rate, the average fare may be too high to be tolerable by the short- or medium-distance passengers, thus resulting in further loss in passengers and revenue.

b) Zone-fare system

The zone-fare system is a system that is half-way between the uniform-fare system and the mileage fare system. The whole system is divided into separate zones, so that within each individual zone, the uniform fare is applicable. It is when a trip covers two or more zone that a graduated fare rate is applied. Thus in a zone-fare system, many of the merits of the uniform fare system or the mileage fare system are retained while many of the demerits are eliminated or minimized. Zones are established with one, two, or more concentric circles starting from the central area of the metropolitan region. Thus when a straight line is drawn through the centre of the circles, the line will be divided into 3, 5 or more sections, depending on the number of circle drawn. Should there be too many circles drawn, a line will be divided into too many subsections, so that many merits of the zone fare system are lost. The most common division is generally either one circle which divides the line into town centre zone and suburban zone for a relatively small region, or with two circles to establish the central, intermediate and suburban zones for larger region.

(i) Simplicity of operation

With a zoning system established with one or two concentric circles, the number of possible combination of type of fares will be only three or six, so that although a multiple types of tickets have to be made available, the number is not large enough to result in any considerable complication of operation. At the entrance and exit gates, the tickets may be made easily recognizable through the adoption of an appropriate colour scheme for the tickets. The turnstile system cannot be applied in this system.

(ii) Cost of fare collection

If ticket dispensing, entrance checking and ticket retrieval at the exits should be done manually, no substantial increase is anticipated when

the colour scheme for the tickets is so chosen as to enable recognition at a glance. If machines are used, the machines should have the capability for simple distinction, thus resulting in a slight increase in equipment cost.

Checking of tickets in the train is not deemed necessary, but a fare adjustment counter will have to be made available.

(iii) Convenience to passengers

In purchasing a ticket, a passenger has to make a decision as to the zone of the destination before action is taken for ticket purchasing in case of a mechanical ticket dispenser, or the ticket seller has to decide on the correct ticket to be issued in case of manual ticket sales. However, the range of choice is narrow, and the inconvenience due to necessity for decision will be small.

(iv) The possibility of fare evasion

Since the checking of the ticket at the exit gate can be easily carried out when a proper colour scheme is adopted, the possibility of fare evasion can be virtually eliminated provided preventive measures against illicit access to the platform are taken.

(v) The total revenue

Revenue loss may be anticipated through the loss of short distance interzonal passengers. However, if the zones are not too finely divided, the loss of traffic will be much smaller than that of an uniform fare system.

(vi) Ease of modification of fare structure or fare level

Together with the extension of the rapid transit line or network, the extended section can easily be included in the existing zone or classified as a new zone without any modification to the existing sections. Where fare raising is necessary, this may be made across the board, without any unbalanced in fare increase felt by any sector of passengers.

(c) Mileage fare system

Theoretically, the mileage fare for a trip is obtained through multiplying the distance of the trip by the predetermined fare rate per unit distance. This will mean a different fare even for a very small difference in trip length. However, in practice, the section fare is set by rounding up the calculated 'theoretical fare' into the most convenient interval. In the case of Manila, for instance, the fare graduation may be either at 5 centavos, or 10 centavos scale interval.

(i) Simplicity of operation

Whatever the fare graduation scale that may be adopted, there is no denying that the possible fare variation will come to be very large irrespective of whether ticket dispensing operation is done mechanically or manually, the operating mechanism will be very complicated. Each station will have to make available a large stock of tickets for the specific use of that station. If gate machines were employed, these machines will have to be a very highly sophisticated type. Fare adjustement

facilities become a necessity at the exit end of the station. The turnstile system cannot be made applicable.

(ii) Cost of far collection

All the demerits of complication in operation are reflected in the additional cost necessary in fare collection. The extra man-power, the costlier sophisticated ticket dispensing machine or gate machines, and the fare adjustement facilities, all contribute towards higher operating cost. Constant checking of ticket is also necessary to prevent fare evasion, thus adding further to operating cost.

(iii) Convenience to passengers

The greatest inconvenience to passengers will be at the ticket dispensing stage whereby it is necessary to make a decision as to the correct fare to the destination. This will adversely effect the speed of the operation. The possibility of having a ticket of incorrect fare will be much higher. This will result in the necessity for fare adjustement at the destination.

(iv) The possibility of fare evasion

Under manual operation, the possibility of under-fared passengers passing through the exit gate is high especially during rush hours. This defect may be rectified to some extent through the introduction of sophisticated gate machines or through constant checking of tickets in the train and imposition of heavy penalty for misuse of tickets.

(v) The total revenue

The milage fare system is, to the passenger, the most rational and most easily acceptable system of fare collection. Loss of passengers through fare resistance is not expected unless the minimum fare is set too high for the short distance passengers. The revenue will therefore be near the maximum. It should be noted, however, that should this system be adopted, a small percentage of revenue loss may be expected due to failure in detection of under-fared passengers.

(vi) Ease of modification of fare structure or fare level

This switch from the mileage fare system to other fare structure may be carried out easily. A fare rate revision can be also easily assimilated by the users without any confusion.

2.2.4 Fare Level

The fare level adopted will directly affect the traffic volume and consequently the financial viability of the rapid transit system and has to be studied with care. In the decision on the fare level to be adopted, the following are some of the major factors to be considered.

(a) The fare level of other modes of transport

(b) The annual operating expenses of the system

(c) The types of coins in circulation

(a) The fare level of other modes of transport

This is perhaps the biggest factor to be considered in the discussion on the fare level. Basically, in a planned urban transport system, all modes of transport will be complementary to each other. However, in terms of revenue, the various modes of transport may be in a competitive position. Thus any great difference in fare level between two competing modes of transport will inevitably result in the loss of competitiveness for the mode with a higher fare. On the other hand, it may be justifiable to charge a high fare for a newly introduced mode of transport, if the new mode should be more comfortable, more punctual, more reliable, shorter in travel time and in waiting time.

In fact, in most of the cities with a mass rapid transit railway system, the minimum fare for the railway system is either the same as, or only a little higher than that for the road-surface mass transit system (bus or tram car), and some cities provide for free transfer between the rail transport and the bus (or tram car) transport.

The following are some of the comparative fare systems between the rail transport and the bus (or tram car transport) for some cities over the world.

(i) The same fare system and fare level applicable to both the rail transport, with free transfer allowable between the two modes.
Toronto, Munich, Hamburg, Montreal.

(ii) The same fare system and fare level, but without free transfer facility.
Stockholm, Philadelphia, New York, Chicago, Rome.

(iii) Different fare level

a) Higher fare for rail transport

London:	Minimum fare for subway:	5 p
	Minimum fare for bus :	3 p
San Francisco:	Minimum fare for subway (BART):	30 ct.
	Uniform fare for bus and streetcar:	25 ct.
Boston:	Minimum fare for subway:	25 ct.
	Minimum fare for bus :	20 ct.
Moscow:	Minimum fare for subway:	5 k.
	Minimum fare for trolley bus:	4 k.
	Minimum fare for streetcar:	3 k.
	Minimum fare for bus:	5 k.
Mexico City:	Minimum fare for subway:	1.20 p.
	Minimum fare for bus :	0.80 p.

b) Lower fare for rail transport

Tokyo:	Minimum fare for subway:	¥60
	Minimum fare for bus:	¥70

It will be seen from the above that the fare level of the rail transport and that of the bus (or other surface transport) are either the same or are very small in fare difference. Where the fares are different, the fare

Table 6.2.1 Relation between Fare Rate and Coin Handling in Manila

Minimum Fare Rate

	Minimum Fare Rate		10 ct	15 ct	20 ct	25 ct	30 ct	35 ct	40 ct	45 ct	50 ct
at minimum fare	Minimum No. of coins for exact fare		10	10, 5	10, 10	25	25, 5	25, 10	25,10,5	25,10,10	50
	Most convenient coins of large denomination	coins used	25	25	25	50	50	50	50	50	100
		change	10, 5	10	5	25	10, 10	10, 5	10	5	50
	Most convenient coins of smaller denomination with change	coins used	-	5	-	5	5	10, 5	10	5	25, 25
		change	-	5	-	5	5	10, 5	10	5	-
at double minimum fare	Minimum No. of Coins for exact fare		10,10	25, 5	25,10,5	50	50, 10	50,10,10	50,25,5	50,25,10,5	100
	Most convenient coins of large denomination	coins used	25	50	50	100	100	100	100	100	-
		change	5	10, 10	10	50	25,10,5	25, 5	10, 10	10	-
	Most convenient coins of smaller denomination with change	coins used	10, 10	25, 10	25, 25	25, 25	50, 25	50, 25	50, 25	50, 50	50, 50
		changed	-	5	10	-	10, 5	5	10, 10	10	-
at three times minimum fare	Minimum No. of coins for exact fare		25, 5	25,10,10	50, 10	50, 25	50,25,10,5	100, 5	100,10,10	100,25,10	100,25
	Most convenient coins of large denomination	coins used	50	50	100	100	100	-	-	-	-
		change	10, 10	5	25,10,5	25	10	-	-	-	-
	Most convenient coins of smaller denomination with change	coins used	25, 10	25, 25	50, 25	50, 50	50, 50	100, 10	100, 25	100, 50	100, 100
		change	5	5	10, 5	25	10	5	5	10, 5	50

for rail transport is generally higher, and the fare difference is less than 70% of the lower fare.

b) The annual operating expenses of the system

The initial cost for an urban rapid transit is enormous. After the rapid transit system is in service, the annual expenses required to maintain the system in safe, punctual and reliable operation will be considerable. Whatever the fare policy adopted, it is a common practice that the annual fare revenue should be sufficient to cover the annual operating expenses. Failing this, the system will be constantly operating in a deficit, which is a very unhealthy situation. Although there are cases whereby the fare level is set very low, and external subsidy is obtained from the national or the local government to cover the annual operating deficits, such cases are exceptional, and should be avoided.

One of the guide lines to be adopted in the establishment of the fare level is therefore that the fare revenue should at least exceed the annual operating expenses.

(c) The types of coins in circulation

In the setting of the fare level, it may well be advisable to consider also the types of coins that are in circulation so that a minimum number of coins will be required for ticket purchasing or for fare adjustment. This fact is of course a very minor one. However, the minimuzing of the number of coins will greatly simplify the process of ticket dispensing and fare adjustement, thus resulting in saving in operating cost to some extent.

The coins that are now in circulation in Manila are of the following denominations: 1 centavo, 5 ct, 10 ct, 25 ct, 50 ct and 100 ct (₱1). The number of combinations of types of coins necessary for the purchase of a ticket at a minimum fare and its multiples is as shown in Table 6.2.1.

It will be seen from the table that the most convenient fare in terms of coins used will be 10 ct, 25 ct or 50 ct. If any of these three minimum fares, were adopted, a minimum number of coins will be involved in the procurement of a ticket. In almost all these cases, a maximum of 3 coins are involved in a transaction, including the coins received as change. At other minimum fare rates up to 50 ct, a multiple number of coins are required to make up an exact fare, and where change is involved, the number of coins in a transaction may come to four or five.

From the point of simplicity in operation, it may be desirable that the minimum fare be 10 ct, 25 ct or 50 ct. However, as mentioned before, this is a very minor factor, and there are no reasons to reject other minimum fares established from financial consideration.

d) Fare level and traffic volume

The traffic volume on the rapid transit system will be greatly affected by the fare level adopted. There is no universal formula to express the relation between the variation in fare level and the consequent increase or decrease in traffic volume, although in many cities, an empirical study and analysis on such a relation is being

carried out. However, in the case of Manila, since there is no existing urban rapid mass transit system in operation, it is not possible to empirically establish the correlation in between the two varying factors, and it is therefore necessary to make an assumption by making reference to the correlation established for the other cities of similar conditions.

In the study for the Hong Kong Mass Transit Railway System, the Hong Kong Government undertook an analysis of experience in other cities where detailed evaluations had been carried out on passenger response to increase in mass transit fare level. These studies reveal three significant features of passenger reaction to fare increase.

1) Work trips are least affected by fare increase.
2) Trips in off peak periods, especially evenings and Saturdays are afffected most.
3) The longer the journey, the less the impact of higher fares on traffic volumes.

The studies also indicate that an "elasticity of demand" for rail transit fo approximately -0.3 would be a fair assumption provided rail fares are not too dissimilar from road transport fares. The relatively low income and car ownership of Hong Kong compared to the cities in which the studies were undertaken was also taken into consideration. The precise assumptions adopted by the Hong Kong Government separately for the short and the long trips are as follows.

1) For journeys not exceeding five miles, the volume of passengers is reduced by 3% for each 10% increase in fare.
2) For journeys greater than five miles, the volume of passengers is reduced by 1% for each 10% increase in fare.
3) For reduction in mass transit fares, the volume of passengers is proportionately increased at the same rate.

Although it cannot be asserted with certainty that the same relationship may be applicable to Manila, the 'elastity of demand' established for Hong Kong, however, should serve as a useful reference in the analysis of the Manila Rapid Transit System.

2.2.5 Concessionary Fare

In the determination of fare for a rapid transit system, the policy on concessionary fare has also to be decided. Basically, there are two different types of concessionary fares.

1) A concessionary fare made available to a specific group or sector of the users for social welfare reason. Under this types comes the concessionary fare for children, students, military personnel, the aged and the disabled. In this case the concessionary ticket may either be for a single trip, multiple trip or a specific period.

2) The sale of tickets valid for multiple trips for anybody who is a regular user of the system. In this case, the concessionary ticket may be issued in the form of one single season ticket which may be valid for an unlimited number of trips for a specific time period, or for a specific number of trips, or in the form of coupon ticket book consisting of a multiple numbers of single trip tickets,

available at a discount. The main merit of the multiple trip tickets is that on the user side, the passengers may save the time for acquiring an individual ticket on each individual journey, while on the operator side, saving in operating cost is expected. If a multiple trip ticket is sold at a discount which equals or is less than the saving in operating cost, then the discount ticket is not a concessionary ticket in a strict sense but is only the sale of a product of cheaper cost at a cheaper price.

There are no clear cut universal rules on whether a concessionary fare system should be adopted. It depends very greatly on the social conditions of the country involved. If concession to students, children, the aged or any other sectors of the citizen is a government policy or a common social practice, then the same advantage should be provided for such passengers on the rapid transit system. However, if the social situation is otherwise, then provision of concessionary may not be justifiable.

In the case of discounting for multiple trip ticket, the decision on whether or not a discount rate higher than the expected saving in operating cost be adopted is again a matter of policy, and should be made on a higher level. However, the saving in operating cost cannot be overlooked, and discounting of the fare to the extent of the saving is certainly recommendable.

2.2.6 Some Examples of Fare System in Other Cities

Before making a decision as to the final fare system to be adopted, it is useful to make an analysis of the fare systems which are in existence in the urban rapid transit systems of other cities over the world.

Here detail description will be made of one typical cases for each fare system.

(1) Uniform fare system (Paris)

In the metropolitan Paris, the basic fare rate (called the fare module) is standardized for all modes of urban mass transits, and any variation in fare is shown as a multiple of the fare module, which is generally expressed by the letter 'V'. The fare for a mode of mass transit may be 1.0 V, 1.5 V, 0.5 V and so on. The value of 'V' was 0.8 F in 1973.

In the case of the subway in Paris (the Metro), the uniform fare system is adopted, so that a passenger may change trains as many times as possible within the Metro system, as long as he does not go out of the exit gate or change to a different mode of transport. Both the one-trip ticket and the coupon tickets (carnet) of ten tickets per coupon book are available. In 1973 a one-trip ticket cost 1.625 V (=1.30 F), while each ticket from a coupon ticket costs only 1.0 V (0.80 F) in a second class car. For a first class ride, a one-trip ticket costs 2.5 V (2.00 F) while a trip on a coupon ticket came to 1.5 V (=1.20 F).

For the buses which cover the same region as the Metro, the zone fare system is adopted. A trip of the same origin and destination and of the same distance may in many cases, have a different fare between a Metro trip and a bus trip, with the bus trip costing a higher fare.

There are now 16 Metro routes with 342 stations in the Metropolitan Paris, and the longest route is Route No. 9 with a total distance of 19.56 km.

Several concession fares are available for some sectors of the passengers. Weekly season tickets, which are valid for a maximum of 12 trips and up to the Sunday of the week of purchase are available at 5.60 F for employment commuters and 4.80 F for schooling commuters, who ride on second class cars, but are not applicable to first class passengers. Monthly season tickets are not available.

For war veterans, disabled persons, parents with more than 3 children, and families living on social welfare, special concessionary coupon tickets are available at 10 tickets of 0.5 V (=0.40 F) each for second class, and of 0.75 V (=0.60 F) each for first class passengers.

(2) Zone fare system (Munich)

The mass rapid transit system in Munich, W. German comprises a railway network made up of the subway (U-bahn) and the suburban railway (S-Bahn), under the administration of the Munich Transport Corporative (MVV). The administrative territory of the MVV covers a region of about 40 km in radius, and the fare system adopted is the zone fare system. The zones are divided by 5 concentric circles with the centre of the circles situated at the city centre. The whole territory is thus divided into one core zone and 5 ring zones.

The fare for a trip is decided by the number of zones traversed. In this case, while both the core zone and the ring zones are respectively considered individual zones, only one count is given for a trip that extends over two ring zones. The minimum fare for one count is 1 mark, and 1 mark is added for each individual count. Thus the ordinary adult fare for a trip is as follows.

Number of zones	Number of fare counts	Fare (Marks)
up to 2	I	1
up to 3	II	2
up to 5	III	3
up to 7	IV	4
up to 9	V	5
up to 10	VI	6

A special fare for short distance trip is also available for trips between two adjacent stations, and the fare is 0.7 mark per trip.

(3) Mileage fare system (San Francisco)

The San Francisco Bay Area Rapid Transit (BART) is the rapid transit railway system serving the San Francisco metropolitan area which covers the cities of San Francisco and Oakland as well as the surrounding counties. The system is underground in the urban area, but comprises elevated sections in the suburban region.

The fare system adopted is the mileage fare system. The minimum fare is 30 cents, and graduation is at 5 cents interval.

The following lists the interstation single-trip fare for some of the stations on the Richmond - Fremont Line of the BART system.

	1. Richmond	2. E. C. Plaza	3. MacArthur	4. L. Merritt	5. Coliseum Coliseum	6. Hayward	7. Union C.	8. Fremont
1. Richmond								
2. E. Cerrito Plaza	30	-						
3. MacArthur	45	30	-					
4. Lake Merritt	50	35	30	-				
5. Coliseum	65	50	35	30	-			
6. Hayward	90	80	65	60	45	-		
7. Union City	100	100	90	85	70	45		
8. Fremont	110	105	100	100	85	55	30	-

(Unit: U.S. Cents)

(4) Other cities

There are at present over 50 cities in the world having an urban mass rapid transit system with the system wholly or partially underground. Although the fare level varies, the fare structure comes under one of the above three types. In Table 6.2.2, the fare structure and fare level of some of the major cities in the world are listed for reference.

2.2.7 Recommendations

a) Fare policy

Considering that the biggest objective of the establishment of the urban rapid transit railway system is to attractive as large a number of users as possible away from the existing road network to the system in order to relieve the congestion of surface traffic, it is of importance therefore that commercial viability of the system should not be the deciding factor in the determination of the fare system to be adopted. In other words, the policy of recovering the capital cost through fare revenue should not be adopted.

In fact, it is easily proved that since the capital cost for an urban rapid transit system is so costly that the recovery of it through fare revenue is utterly impossible in almost all cases. That is, an increase of the fare rate will result in a drop in passengers volume, so that there exists a maximum fare rate beyond which a further raise in the fare will result in a decrease in revenue.

On the other hand, the fare policy adopted should be that the revenue should be sufficient to cover the annual operating expenses of the rapid transit system.

Table 6.2.2 Fare System of Mass Rapid Transit in Major Cities in the World

City	Country	Rapid Transit System	Fare System	Fare Rate	Fare Rate in* US Cent Equivalent
Rome	Italy	Subway	Uniform fare	L.50/trip	(7.5 ct.)
Paris	France	Subway	Uniform fare	1.3F/one-trip ticket	(30 ct.)
				0.8F/carnet ticket	(18 ct.)
Moscow	U.S.S.R.	Subway	Uniform fare	5 kopeks/trip	(6.7 ct.)
New York	U.S.A.	Subway	Uniform fare	35 ct./trip	(35 ct.)
Chicago	U.S.A.	Subway	Uniform fare	40 ct./trip (plus 10 ct. for transfer)	(40 ct.)
Mexico City	Mexico	Subway	Uniform fare	1.2 peso/trip	(8 ct.)
Montreal	Canada	Subway	Uniform fare	35 C.ct./trip	(35 ct.)
Philadelphia	U.S.A	Subway	Uniform fare	35 ct./trip (plus 5 ct. for transfer)	(35 ct.)
Boston	U.S.A.	Subway	Uniform fare	25 ct./trip (underground section only)	(25 ct.)
Toronto	Canada	Subway	Zone fare	Minimum fare 30 C.ct./trip	(30 ct.)
Munich	W. Germany	Subway & Elevated Railway	Zone fare	Minimum fare 1 mark/trip	(39 ct.)
				(0.7 mark for short distance trip)	(27 ct.)
Stockholm	Sweden	Subway	Zone fare	Minimum fare 1.25 Kroner/trip	(29 ct.)
London	U.K.	Subway	Mileage fare	Minimum fare 5p.	(10 ct.)
San Francisco	U.S.A.	Subway	Mileage fare	Minimum fare 30 ct.	(30 ct.)
Tokyo	Japan	Subway	Mileage fare	Minimum fare ¥60	(20 ct.)
Osaka	Japan	Subway	Mileage fare	Minimum fare ¥50	(17 ct.)

* in Dec.'75 exchange rate

A revenue that is below the annual operating expenses will mean that an annual subsidy from the government has to be obtained to maintain the system in operation, and will be a great burden to the national economy. Although there are many examples of subsidy on operating expenses of various rapid transit system in the world, this is not a normal practice and should be avoided if possible.

In the case of the Manila rapid transit system, it is recommended therefore that the fare policy should be that the annual revenue should be sufficient to cover the annual operating expenses, without attempting to recover the capital cost of the system. The capital cost, or a lion's share of the capital cost, should be borne by the government, whether federal, provincial, or municipal.

b) Fare Structure

The fare structure to be adopted for the Manila rapid transit system should be one that is easily understood and readily assimilated by the general public. In this sense, it is important that the structure should not be drastically different from that prevailing in the existing modes of public transport.

The two major modes of public transport in Manila are the bus and the jeepney. Although the fare rate is stipulated as proportional to the distance, in practice, due to the relative short trip distance, a flat rate is generally adopted for a single trip on either mode. An user who wishes to make a long trip will therefore have to change from one vehicle to another at the terminal of the bus or jeepney route. This existing system is very similar to a zone system whereby the bus or jeepney travels from one end of the zone to the other end, and the passengers have to change vehicle for travelling in a new zone. At each change of vehicle (i.e. change of zone) a new fare has to be paid.

It is seen therefore for the Manila rapid transit system, a zone fare structure will be most appropriate. A passengers travelling across the zone border will, as in the existing modes of transport, have to pay extra fare, but the inconvenience of transferring is eliminated.

An uniform fare structure will mean that the average fare rate has to be set at a relatively high level, since the total distance from one end of the metropolitan area to the other is well over 20 km in most directions. The long-distance passengers will be at an advantage, but the short trip passengers, who are estimated to form the bulk of the users, will be at a great disadvantage. This fare structure is evidently unsuitably for a large metropolitan.

Should the mileage fare structure be adopted, there will be no problems of advantage to one sector of users and disadvantage to another, as each pays about proportional to the distance travelled. However, since this will be a major deviation from the existing system, it will take quite some time before the general public get use to it. Moreover, since the mileage fare structure is more complicated, a large man-power will be necessary in operation, resulting in a higher operating cost. This fare structure therefore, cannot be easily recommended without full consideration of the effects on operating cost.

It is recommended in this study therefore that the fare structure adopted should

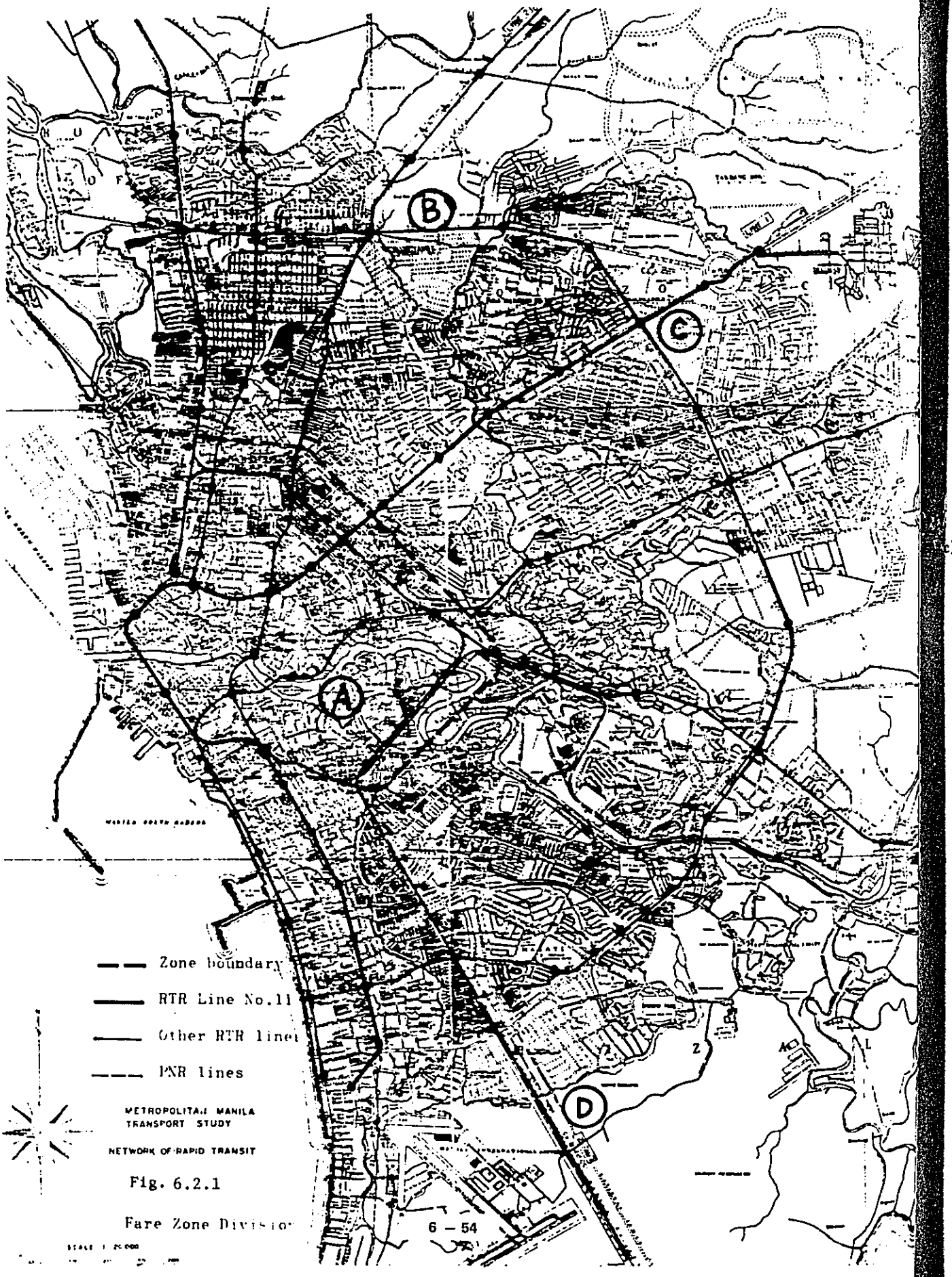


Fig. 6.2.1

Fare Zone Division

be the zone fare structure, which is relatively simple and easy to operate, and is more readily assimilated by the general public.

As for zone division, concentric zone boundaries are usually adopted in cities where the transport routes are generally radial. In the case of Manila, when the whole rapid transit system is eventually completed, besides the radial routes, there will also be a circular route in Line No. 3 of the rapid transit system, and zoning with only concentric boundary may end with the whole route of Line 3 within the same zone. To avoided such defect, it is proposed that besides circular zone boundary, the peripheral region should also be divided into several sections.

Fig. 6.2.1 shows the proposed zone division for the Manila rapid transit system. It may be seem that the whole metropolitan area is divided into 4 zones. The zone A generally encompasses the CBD, and is the zone where all the rapid transit lines except Line 3 pass through. Zone B occupies the northern part, Zone C the eastern part while Zone D the southern part of the metropolitan. With regards to Line No. 1 the zone boundaries come between the stations Rizal Park and General Hospital and the stations Santo Tomas University and Welcome Rotonda. Thus Line No. 1 is divided into 3 sections of almost equal distance, each section being about 7 km. Compared to the existing jeepney route of about 5 km in length, the distance in each zone of Line No. 1 is slightly longer.

(c) Fare level

The fare level adopted for the Manila rapid transit system should be such that the rapid transit system will remain in a competitive position against the existing modes of public transport in terms of fare. A slightly higher rate, however is proper since the higher fare rate is more than compensated by the speed, convenience and reliability offered by the new system.

The existing fare rate of the bus and jeepney is a minimum of 20 centavos per trip. This fare rate should form the guide line in the determination of the basic minimum fare for the rapid transit system. From the point of competitiveness in fare, it is considered that the new minimum fare rate adopted for the rapid transit system should not be more than half again the existing fare rate applicable to bus and jeepney. The range for the fare rate will thus be between 20 ct and 30 ct. Also taking into consideration the convenience in coin handling, it is considered that the most favourable minimum fare rate is 25 ct per trip, which is a 25% increase over the fare for a bus or a jeepney trip.

The fare for an interzonal trip may be determined as a multiple of the minimum fare or at a lower rate of increase. Both systems are now prevailing in cities where zone fare structure is adopted. In Munich, West Germany, for example, the minimum fare is 1 mark for the first fare count and the fare increases to 2, 3, 4, 5 and eventually to a maximum of 6 marks for six fare counts. The fare rate in Stockholm, Sweden is calculated as a multiple of a basic rate of 0.65 kroner. Thus the fare for an interzonal trip is 2 times the basic rate (1.3 kr) and increase to a maximum of 10 times the basic rate (6.5 kr). The fare rate for Hamburg, Western Germany, however, increase at a rate lower than the multiple of the minimum fare. That is, the minimum fare is 0.7

mark for the first zone count and increase by 0.3 mark (or 43% of minimum fare) for each increase in zone count.

Considering that the rapid transit system is in practice a replacement of the bus and jeepney service and that with the existing bus and jeepney service, a new fare is paid for each transfer, an increase by a simple multiple of the minimum fare is not expected to meet with any major resistance from the general public. Besides, increasing of the fare by simple multiples will be most simple in operation. Thus doubling of the minimum fare for a trip to the adjacent zone and tripling of the minimum fare for a trip across two zone boundaries is considered most favorable for the rapid transit system. However, special consideration should be given to the trips between two adjacent stations separated by the zone boundary. In this case, a discount fare of 35 ct or the minimum fare may be applied.

In summary, it is recommended that the minimum faer for an interzonal trip be 25 centavos, the fare for a trip between two adjacent zones be 50 centavos, and that for a trip across two zone boundaries be 75 centavos. For a trip between adjacent stations separated by the zone boundary, either a discount fare of 35 ct or the minimum fare of 25 ct may be made applicable.

d) Concessionary fare

There are no concessionary fares available in the existing modes o f public transport in Manila for any special sectors of citizens nor are any discounts available for regular users in the form of season ticket or coupon ticket. It is unnecessary therefore to newly introduce a concessionary fare system in the fare structure of the Manila rapid transit system from the beginning. Such concessions, however, may be considered in the future when it should eventually become necessary as a part of the national social welfare policy.

The introduction of the season ticket system has the merit of securing regular customers for a long period. However, it has also the demerit of being complicated in operation. Also, where such a system is new to the users, the possible of abuses through fraudulent uses is high and the checking against such frauds is difficult. In the case of the Manila rapid transit system, it is therefore considered that the introduction of the season ticket system is unnecessary.

The provision of coupon tickets, however, has many merits. In this cases, a multiple numbers of tickets (say ten or twenty) is sold together in the form of a coupon book and may be detached and used as individual tickets. For the regular passengers, the use of the coupon will save them the trouble of purchasing a ticket on every trip. For the ticket vendors, the sale of one coupon book saves the time and trouble for selling many individual tickets and the saving in operating cost can become considerable. The use of coupon tickets should be therefore encouraged through the provision of discount for the purchase of coupon books. This discount provided will not constitute a loss in revenue if the discount rate is determined through the saving in operating cost. Generally, a discount of five or ten percent is common. This may be effected by providing extra tickets in a coupon book. Thus for the 25 ct coupon, a book of 11 tickets may be sold at 2.5 pesos for a discount of

10%, or a book of 21 tickets sold at 5 pesos for a 5% discount. In any cases, the discount rate has to be determined from the saving in operating cost expected from the sale of the coupon tickets.

In summary, it is recommended that no concessionary fare be adopted for social welfare reasons, and that the season ticket system should not be introduced. However, tickets in coupon books should be introduced and sold at a discount about equal to or less than the saving in operating cost that may be expected from the sales of such coupon books.

2.3 FINANCIAL COSTS

The financial costs of the rapid transit railway have been estimated in the engineering studies of this report, and the details are described in the following sections.

2.3.1 Capital Investment Cost

The capital investment cost include the cost for construction of the civil engineering works, the laying of the track, the installation of all electrical and mechanical facilities, the furnishment of station facilities as well as the procurement of rolling stocks.

In this study, the investment costs for the various alternatives of the system and the alternative cases of construction schedules are estimated and the costs are divided into foreign currency and local currency portion. Table 6.2.3 list the results of estimated year by year investment amount broken down into foreign currency and local currency.

2.3.2 Annual Operating Expenses

The annual operating expenses include the salaries, wages of the personnel, the cost of the fuel, power and other consumptions, the repair, replacement and others maintenance works of the rolling stocks, the track and the electrical and mechanical equipment, as well as other administrative expenses. The interest on capital cost is generally also included in the operating expenses unless subsidies are made from external source.

In this report, the annual operating expenses of the key years are estimated in Chapter 4.

2.4 REVENUE

2.4.1 Fare Revenue for the Key Year

The fare revenue is calculated based on the fare structure and fare level recommended in the previous section. Detailed calculations of fare revenues of different alternative construction schedules are made for the various key years, and the results are shown in Table 6.2.4.

2.4.2 Miscellaneous Revenue

Besides the fare revenue, it is customary that the operating organization will also have other miscellaneous revenue in the form of advertisement fee in the train, stations and along the route, or of concession receipts for installation of newspaper stands or other use of the rapid transit railway property. Depending upon the concession given, the receipt may come to a maximum of 10% of the fare revenue. In Japan, the average

Table 6.2.3 Estimated Annual Investment on Construction Cost

Unit 1000 US$

	Alternative 1. Construction starging from Baclaran						Alternative 2. Construction starting from U.P.					
	(A) All Underground			(B) Partially Elevated			(A) All underground			(B) Partially Elevated		
	Foreign Currency	Local Currency	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1. 1976	333	333	666	333	333	666	333	333	666	333	333	666
2. 1977	333	333	666	333	333	666	666	333	999	333	333	666
3. 1978	3000	4167	7167	3000	4167	7167	4167	4433	8600	3000	4000	7000
4. 1979	3477	4876	8353	3430	4834	8264	4923	5244	10167	3130	4350	7480
5. 1980	14066	25061	39667	14066	25601	39667	18137	33196	51333	11774	21559	33333
6. 1981	45884	45259	91143	45597	45666	91263	55236	56294	111530	47027	42640	89667
7. 1982	59153	65424	124577	58960	64577	123537	68284	75916	144200	60717	62793	123510
8. 1983	34524	32993	67517	34003	33150	67153	32117	30950	63067	32193	31207	63400
9. 1984	51170	64730	115900	41383	50007	91390	44346	50148	94494	43940	49747	93687
10. 1985	39347	39420	78767	30807	24693	55500	30443	30867	61300	30037	30463	60500
11. 1986	41873	43621	85494	34373	32474	66847	34334	38406	72740	33809	38044	66853
12. 1987	20417	12500	32917	20453	12480	32933	20610	12790	33400	20530	12537	33067
13. 1988	21183	13223	34406	21234	13353	34587	21217	13460	34677	21257	13647	34904
Total	334760	352480	687240	307972	311668	619640	334803	352370	687173	308080	311653	619733

Table 6.2.4 Estimated Fare Revenue for Key Years

Year	Section in Operation	Case 1. PNR improved to rapid transit railway level		Case 2. PNR not improved to rapid transit railway level	
		Daily Passenger Volume (1,000)	Annual Revenue (1,000 US$)	Daily Passenger Volume (1,000)	Annual Revenue (1,000 US$)
Recommended Alternative (Construction Starting from U.P.)					
1983	U.P. - F.E.U.	326.2	5,996	320.3	5,845
1985	U.P. - Rizal Park	533.3	9,461	575.6	10,003
1987	U.P. - Baclaran	826.2	16,159	902.7	17,389
1989	Whole Line (U.P. - MDA)	896.2	17,599	979.5	18,964
2000	"	1,280.1	25,506	1,369.0	26,939
Compared Alternative (Construction Starting from Baclaran)					
	Baclaran - Rizal Park	126.9	2,355	214.6	3,150
1983	Baclaran - U.S.T.	362.6	6,424	483.2	7,861
1985	Baclaran - U.P.	826.2	16,159	902.7	17,389
1987	Whole Line (MDA - U.P.)	896.2	17,599	979.5	18,964
2000	"	1,280.1	25,506	1,369.0	26,939

Table 6.2.5 Effects of Variation in Fare Rate on Annual Fare Revenue

	Passenger Volume (1,000 pass./year)			Passenger	Fare Revenue (Million US$/yr.)			Revenue
	Under 8 km in trip length	Over 8 km in trip length	Total	Index(%)	Under 8 km	Over 8 km	Total	Index(%)
At proposed fare rate	863	417	1,280	100.0	14.4	11.1	25.5	100
At 20% higher rate	812	408	1,220	95.3	16.2	13.1	29.3	114
At 40% higher rate	760	400	1,160	90.6	17.7	15.0	32.7	128
At 60% higher rate	708	392	1,100	85.9	8.8	16.8	35.6	140
At 80% higher rate	656	383	1,039	81.2	19.6	18.5	38.1	149
At 100% higher rate	604	375	979	76.5	20.1	20.1	40.2	158
At 120% higher rate	553	366	919	71.8	20.2	21.6	41.8	164
At 140% higher rate	501	358	859	67.1	20.0	23.0	43.0	169
At 160% higher rate	449	350	799	62.4	19.4	24.4	43.8	172
At 180% higher rate	397	342	739	57.7	18.5	25.6	44.1	173
At 200% higher rate	346	333	679	53.0	17.2	26.8	44.0	172
At 220% higher rate	294	324	618	48.3	15.6	27.8	43.4	170
At 240% higher rate	242	316	558	43.6	13.7	28.8	42.5	167
At 260% higher rate	190	308	498	38.9	11.4	29.7	41.1	161
At Uniform rate of 40 ct.	790	432	1,222	95.5	15.4	8.4	23.8	93
At Uniform rate of 60 ct.	617	412	1,029	80.4	18.1	12.0	30.1	118
At Uniform rate of 80 ct.	449	397	846	66.1	17.5	15.5	32.9	129

miscellaneous revenue for the various mass transit systems is about 6.8%. For the Manila rapid transit railway system, it is conservative estimated that the miscellaneous revenue will come to 3.0% of the fare revenue.

2.4.3 Effect of Variation in Fare Rate on Annual Fare Revenue

As already indicate previously, a raise in fare rate by a percentage will not result in the increase in revenue by the same percentage since a higher fare will result in a loss in traffic volume and consequently fare revenue. In fact there is a maximum fare above which both the traffic volume and the fare revenue will decrease.

Here an estimation of the fare revenue basing on the recommended fare structure and fare level is made for the year 2000 and the effect of raising the fare rate by stages of 20% above the recommended fare when the fare rates of existing modes of mass transit remain unchanged is analysed, by applying the "elasticity of demand" describes in page 6-48 in this chapter. Table 6.2.5 and Fig. 6.2.2 showed the results of the calculation.

It is seen from the table that the increase of the first 20% of fare rate results in an increase of 14.9% in revenue, but the percentage increase in revenue gradually diminishes for further raise in fare rate. The fare revenue reaches the maximum of US$44.1 million per year when the fare rate is raised to 2.8 times the recommended rate for a minimum fare of 70 ct per trip. The increase in total fare revenue is however only about 73% as compared to that at the recommended rate. A fare rate beyond this will result in a decrease in revenue.

Although raising the fare by 180% will increase the total fare revenue by about 73%, this is effected at a loss of 42% of the passenger volume, so that the daily volume of passengers will fall from 1.28 million per day to 0.74 million per year. From the point of attracting as large a number of passengers from the surface transport as possible to relieve traffic congestion, it is not considered desirable to raise the fare rate to too higher a level when the fare rates of the existing modes of public transport remain unchanged, and should a fare rate higher than the recommended rate be adopted, the raise should be confined to a lower percentage.

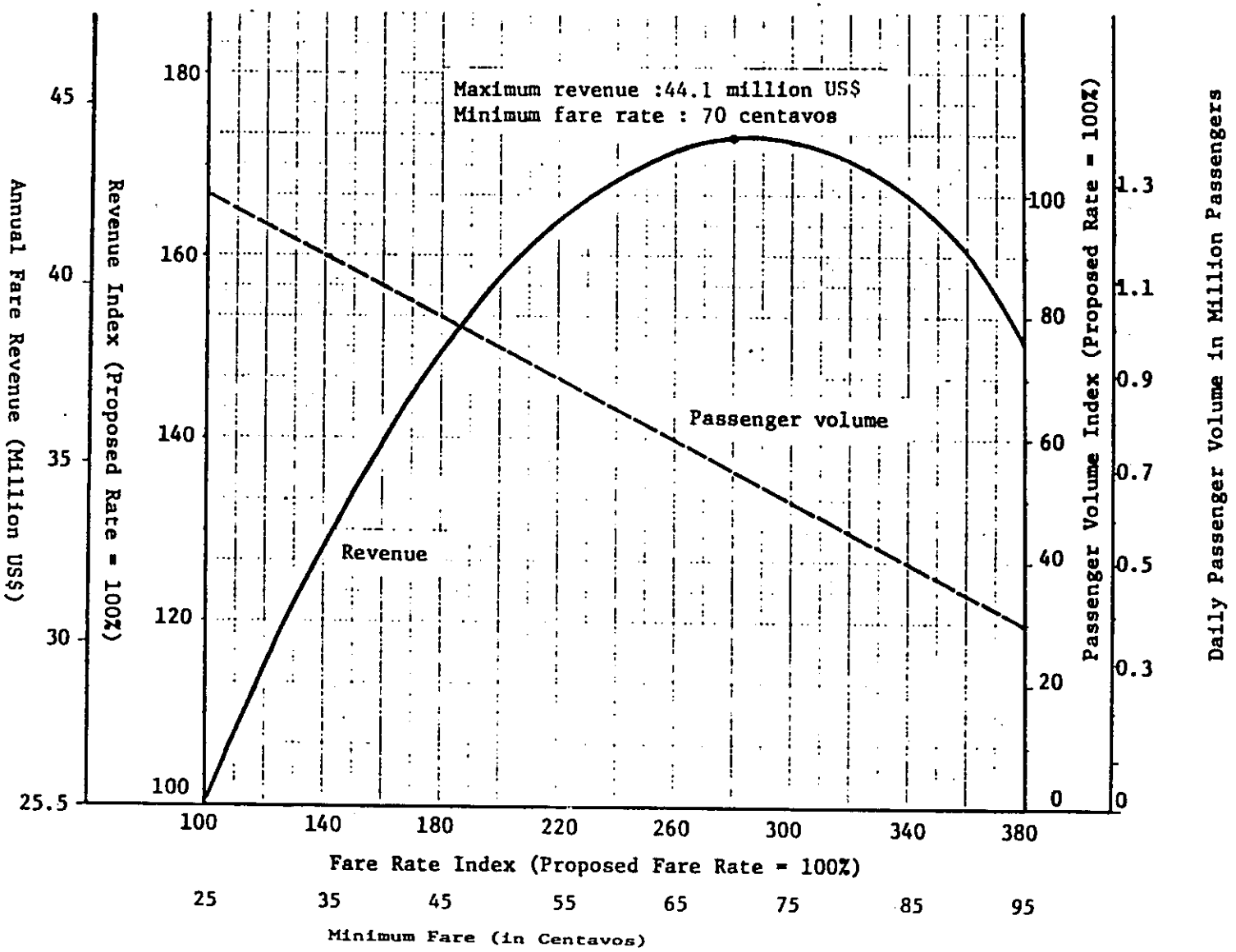
2.5 CASH FLOW PLAN

With the annual revenue and operating expenses estimated, the current cash flow of the operation of the railway system excluding the capital costs may be determined. A cash flow plan including the capital cost element, however, cannot be made until the operational and financial policy is decided. In this section, a few assumptions on the operational and financial policy are made as follows:

(1) Organization: It is assumed that the rapid transit railway system will be operated by a public corporation with the capital cost borne by the government. Thus the interest payable on the capital investment will be borne by the government and will not be included in the cash flow plan.

(2) Subsidy: Although the fare of the system is so determined that when the whole line is completed and operation enters the stable stage the revenue will be sufficient to cover the annual expenses, it is anticipated that dificits in operation will be recorded during the initial years, due to the low passenger

Fig. 6.2.2 Effects of Variation in Fare Rate on Annual Fare Revenue and Daily Passenger Volume, Year 2000



volume when the line is only partially operational. It is assumed that the deficit of the initial years will be subsidized by the government without interest. On the other hand, during the latter years, all surplus recorded will be paid up to the government to aid in the repayment of capital cost.

(3) Depreciation: The structures, facilities and equipments constructed and installed will be annual depreciated, and it is necessary to make an annual depreciation deposit for future replacement of the totally depreciated elements. By this means, it will ensure that the railway system will virtually be permanently in operation for an unlimited number of years. Thus when depreciation is considered in the financial plan, it will also be necessary to make the financial analysis for an unlimited number of years, to bring the factors under analysis to the same condition. However, since the period under analysis is limited, it may be convenient to make the financial analysis without taking depreciation into consideration. In this case, the residue value that is also not considered is in fact an extra plus factor for the financial position of the system. In this study, the period of analysis is assumed to be 30 years after the opening of the first section or about 20 years after the completion of the whole time.

Basing on the above assumptions, the annual cash flow plan based on the annual revenues and operating expenses of the system is calculated for the recommended alternative in the case that the PNR is improved to rapid transit railway level. Table 6-2-6 shows the results when the operation is started from U.P. side as recommended while Table 6-2-7 shows the results should the operation be started from Baclaran side.

It will be seen from the above table that from the point of annual revenues and operation expenses, the system will be operating at a deficit for the first few years when only part of the recommended route is in operation. However, the operation will turn profitable on the very first year that the whole recommended route is operational. The accumulated profit over a thirty year period is estimated at over 156 million US$ for the recommended alternative, whereas that for the case of operation from Baclaran side will come to a slightly lower 141 million US$.

26 FINANCIAL INVESTMENT PLAN

In the preparation of cash flow plan of the system, it was assumed that the government will bear the capital cost and interest on any loan of the foreign currency portion of the capital cost. Also, it was assumed that the government will subsidize any deficit in operational deficit and receive any operational surplus. In this section a financial investment plan of the government will be made to analyze the annual amount that the government has to appropriate for the implementation of the rapid transit railway Line No. 1.

Table 6.2.6
Cash Flow Plan for Recommended Alternative (Estimated Annual Revenue and Operating Expenses)

1) PNR is improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from U.P.
4) Stage 4 not included

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	326.2	351.3	533.3	556.4	826.2	861.0	896.2	931.1	966.0	1000.9	1035.8	1070.7	1105.6	1140.5	1175.4
2	Annual Passenger Volume (million passengers)	119.1	128.3	194.7	203.1	301.6	314.3	327.1	339.8	352.6	365.3	378.1	390.8	403.5	416.3	429.0
3	Annual Fare Revenue (1,000 US$)(@US$1=P7.50)	5996	6483	9461	9888	16159	16877	17599	18318	19037	19756	20474	21193	21912	22631	23350
4	Miscellaneous Revenue (1,000 US$)	180	194	284	297	485	506	528	550	571	593	614	636	657	679	701
5	Total Annual Revenue (1,000 US$)	6176	6677	9745	10185	16644	17383	18127	18868	19408	20349	21088	21829	22569	23310	24050
6	Annual Operating Expenses (1,000 US$)	6663	7156	11043	11502	16563	17264	17971	18146	18320	18495	18670	18844	19019	19193	19368
7	Annual Profit/Loss (1,000 US$)	-487	-479	-1298	-1317	81	119	156	722	1088	1854	2418	2985	3550	4117	4682
8	Accumulated Profit/Loss (1,000 US$)	-487	-966	-2264	-3581	-3500	-3381	-3225	-2503	-1415	439	2857	5842	9392	13509	18191
9	Section in Operation	UP - FEU		UP - Rizal Park		UP - Baclaran										

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1210.3	1245.2	1280.1	1315.0	1349.9	1384.8	1419.7	1454.6	1489.5	1524.4	1559.3	1594.2	1629.1	1664.0	1698.9
2	Annual Passenger Volume	441.8	454.5	467.2	480.0	492.7	505.4	518.2	530.9	543.7	556.4	569.1	581.9	594.6	607.4	620.1
3	Annual Fare Revenue	24068	24787	25506	26225	26943	27662	28381	29100	29818	30537	31256	31975	32694	33412	34131
4	Annual Miscellaneous Revenue	722	744	765	787	808	830	851	873	895	916	938	959	981	1002	1024
5	Total Annual Revenue	24790	25531	26271	27012	27751	28492	29232	29973	30713	31453	32194	32934	33675	34414	35155
6	Annual Operating Expenses	19543	19717	19892	20067	20241	20416	20591	20765	20940	21114	21289	21464	21638	21813	21988
7	Annual Profit/Loss	5247	5814	6379	6945	7510	8076	8641	9208	9773	10339	10905	11470	12037	12601	13167
8	Accumulated Profit/Loss	23438	29252	35631	42576	50086	58162	66803	76011	85784	96123	107028	118498	130535	143136	156303
9	Section in Operation															

Table 6.2.7
Cash Flow Plan for Compared Alternative (1)
(Estimated Annual Revenue and Operating Expenses)

1) PNR is improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from Baclaran
4) Stage 4 not included

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	126.9	134.4	362.6	375.9	826.2	861.0	896.2	931.1	966.0	1000.9	1035.8	1070.7	1105.6	1140.5	1175.4
2	Annual Passenger Volume (million passengers)	46.3	49.1	132.3	137.2	301.6	314.3	327.1	339.8	352.6	365.3	378.1	390.8	403.5	416.3	429.0
3	Annual Fare Revenue (1,000 US$)(@US$1=P27.50)	2355	2491	6424	6686	16159	16877	17599	18318	19037	19756	20474	21193	21912	22631	23350
4	Miscellaneous Revenue (1,000 US$)	71	75	193	201	485	506	528	550	571	593	614	636	657	679	701
5	Total Annual Revenue (1,000 US$)	2426	2566	6617	6887	16644	17383	18127	18868	19408	20349	21088	21829	22569	23310	24050
6	Annual Operating Expenses (1,000 US$)	6110	6375	10943	11317	16567	17265	17971	18146	18320	18495	18670	18844	19019	19193	19368
7	Annual Profit/Loss (1,000 US$)	-3684	-3809	-4326	-4430	77	118	156	722	1088	1854	2418	2985	3550	4117	4682
8	Accumulated Profit/Loss (1,000 US$)	-3684	-7493	-11819	-16249	-16172	-16054	-15898	-15176	-14088	-12234	-9816	-9249	-5699	-1582	3100
9	Section in Operation	Baclaran-Rizal Park		Baclaran-UST		Baclaran - UP										

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1210.3	1245.2	1280.1	1315.0	1349.9	1384.8	1419.7	1454.6	1489.5	1524.4	1559.3	1594.2	1629.1	1664.0	1698.9
2	Annual Passenger Volume	441.8	454.5	467.2	480.0	492.7	505.4	518.2	530.9	543.7	556.4	569.1	581.9	594.6	607.4	620.1
3	Annual Fare Revenue	24068	24787	25506	26225	26943	27662	28381	29100	29818	30537	31256	31975	32694	33412	34131
4	Annual Miscellaneous Revenue	722	744	765	787	808	830	851	873	895	916	938	959	981	1002	1024
5	Total Annual Revenue	24790	25531	26271	27012	27751	28492	29232	29973	30713	31453	32194	32934	33675	34414	35155
6	Annual Operating Expenses	19543	19717	19892	20067	20241	20416	20591	20765	20940	21114	21289	21464	21638	21813	21988
7	Annual Profit/Loss	5247	5814	6379	6945	7510	8076	8641	9208	9773	10339	10905	11470	12037	12601	13167
8	Accumulated Profit/Loss	8347	14161	20540	27485	34995	43071	51712	60920	70693	81032	91937	103407	115444	128045	141212
9	Section in Operation															

The calculation will be based on the following assumptions of financial conditions.

(1) Foreign loan: The whole foreign currency portion of the construction cost is assumed to be procured through foreign loan, at an interest rate of 7.5%. The terms of repayment are assumed to be 7 years grace period and 25 years equal payment.

(2) Local currency: It is assumed that all local currency costs will be appropriated directly through government budget, and no interest will be paid. This will include the local currency portion of the capital cost as well as government subsidy on operational deficits. Thus, should the financial source for this portion be sought in domestic financial market, the investment plan will have to be revised to include the interest on the domestic loans.

Table 6.2.8 shows the result of the annual financial investment plan for the recommended alternative whereas the results if operation is started from Baclaran side is shown in Table 6.2.9 as compared alternative (1).

It will be seen that in both cases, the repayment of foreign loan will be completed on the 42th year after initiation of implementation of the construction porgram or 35 years after opening of the first section for operation. A net profit will be recorded from the 30th year after operation in both cases. However, the entire sum of capital investment cannot be recovered within the analysis period. Thus, after repayment of the whole foreign currency loan, the accumulated total expenditure by the government will come to over US$703 million for the recommended alternative and US$716 million for the alternative that operation is started from Baclaran side.

2.7 CASH FLOW PLAN AND FINANCIAL INVESTMENT PLAN OF OTHER COMPARED ALTERNATIVES

The recommended alternative had been decided after comparative studies of the traffic, engineering, economic and financial aspects of various alternatives differing in type of structure, staging of construction as well as the total length of the route. The findings of the financial analysis have a strong influence on the final recommendation. Here, the results of financial analysis on all the compared alternatives are presented in the subsequent pages for reference purpose. These comparative analyses were made with the assumption that the PNR will be improved to rapid transit railway level (case 1) and that the route will include stage 4 which is the extending of the line from Baclaran to the airport. The cases are based on a combination of the two following factors:

(a) Stage construction schedule of the line
  (i) Alternative 1: Construction staring from U.P. side
  (ii) Alternative 2: Construction starting from Baclaran side

(b) Type of structure
  (i) Alternative (A): Partially elevated (U.P. - Sto. Domingo)
  (ii) Alternative (B): All underground

The results of these calculations for the alternatives are presented in the following order.

(i) Table 6.2.10 and 6.2.11: Cash flow plan and financial plan for compared alternative (2).

Table 6.2.8 Financial Investment Plan for Recommended Alternative

1) PNR is improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from U.P.
4) Stage 4 not included

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-	333	-	333	333		333	
2	1977	333		25	25	666	25	333	358		358	
3	1978	3000		50	50	3666	50	4000	4050		4050	
4	1979	3130		275	275	6796	275	4350	4625		4625	
5	1980	11774		510	510	18570	510	21559	22069		22069	31435
6	1981	47027		1393	1393	65597	1393	42640	44033		44033	75468
7	1982	60717		4920	4920	126314	4920	62793	67713		67713	143181
8	1983	32193	13	9474	9487	158494	9487	31207	40694	-487	41181	184362
9	1984	43940	27	11887	11914	202407	11914	49747	61661	-479	62140	246502
10	1985	30037	147	15181	15328	232297	15328	30463	45791	-1298	47089	293591
11	1986	32823	272	17422	17694	264848	17694	34851	52545	-1317	53862	347453
12	1987		743	19864	20607	264105	20607		20607	81	20526	367979
13	1988		2624	19808	22432	261481	22432		22432	119	22313	390292
14	1989		5053	19611	24664	256428	24664		24664	156	24508	414800
15	1990		6340	19232	25572	250088	25572		25572	722	24850	439650
16	1991		8098	18757	26855	241990	26855		26855	1088	25767	465417
17	1992		9299	18149	27448	232691	27448		27448	1854	25594	491011
18	1993		10612	17452	28064	222079	28064		28064	2418	25646	516657
19	1994		10612	16656	27268	211467	27268		27268	2985	24283	540940
20	1995		10612	15860	26472	200855	26472		26472	3550	22922	563862
21	1996		10612	15064	25676	190243	25676		25676	4117	21559	585421
22	1997		10612	14268	24880	179631	24880		24880	4682	20198	605619
23	1998		10612	13472	24084	169019	24084		24084	5247	18837	624456
24	1999		10612	12676	23288	158407	23288		23288	5814	17474	641930
25	2000		10612	11881	22493	147795	22493		22493	6379	16114	658044
26	2001		10612	11085	21697	137183	21697		21697	6945	14752	672796
27	2002		10612	10289	20901	126571	20901		20901	7510	13391	686187
28	2003		10612	9493	20105	115959	20105		20105	8076	12029	698216
29	2004		10612	8697	19309	105347	19309		19309	8641	10668	708884
30	2005		10612	7901	18513	94725	18513		18513	9208	9305	718189
31	2006		10612	7105	17717	84123	17717		17717	9773	7944	726133
32	2007		10612	6309	16921	73511	16921		16921	10339	6582	732715
33	2008		10599	5513	16112	62912	16112		16112	10905	5207	737922
34	2009		10586	4718	15304	5232	15304		15304	11470	3834	741756
35	2010		10466	3924	14390	41860	14390		14390	12037	2353	744109
36	2011		10341	3140	13481	31519	13481		13481	12601	880	744989
37	2012		9870	2364	12234	21649	12234		12234	13167	*933	744056
38	2013		7989	1624	9613	13660	9613		9613	13167	*3554	740502
39	2014		5560	1025	6585	8100	6585		6585	13167	*6582	733920
40	2015		4272	608	4880	3828	4880		4880	13167	*8287	725633
41	2016		2514	287	2801	1314	2801		2801	13167	*10366	715267
42	2017		1314	99	1413	0	1413		1413	13167	*11754	703513
43	2018											
44	2019											
Total		265307	265307	378068	643375		643375	282276	925651	222138	703513	

(in 1,000 US$)

Table 6.2.9 Financial Investment Plan for Compared Alternative (1)

1) PNR is improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from Baclaran
4) Stage 4 not included

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-	333	-	333	333		333	333
2	1977	333		25	25	666	25	333	358		358	691
3	1978	3000		50	50	3666	50	4167	4217		4217	4908
4	1979	3430		275	275	7096	275	4834	5109		5109	10017
5	1980	14066		532	532	21162	532	25601	26133		26133	36150
6	1981	45597		1587	1587	66759	1587	45666	47253		47253	83403
7	1982	58960		5007	5007	125719	5007	64577	69584		69584	152987
8	1983	34003	13	9429	9442	159709	9442	33150	42592	-3684	46276	199263
9	1984	41383	27	11978	12005	201065	12005	50007	62012	-3809	65821	265084
10	1985	30807	147	15080	15227	231725	15227	24693	39920	-4326	44246	309330
11	1986	33410	284	17379	17663	264851	17663	29301	46964	-4430	51394	360724
12	1987		846	19864	20710	264005	20710		20710	77	20633	381357
13	1988		2670	19800	22470	261335	22470		22470	118	22352	403709
14	1989		5029	19600	24629	256306	24629		24629	156	24473	428182
15	1990		6389	19223	25612	249917	25612		25612	722	24890	453072
16	1991		8044	18744	26788	241873	26788		26788	1088	25700	478772
17	1992		9276	18140	27416	232597	27416		27416	1854	25562	504334
18	1993		10613	17445	28058	221984	28058		28058	2418	25640	529974
19	1994		10613	16649	27262	211371	27262		27262	2985	24277	554251
20	1995		10613	15853	26466	200758	26466		26466	3550	22916	577167
21	1996		10613	15057	25670	190145	25670		25670	4117	21553	598720
22	1997		10613	14261	24874	179532	24874		24874	4682	20192	618912
23	1998		10613	13465	24078	168919	24078		24078	5247	18831	637743
24	1999		10613	12669	23282	158306	23282		23282	5814	17468	655211
25	2000		10613	11873	22486	147693	22486		22486	6379	16107	671318
26	2001		10613	11077	21690	137080	21690		21690	6945	14745	686063
27	2002		10613	10281	20894	126467	20894		20894	7510	13384	699447
28	2003		10613	9485	20098	115854	20098		20098	8076	12022	711469
29	2004		10613	8689	19302	105241	19302		19302	8641	10661	722130
30	2005		10613	7893	18506	94628	18506		18506	9208	9298	731428
31	2006		10613	7097	17710	84015	17710		17710	9773	7937	739365
32	2007		10613	6301	16914	73402	16914		16914	10339	6575	745940
33	2008		10600	5505	16105	62802	16105		16105	10905	5200	751140
34	2009		10586	4710	15296	52216	15296		15296	11470	3826	754966
35	2010		10466	3916	14382	41750	14382		14382	12037	2345	757311
36	2011		10329	3131	13460	31421	13460		13460	12601	859	758170
37	2012		9766	2357	12123	21655	12123		12123	13167	*1044	757126
38	2013		7942	1624	9566	13713	9566		9566	13167	*3601	753525
39	2014		5584	1028	6612	8129	6612		6612	13167	*6555	746970
40	2015		4224	610	4834	3905	4834		4834	13167	*8333	738637
41	2016		2569	293	2862	1336	2862		2862	13167	*10305	728332
42	2017		1336	100	1436	0	1436		1436	13167	*11731	716601
43	2018		-	-		-						
44	2019		-			-						
Total		265322	265322	378082	643404		643404	282662	926066	209465	716601	

(in 1,000 US$)

Table 6.2.10
Cash Flow Plan for Compared Alternative (2)
(Estimated Annual Revenue and Operating Expenses)

1) PNR is improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from U.P.
4) Stage 4 included

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	326.2	351.3	533.3	556.4	826.2	861.0	896.2	931.1	966.0	1000.9	1035.8	1070.7	1105.6	1140.5	1175.4
2	Annual Passenger Volume (million passengers)	119.1	128.2	194.7	203.1	301.6	314.3	327.1	339.8	352.6	365.3	378.1	390.8	403.5	416.3	429.0
3	Annual Fare Revenue (1,000 US$)(@US$1=P7.50)	5996	6483	9461	9888	16159	16877	17599	18318	19037	19756	20474	21193	21912	22631	23350
4	Miscellaneous Revenue (1,000 US$)	180	194	284	297	485	506	528	550	571	593	614	636	657	679	701
5	Total Annual Revenue (1,000 US$)	6176	6677	9745	10185	16644	17383	18127	18868	19408	20349	21088	21829	22569	23310	24050
6	Annual Operating Expenses (1,000 US$)	6663	7156	11043	11502	16563	17264	20197	20393	20590	20786	20982	21179	21375	21571	21767
7	Annual Profit/Loss (1,000 US$)	-487	-479	-1298	-1317	81	119	-2070	-1525	-1182	-437	106	650	1194	1739	2283
8	Accumulated Profit/Loss (1,000 US$)	-487	-966	-2264	-3581	-3500	-3381	-5451	-6976	-8158	-8595	-8489	-7839	-6645	-4906	-2623
9	Section in Operation	UF - FEU		UP-Rizal Park		UP- Baclaran			Whole Line (UP - Manila Domestic Airport)							

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1210.3	1245.2	1280.1	1315.0	1349.9	1384.8	1419.7	1454.6	1489.5	1524.4	1559.3	1594.2	1629.1	1664.0	1698.9
2	Annual Passenger Volume	441.8	454.5	467.2	480.0	492.7	505.4	518.2	530.9	543.7	556.4	569.1	581.9	594.6	607.4	620.1
3	Annual Fare Revenue	24068	24787	25506	26225	26943	27662	28381	29100	29818	30537	31256	31975	32694	33412	34131
4	Annual Miscellaneous Revenue	722	744	765	787	808	830	851	873	895	916	938	959	981	1002	1024
5	Total Annual Revenue	24790	25531	26271	27012	27751	28492	29232	29973	30713	31453	32194	32934	33675	34414	35155
6	Annual Operating Expenses	21964	22160	22356	22553	22749	22945	23142	23338	23534	23730	23927	24123	24319	24516	24712
7	Annual Profit/Loss	2826	3371	3915	4459	5002	5547	6090	6635	7179	7723	8267	8811	9356	9898	10443
8	Accumulated Profit/Loss	203	3574	7489	11948	16950	22497	28587	35222	42401	50124	58391	67202	76558	86456	96899
9	Section in Operation	Whole Line														

Table 6.2.11 Financial Investment Plan for Compared Alternative (2)

1) PNR is improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from U.P.
4) Stage 4 included

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-	333	-	333	333	-	333	333
2	1977	333		23	23	666	23	333	356	-	356	689
3	1978	3000		47	47	3666	47	4000	4047	-	4047	4736
4	1979	3130		257	257	6796	257	4350	4607	-	4607	9343
5	1980	11774		476	476	18570	476	21559	22035	-	22035	31378
6	1981	47027		1300	1300	65597	1300	42640	43940	-	43940	75318
7	1982	60717		4592	4592	126314	4592	62793	67385	-	67385	142703
8	1983	32193	13	8842	8855	158494	8855	31207	40062	-487	40549	183252
9	1984	43940	27	11095	11122	202407	11122	49747	60869	-479	61348	244600
10	1985	30037	147	14168	14315	232297	14315	30463	44778	-1298	46076	290676
11	1986	33809	272	16261	16533	265834	16533	38044	54577	-1317	55894	346570
12	1987	20530	743	18608	19351	285621	19351	12537	31888	81	31807	378377
13	1988	21257	2624	19993	22617	304254	22617	13647	36264	119	36145	414522
14	1989		5053	21298	26351	299201	26351		26351	-2070	28421	442943
15	1990		6340	20944	27284	292861	27284		27284	-1525	28809	471752
16	1991		8098	20500	28598	284763	28598		28598	-1182	29780	501532
17	1992		9299	19933	29232	275464	29232		29232	-437	29669	531201
18	1993		10652	19282	29934	264812	29934		29934	106	29828	561029
19	1994		11473	18537	30010	253339	30010		30010	650	29360	590389
20	1995		12323	17734	30057	241016	30057		30057	1194	28863	619252
21	1996		12323	16871	29194	228693	29194		29194	1739	27455	646707
22	1997		12323	16009	28332	216370	28332		28332	2283	26049	672756
23	1998		12323	15146	27469	204047	27469		27469	2826	24643	697399
24	1999		12323	14283	26606	191724	26606		26606	3371	23235	720634
25	2000		12323	13421	25744	179401	25744		25744	3915	21829	742463
26	2001		12323	12558	24881	167078	24881		24881	4459	20422	762885
27	2002		12323	11695	24018	154755	24018		24018	5002	19016	781901
28	2003		12323	10833	23156	142432	23156		23156	5547	17609	799510
29	2004		12323	9970	22293	130109	22293		22293	6090	16203	815713
30	2005		12323	9108	21431	117786	21431		21431	6635	14796	830509
31	2006		12323	8245	20568	105463	20568		20568	7179	13389	843898
32	2007		12323	7382	19705	93140	19705		19705	7723	11982	855880
33	2008		12310	6520	18830	80830	18830		18830	8267	10563	866443
34	2009		12297	5658	17955	68533	17955		17955	8811	9144	875587
35	2010		12177	4797	16974	56356	16974		16974	9356	7618	883205
36	2011		12051	3945	15996	44305	15996		15996	9898	6098	889303
37	2012		11581	3101	14682	32724	14682		14682	10443	4239	893542
38	2013		9699	2291	11990	23025	11990		11990	10443	1547	895089
39	2014		7271	1612	8883	15754	8883		8883	10443	*1560	893529
40	2015		5983	1103	7086	9771	7086		7086	10443	*3357	890172
41	2016		4225	684	4909	5546	4909		4909	10443	*5534	884638
42	2017		3024	388	3412	2522	3412		3412	10443	*7031	877607
43	2018		1672	177	1849	850	1849		1849	10443	*8594	869013
44	2019		850	60	910	0	910		910	10443	*9533	859480
Total		308080	308080	409747	717827		717827	311653	1029480	170000	859480	

(in 1,000 US$)

Partially elevated structure with construction starting from U.P. side (PNR improved)

(ii) Tables 6.2.12 and 6.2.13: Compared alternative (3)
Partially elevated structure with construction starting from Baclaran side (PNR improved)

(iii) Tables 6.2.14 and 6.2.15: Compared alternative (4)
All underground structure with construction starting from U.P. side (PNR improved)

(iv) Tables 6.2.16 and 6.2.17 Compared alternative (5)
All underground structure with construction starting from Baclaran side (PNR improved)

Although the above calculations have been made on the assumption that the PNR will be improved to rapid transit railway level, it cannot be denied that the non-improvement of PNR to fulfil this assumption will result in considerable variation in traffic volume. To ascertain the implication of the non-improvement of PNR in the financial analysis of the system, comparative studies have also been made for all the above mentioned alternatives on the assumption that PNR is not improved (case 2) and the results are as follows.

(i) Tables 6.2.18 and 6.2.19: Compared alternative (6)
Partially elevated structure with construction starting from U.P. side (PNR not improved)

(ii) Tables 6.2.20 and 6.2.21: Compared alternative (7)
Partially elevated structure with construction from Baclaran side (PNR not improved)

(iii) Tables 6.2.22 and 6.2.23: Compared alternative (8)
All underground structure with construction from U.P. side (PNR not improved)

(iv) Tables 6.2.24 and 6.2.25: Compared alternative (9)
All underground structure with construction from Baclaran side (PNR not improved)

From the above cash flow plans, a few observation may be made.

1) In all case, the system will be operating at a deficit for the initial years, varying from a 8 year deficit period for compared alternative (7), to 13 year for compared alternative (5), and, as for accumulated profit/loss, the former breaks even on the 9th year, while the later takes 23 years to break even. The accumulated profit at the end of the period of analysis is about 136 million US$ for the former and only about 53 million US$ for the latter.

2) The state of improvement of the PNR commuter service will affect the passenger volume, and consequently the annual revenue of the system. Thus, if the PNR is not improved to rapid transit railway level, it is estimated that the annual revenue will

Table 6.2.12
Cash Flow Plan for Compared Alternative (3)
(Estimated Annual Revenue and Operating Expenses)

1) PNR is improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from Baclaran
4) Stage 4 included

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	126.9	134.4	362.6	375.9	826.2	861.0	896.2	931.1	966.0	1000.9	1035.8	1070.7	1105.6	1140.5	1175.4
2	Annual Passenger Volume (million passengers)	46.3	49.1	132.3	137.2	301.6	314.3	327.1	339.8	352.6	365.3	378.1	390.8	403.5	416.3	429.0
3	Annual Fare Revenue (1,000 US$)(@US$1=P27.50)	2355	2491	6424	6686	16159	16877	17599	18318	19037	19756	20474	21193	21912	22631	23350
4	Miscellaneous Revenue (1,000 US$)	71	75	193	201	485	506	528	550	571	593	614	636	657	679	701
5	Total Annual Revenue (1,000 US$)	2426	2566	6617	6887	16644	17383	18127	18868	19408	20349	21088	21829	22569	23310	24050
6	Annual Operating Expenses (1,000 US$)	6110	6375	10943	11317	16567	17265	20197	20393	20590	20786	20982	21179	21375	21571	21767
7	Annual Profit/Loss (1,000 US$)	-3684	-3809	-4326	-4430	77	118	-2070	-1525	-1182	-437	106	650	1194	1739	2283
8	Accumulated Profit/Loss (1,000 US$)	-3684	-7493	-11819	-16249	-16172	-16054	-18124	-19649	-20831	-21268	-21162	-20512	-19318	-17579	-15296
9	Section in Operation	Baclaran-Rizal Park		Baclaran -UST		Baclaran - UP		Whole Line (Manila Domestic Airport - UP)								

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1210.3	1245.2	1280.1	1315.0	1349.9	1384.8	1419.7	1454.6	1489.5	1524.4	1559.3	1594.2	1629.1	1664.0	1698.9
2	Annual Passenger Volume	441.8	454.5	467.2	480.0	492.7	505.4	518.2	530.9	543.7	556.4	569.1	581.9	594.6	607.4	620.1
3	Annual Fare Revenue	24068	24787	25506	26225	26943	27662	28381	29100	29818	30537	31256	31975	32694	33412	34131
4	Annual Miscellaneous Revenue	722	744	765	787	808	830	851	873	895	916	938	959	981	1002	1024
5	Total Annual Revenue	24790	25531	26271	27012	27751	28492	29232	29973	30713	31453	32194	32934	33675	34414	35155
6	Annual Operating Expenses	21964	22160	22356	22553	22749	22945	23142	23338	23534	23730	23927	24123	24319	24516	24712
7	Annual Profit/Loss	2826	3371	3915	4459	5002	5547	6090	6635	7179	7723	8267	8811	9356	9898	10443
8	Accumulated Profit/Loss	-12470	-9099	-5184	-725	4277	9824	15914	22549	29728	37451	45718	54529	63885	73783	84226
9	Section in Operation	Whole Line														

Table 6.2.13 Financial Investment Plan for Compared Alternative (3)

1) PNR is improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from Baclaran
4) Stage 4 included

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-		-	333	333	-	333	333
2	1977	333		23	23		23	333	356	-	356	689
3	1978	3000		47	47		47	4167	4214	-	4214	4903
4	1979	3430		257	257		257	4834	5091	-	5091	9994
5	1980	14066		497	497		497	25601	26098	-	26098	36092
6	1981	45597		1481	1481		1481	45666	47147	-	47147	83239
7	1982	58960		4673	4673		4673	64577	69250	-	69250	152489
8	1983	34003	13	8800	8813	159709	8813	33150	41963	-3684	45647	198136
9	1984	41383	27	11180	11207	201065	11207	50007	61214	-3809	65023	263159
10	1985	30807	147	14075	14222	231725	14222	24693	38915	-4326	43241	306400
11	1986	34373	284	16221	16505	265814	16505	32474	48979	-4430	53409	359809
12	1987	20453	846	18607	19453	285421	19453	12480	31933	77	31856	391665
13	1988	21234	2670	19979	22649	303985	22649	13353	36002	118	35884	427549
14	1989		5029	21279	26308	298956	26308	-	26308	-2070	28378	455927
15	1990		6389	20927	27316	292567	27316		27316	-1525	28841	484768
16	1991		8044	20480	28524	284523	28524		28524	-1182	29706	514474
17	1992		9276	19917	29193	275247	29193		29193	-437	29630	544104
18	1993		10651	19267	29918	264596	29918		29918	106	29812	573916
19	1994		11470	18522	29992	253126	29992		29992	650	29342	603258
20	1995		12319	17719	30038	240807	30038		30038	1194	28844	632102
21	1996		12319	16856	29175	228488	29175		29175	1739	27436	659538
22	1997		12319	15994	28313	216169	28313		28313	2283	26030	685568
23	1998		12319	15132	27451	203850	27451		27451	2826	24625	710193
24	1999		12319	14270	26589	191531	26589		26589	3371	23218	733411
25	2000		12319	13407	25726	179212	25726		25726	3915	21811	755222
26	2001		12319	12545	24864	166893	24864		24864	4459	20405	775627
27	2002		12319	11683	24002	154574	24002		24002	5002	19000	794627
28	2003		12319	10820	23139	142255	23139		23139	5547	17592	812219
29	2004		12319	9958	22277	129936	22277		22277	6090	16187	828406
30	2005		12319	9096	21415	117617	21415		21415	6635	14780	843186
31	2006		12319	8233	20552	105298	20552		20552	7179	13373	856559
32	2007		12319	7371	19690	92979	19690		19690	7723	11967	868526
33	2008		12306	6509	18815	80673	18815		18815	8267	10548	879074
34	2009		12292	5647	17939	68381	17939		17939	8811	9128	888202
35	2010		12972	4787	16959	56209	16959		16959	9356	7603	895805
36	2011		12035	3935	15970	44174	15970		15970	9898	6072	901877
37	2012		11472	3092	14564	32702	14564		14564	10443	4121	905998
38	2013		9649	2289	11938	23053	11938		11938	10443	1495	907493
39	2014		7290	1614	8904	15763	8904		8904	10443	*1539	905954
40	2015		5930	1103	7033	9833	7033		7033	10443	*3410	902544
41	2016		4275	688	4963	5558	4963		4963	10443	*5480	897064
42	2017		3042	389	3431	2516	3431		3431	10443	*7012	890052
43	2018		1667	176	1843	849	1843		1843	10443	*8600	881452
44	2019		849	59	908	0	908		908	10443	*9535	871917
Total		307972	307972	409604	717576		717576	311668	1029244	157327	871917	

(in 1,000 US$)

Table 6.2.14
Cash Flow Plan for Compared Alternative (4)
(Estimated Annual Revenue and Operating Expen es)

1) PNR is improved to rapid transit railway level
2) All underground structure
3) Construction starting from U.P.
4) Stage 4 included

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	326.3	351.3	533.3	556.4	826.2	861.0	896.2	931.1	966.0	1000.9	1035.8	1070.7	1105.6	1140.5	1175.4
2	Annual Passenger Volume (million passengers)	119.1	128.2	194.7	203.1	301.6	314.3	327.1	339.8	352.6	365.3	378.1	390.8	403.5	416.3	429.0
3	Annual Fare Revenue (1,000 US$)(@US$1=P7.50)	5996	6483	9461	9888	16159	16877	17599	18318	19037	19756	20474	21193	21912	22631	23350
4	Miscellaneous Revenue (1,000 US$)	180	194	284	297	485	506	528	550	571	593	614	636	657	679	701
5	Total Annual Revenue (1,000 US$)	6176	6677	9745	10185	16644	17383	18127	18868	19408	20349	21088	21829	22569	23310	24050
6	Annual Operating Expenses (1,000 US$)	7863	8468	12247	12777	17817	18567	21387	21584	21752	21979	22176	22374	22571	22768	22965
7	Annual Profit/Loss (1,000 US$)	-1687	-1791	-2502	-2592	-1173	-1184	-3260	-2716	-2344	-1630	-1088	-545	-2	542	1085
8	Accumulated Profit/Loss (1,000 US$)	-1687	-3478	-5980	-8572	-9745	-10929	-14189	-16905	-19249	-20879	-21967	-22512	-22514	21972	-20887
9	Section in Operation	UP - FEU		UP-Rizal Park		UP-Baclaran			Whole Line (UP - Manila Domestic Airport)							

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1210.3	1245.2	1280.1	1315.0	1349.9	1384.8	1419.7	1454.6	1489.5	1524.4	1559.3	1594.2	1629.1	1664.0	1698.9
2	Annual Passenger Volume	441.8	454.5	467.2	480.0	492.7	505.4	518.2	530.9	543.7	556.4	569.1	581.9	594.6	607.4	620.1
3	Annual Fare Revenue	24068	24787	25506	26225	26943	27662	28381	29100	29818	30537	31256	31975	32694	33412	34131
4	Annual Miscellaneous Revenue	722	744	765	787	808	830	851	873	895	916	938	959	981	1002	1024
5	Total Annual Revenue	24790	25531	26271	27012	27751	28492	29232	29973	30713	31453	32194	32934	33675	34414	35155
6	Annual Operating Expenses	23163	23360	23557	23755	23952	24148	24345	24541	24737	24933	25130	25326	25522	25719	25915
7	Annual Profit/Loss	1627	2171	2714	3257	3799	4344	4887	5432	5976	6520	7064	7608	8153	8695	9240
8	Accumulated Profit/Loss	-19260	-17089	-14375	-11118	-7319	-2975	1912	7344	13320	19840	26904	34512	42665	51360	60600
9	Section in Operation	Whole Line														

Table 6.2.15 Financial Investment Plan for Compared Alternative (4)

1) PNR is improved to rapid transit railway level
2) All underground structure
3) Construction starting from U.P.
4) Stage 4 included

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-	333	-	333	333	-	333	333
2	1977	333		23	23	666	23	333	356	-	356	689
3	1978	4167		47	47	4833	47	4433	4480	-	4480	5169
4	1979	4923		338	338	9756	338	5244	5582	-	5582	10751
5	1980	18137		683	683	27893	683	33196	33879	-	33879	44630
6	1981	55236		1953	1953	83129	1953	56294	58247	-	58247	102877
7	1982	68284		5819	5819	151413	5819	75916	81735	-	81735	184612
8	1983	32117	13	10599	10612	183517	10612	30950	41562	-1687	43249	227861
9	1984	44346	27	12846	12873	227836	12873	50148	63021	-1791	64812	292673
10	1985	30433	193	15949	16142	258076	16142	30867	47009	-2502	49511	342184
11	1986	34334	390	18065	18455	292020	18455	38406	56861	-2592	59453	401637
12	1987	20610	1116	20441	21557	311514	21557	12790	34347	-1173	35520	437157
13	1988	21217	3325	21806	25131	329406	25131	13460	38591	-1184	39775	476932
14	1989		6057	23058	29115	323349	29115		29115	-3260	32375	509307
15	1990		7341	22634	29975	316008	29975		29975	-2716	32691	541998
16	1991		9115	22121	31236	306893	31236		31236	-2344	33580	575578
17	1992		10332	21483	31815	296561	31815		31815	-1630	33445	609023
18	1993		11706	20759	32465	284855	32465		32465	-1088	33553	642576
19	1994		12530	19940	32470	272325	32470		32470	-545	33015	675591
20	1995		13379	19063	32442	258946	32442		32442	-2	32444	708035
21	1996		13379	18126	31505	245567	31505		31505	542	30963	738998
22	1997		13379	17190	30569	232188	30569		30569	1085	29484	768482
23	1998		13379	16253	29632	218809	29632		29632	1627	28005	796487
24	1999		13379	15317	28696	205430	28696		28696	2171	26525	823012
25	2000		13379	14380	27759	192051	27759		27759	2714	25045	848057
26	2001		13379	13444	26823	178672	26823		26823	3257	23566	871623
27	2002		13379	12507	25886	165293	25886		25886	3799	22087	893710
28	2003		13379	11571	24950	151914	24950		24950	4344	20606	914316
29	2004		13379	10634	24013	138535	24013		24013	4887	19126	933442
30	2005		13379	9697	23076	125156	23076		23076	5432	17644	951086
31	2006		13379	8761	22140	111777	22140		22140	5976	16164	967250
32	2007		13379	7824	21203	98398	21203		21203	6520	14683	981933
33	2008		13365	6888	20253	85033	20253		20253	7064	13189	995122
34	2009		13352	5952	19304	71681	19304		19304	7608	11696	1006818
35	2010		13185	5018	18203	58496	18203		18203	8153	10050	1016868
36	2011		12989	4095	17084	45507	17084		17084	8695	8389	1025257
37	2012		12263	3185	15448	33244	15448		15448	9240	6208	1031465
38	2013		10054	2327	12381	23190	12381		12381	9240	3141	1034606
39	2014		7322	1623	8945	15868	8945		8945	9240	*295	1034311
40	2015		6038	1111	7149	9830	7149		7149	9240	*2091	1032220
41	2016		4263	688	4951	5567	4951		4951	9240	*4289	1027931
42	2017		3046	390	3436	2521	3436		3436	9240	*5804	1022127
43	2018		1673	176	1849	848	1849		1849	9240	*7391	1014736
44	2019		848	59	907	0	907		907	9240	*8333	1006403
Total		334470	334470	444843	779313		779313	352370	1131683	125280	1006403	

(in 1,000 US$)

Table 6.2.16
Cash Flow Plan for Compared Alternative (5)
(Estimated Annual Revenue and Operating Expenses)

1) PNR not improved to rapid transit railway level
2) All underground structure
3) Construction starting from Baclaran
4) Stage 4 included

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	214.6	223.9	483.2	499.7	902.7	940.9	979.5	1014.9	1050.3	1085.7	1121.1	1156.5	1191.9	1227.3	1262.8
2	Annual Passenger Volume (million passengers)	78.3	81.7	176.4	182.4	329.4	343.4	357.5	370.4	383.4	396.3	409.2	422.1	435.1	448.0	460.9
3	Annual Fare Revenue (1,000 US$)(@US$1=P7.50)	3150	3292	7861	8159	17389	18175	18964	19689	20414	21139	21864	22589	23314	24039	24764
4	Miscellaneous Revenue (1,000 US$)	95	100	236	245	522	545	569	591	612	634	656	678	699	721	743
5	Total Annual Revenue (1,000 US$)	3245	3392	8097	8404	17911	18720	19533	20282	21026	21773	22520	23267	24013	24760	25507
6	Annual Operating Expenses (1,000 US$)	6110	6375	10943	11317	17760	18512	21400	21596	21763	21989	22185	22382	22578	22774	22970
7	Annual Profit/Loss (1,000 US$)	-2865	-2983	-2846	-2913	151	208	-1867	-1314	-737	-216	335	885	1435	1986	2537
8	Accumulated Profit/Loss (1,000 US$)	-2865	-5848	-8694	-11607	-11456	-11248	-13115	-14429	-15166	-15382	-15047	-14162	-12727	-10741	-8204
9	Section in Operation	Baclaran-Rizal Park		Baclaran-UST		Baclaran-UP		Whole Line (Manila Domestic Airport - UP)								

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1298.2	1333.6	1369.0	1404.4	1439.8	1475.2	1510.6	1546.0	1581.5	1616.9	1652.3	1687.7	1723.1	1758.5	1793.9
2	Annual Passenger Volume	473.8	486.8	499.7	512.6	525.5	538.5	551.4	564.3	577.2	590.2	603.1	616.0	628.9	641.9	654.8
3	Annual Fare Revenue	25489	26214	26939	27664	28389	29114	29839	30564	31289	32014	32737	33464	34189	34914	35639
4	Annual Miscellaneous Revenue	765	786	808	830	852	873	895	917	939	960	982	1004	1026	1047	1069
5	Total Annual Revenue	26254	27000	27747	28494	29241	29987	30734	31481	30228	32974	33721	34468	35215	35961	36708
6	Annual Operating Expenses	23167	23363	23559	23756	23952	24148	24345	24541	24737	24933	25130	25326	25522	25719	25915
7	Annual Profit/Loss	3087	3637	4188	4738	5289	5839	6389	6940	5491	8041	8591	9142	9693	10242	10793
8	Accumulated Profit/Loss	-5117	-1480	2708	7446	12735	18574	24963	31903	37394	45435	54026	63168	72861	83103	93896
9	Section in Operation	Whole Line														

Table 6.2.17 Financial Investment Plan for Compared Alternative (5)

1) PNR is improved to rapid transit railway level
2) All underground structure
3) Construction starting from Baclaran
4) Stage 4 included

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-		-	333	333	-	333	333
2	1977	333		23	23		23	333	356	-	356	689
3	1978	3000		47	47		47	4167	4214	-	4214	4903
4	1979	3477		257	257		257	4876	5133	-	5133	10036
5	1980	14066		500	500		500	25601	26101	-	26101	36137
6	1981	45884		1485	1485		1485	45259	46744	-	46744	82881
7	1982	59153		4697	4697		4697	65424	70121	-	70121	153002
8	1983	34524	13	8837	8850	160757	8850	32993	41843	-3684	45527	198529
9	1984	51170	27	11253	11280	211900	11280	64730	76010	-3809	79819	278348
10	1985	39347	147	14833	14980	251100	14980	39420	54400	-4326	58726	337074
11	1986	41873	286	17577	17863	292687	17863	43621	61484	-4430	65914	402988
12	1987	20417	848	20488	21336	312256	21336	12500	33836	-1116	34952	437940
13	1988	21183	2684	21858	24542	330755	24542	13223	37765	-1129	38894	476834
14	1989		5050	23153	28203	325705	28203	-	28203	-3273	31476	508310
15	1990		6431	22799	29230	319274	29230	-	29230	-2728	31958	540268
16	1991		8478	22349	30827	310796	30827		30827	-2355	33182	573450
17	1992		10051	21756	31807	300745	31807		31807	-1640	33447	606897
18	1993		11726	21052	32778	289019	32778		32778	-1097	33875	640772
19	1994		12543	20231	32774	276476	32774		32774	-553	33327	674099
20	1995		13390	19353	32743	263086	32743		32743	-9	32752	706851
21	1996		13391	18416	31807	249695	31807		31807	536	31271	738122
22	1997		13390	17479	30869	236305	30869		30869	1080	29789	767911
23	1998		13391	16541	29932	222914	29932		29932	1623	28309	796220
24	1999		13390	15604	28994	209524	28994		28994	2168	26826	823046
25	2000		13391	14667	28058	196133	28058		28058	2712	25346	848392
26	2001		13390	13729	27119	182743	27119		27119	3256	23863	872255
27	2002		13391	12792	26183	169352	26183		26183	3799	22384	894639
28	2003		13390	11855	25245	155962	25245		25245	4344	20901	915540
29	2004		13390	10917	24307	142572	24307		24307	4887	19420	934960
30	2005		13390	9980	23370	129182	23370		23370	5432	17938	952898
31	2006		13390	9043	22433	115792	22433		22433	5976	16457	969355
32	2007		13390	8105	21495	102402	21495		21495	6520	14975	984330
33	2008		13377	7168	20545	89025	20545		20545	7064	13481	997811
34	2009		13363	6232	19595	75662	19595		19595	.7608	11987	1009798
35	2010		13244	5296	18540	62418	18540		18540	8153	10387	1020185
36	2011		13105	4369	17474	49313	17474		17474	8695	8779	1028964
37	2012		12542	3452	15994	36771	15994		15994	9240	6754	1035718
38	2013		10707	2574	13281	26064	13281		13281	9240	4041	1039759
39	2014		8341	1824	10165	17723	10165		10165	9240	925	1040684
40	2015		6960	1241	8201	10763	8201		8201	9240	*1039	1039645
41	2016		4913	753	5666	5850	5666		5666	9240	*3574	1036071
42	2017		3339	410	3749	2511	3749		3749	9240	*5491	1030580
43	2018		1664	176	1840	847	1840		1840	9240	*7400	1023180
44	2019		847	59	906	0	906		906	9240	*8334	1014846
Total		334760	334760	445230	779990		779990	352480	1132470	117624	1014846	

(in 1,000 US$)

Table 6.2.18
Cash Flow Plan for Compared Alternative (6)
(Estimated Annual Revenue and Operating Expenses)

1) PNR not improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from U.P.
4) Stage 4 included

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	320.3	344.0	575.6	599.5	902.7	940.9	979.5	1014.9	1050.3	1085.7	1121.1	1156.5	1191.9	1227.3	1262.8
2	Annual Passenger Volume (million passengers)	116.9	125.6	210.1	218.8	329.4	343.4	357.5	370.4	383.4	396.3	409.2	422.1	435.1	448.0	460.9
3	Annual Fare Revenue (1,000 US$)(@US$1=P27.50)	5845	6299	10003	10437	17389	18175	18964	19689	20414	21139	21864	22589	23314	24039	24764
4	Miscellaneous Revenue (1,000 US$)	175	189	300	313	522	545	569	591	612	634	656	678	699	721	743
5	Total Annual Revenue (1,000 US$)	6020	6488	10303	10750	17911	18720	19533	20282	21026	21773	22520	23267	24013	24760	25507
6	Annual Operating Expenses (1,000 US$)	6663	7156	11043	11502	16563	17264	20197	20393	20590	20786	20982	21179	21375	21571	21767
7	Annual Profit/Loss (1,000 US$)	-643	-668	-740	-752	1348	1456	-664	-111	436	987	1538	2088	2638	3189	3740
8	Accumulated Profit/Loss (1,000 US$)	-643	-1311	-2051	-2803	-1455	1	-663	-774	-338	649	2187	4275	6913	10102	13842
9	Section in Operation	UP - FEU		UP-Rizal Park		UP - Baclaran			Whole Line (UP - Manila Domestic Airport)							

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1298.2	1333.6	1369.0	1404.4	1439.8	1475.2	1510.6	1546.0	1581.5	1616.9	1652.3	1687.7	1723.1	1758.5	1793.9
2	Annual Passenger Volume	473.8	486.8	499.7	512.6	525.5	538.5	551.4	564.3	577.2	590.2	603.1	616.0	628.9	641.9	654.8
3	Annual Fare Revenue	25489	26214	26939	27664	28389	29114	29839	30564	31289	32014	32737	33464	34189	34914	35639
4	Annual Miscellaneous Revenue	765	786	808	830	852	873	895	917	939	960	982	1004	1026	1047	1069
5	Total Annual Revenue	26254	27000	27747	28494	29241	29987	30734	31481	32228	32974	33721	34468	35215	35961	36708
6	Annual Operating Expenses	21964	22160	22356	22553	22749	22945	23142	23338	23534	23730	23927	24123	24319	24516	24712
7	Annual Profit/Loss	4290	4840	5391	5941	6492	7042	7592	8143	8694	9244	9794	10345	10896	11445	11996
8	Accumulated Profit/Loss	18132	22972	28363	34304	40796	47838	55430	63573	72267	81511	91305	101650	112546	123991	135987
9	Section in Operation	Whole Line														

Table 6.2.19 Financial Investment Plan for Compared Alternative (6)

1) PNR not improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from U.P.
4) Stage 4 included

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-	333	-	333	333	-	333	333
2	1977	333		23	23	666	23	333	356	-	356	689
3	1978	3000		47	47	3666	47	4000	4047	-	4047	4736
4	1979	3130		257	257	6796	257	4350	4607	-	4607	9343
5	1980	11774		476	476	18570	476	21559	22035	-	22035	31378
6	1981	47027		1300	1300	65597	1300	42640	43940	-	43940	75318
7	1982	60717		4592	4592	126314	4592	62793	67385	-	67385	142703
8	1983	32193	13	8842	8855	158494	8855	31207	40062	-643	40705	183408
9	1984	43940	27	11095	11122	202407	11122	49747	60869	-668	61537	244945
10	1985	30037	147	14168	14315	232297	14315	30463	44778	-740	45518	290463
11	1986	33809	272	16261	16533	265834	16533	38044	54577	-752	55329	345792
12	1987	20530	743	18608	19351	285621	19351	12537	31888	1348	30540	376332
13	1988	21257	2624	19993	22617	304254	22617	13647	36264	1456	34808	411140
14	1989		5053	21298	26351	299201	26351		26351	-664	27015	438155
15	1990		6340	20944	27284	292861	27284		27284	-111	27395	465550
16	1991		8098	20500	28598	284763	28598		28598	436	28162	493712
17	1992		9299	19933	29232	275464	29232		29232	987	28245	521957
18	1993		10652	19282	29934	264812	29934		29934	1538	28396	550353
19	1994		11473	18537	30010	253339	30010		30010	2088	27922	578275
20	1995		12323	17734	30057	241016	30057		30057	2638	27419	605694
21	1996		12323	16871	29194	228693	29194		29194	3189	26005	631699
22	1997		12323	16009	28332	216370	28332		28332	3740	24592	656291
23	1998		12323	15146	27469	204047	27469		27469	4290	23179	679470
24	1999		12323	14283	26606	191724	26606		26606	4840	21766	701236
25	2000		12323	13421	25744	179401	25744		25744	5391	20353	721589
26	2001		12323	12558	24881	167078	24881		24881	5941	18940	740529
27	2002		12323	11695	24018	154755	24018		24018	6492	17526	758055
28	2003		12323	10833	23156	142432	23156		23156	7042	16114	774169
29	2004		12323	9970	22293	130109	22293		22293	7592	14701	788870
30	2005		12323	9108	21431	117786	21431		21431	8143	13288	802158
31	2006		12323	8245	20568	105463	20568		20568	8694	11874	814032
32	2007		12310	7382	19705	93140	19705		19705	9244	10461	824493
33	2008		12297	6520	18830	80830	18830		18830	9794	9036	833529
34	2009		12177	5658	17955	68533	17955		17955	10345	7610	841139
35	2010		12051	4797	16974	56356	16974		16974	10896	6078	847217
36	2011		11581	3945	15996	44305	15996		15996	11445	4551	851768
37	2012		11581	3101	14682	32724	14682		14682	11996	2686	854454
38	2013		9699	2291	11990	23025	11990		1190	11996	*6	854448
39	2014		7271	1612	8883	15754	8883		8883	11996	*3113	851335
40	2015		5983	1103	7086	9771	7086		7086	11996	*4910	846425
41	2016		4225	684	4909	5546	4909		4909	11996	*7087	839338
42	2017		3024	388	3412	2522	3412		3412	11996	*8584	830754
43	2018		1672	177	1849	850	1849		1849	11996	*10147	820607
44	2019		850	60	910	0	910		910	11996	*11086	809521
Total		308080	308080	409747	717827		717827	311653	1029480	219959	809521	

(in 1,000 US$)

Table 6.2.20
Cash Flow Plan for Compared Alternative (7)
(Estimated Annual Revenue and perating Expenses)

1) PNR not improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from Baclaran
4) Stage 4 included

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	214.6	223.9	483.2	499.7	902.7	940.9	979.5	1014.9	1050.3	1085.7	1121.1	1156.5	1191.9	1227.3	1262.8
2	Annual Passenger Volume (million passengers)	78.3	81.7	176.4	182.4	329.4	343.4	357.5	370.4	383.4	396.3	409.2	422.1	435.1	448.0	460.9
3	Annual Fare Revenue (1,000 US$)(@US$1=P7.50)	3150	3292	7861	8159	17389	18175	18964	19689	20414	21139	21864	22589	23314	24039	24764
4	Miscellaneous Revenue (1,000 US$)	95	100	236	245	522	545	569	591	612	634	656	678	699	721	743
5	Total Annual Revenue (1,000 US$)	3245	3392	8097	8404	17911	18720	19533	20282	21026	21773	22520	23267	24013	24760	25507
6	Annual Operating Expenses (1,000 US$)	6110	6375	10943	11317	16567	17265	20197	20393	20590	20786	20982	21179	21375	21571	21767
7	Annual Profit/Loss (1,000 US$)	-2865	-2983	-2846	-2913	1344	1455	-664	-111	436	987	1538	2088	2638	3189	3740
8	Accumulated Profit/Loss (1,000 US$)	-2865	-5848	-8694	-11607	-10263	-8808	-9472	-9583	-9147	-8160	-6622	-4534	-1896	1293	5033
9	Section in Operation	Baclaran-Rizal Park		Baclaran-UST		Baclaran - UP		Whole Line (Manila Domestic Airport - UP)								

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1298.2	1333.6	1369.0	1404.4	1439.8	1475.2	1510.6	1546.0	1581.5	1616.9	1652.3	1687.7	1723.1	1758.5	1793.9
2	Annual Passenger Volume	473.8	486.8	499.7	512.6	525.5	538.5	551.4	564.3	577.2	590.2	603.1	616.0	628.9	641.9	654.8
3	Annual Fare Revenue	25489	26214	26939	27664	28389	29114	29839	30564	31289	32014	32737	33464	34189	34914	35639
4	Annual Miscellaneous Revenue	765	786	808	830	852	873	895	917	939	960	982	1004	1026	1047	1069
5	Total Annual Revenue	26254	27000	27747	28494	29241	29987	30734	31481	32228	32974	33721	34468	35215	35961	36708
6	Annual Operating Expenses	21964	22160	22356	22553	22749	22945	23142	23338	23534	23730	23927	24123	24319	24516	24712
7	Annual Profit/Loss	4290	4840	5391	5941	6492	7042	7592	8143	8694	9244	9794	10345	10896	11445	11996
8	Accumulated Profit/Loss	9323	14163	19554	25495	31987	39029	46621	54764	63458	72702	82496	92841	103737	115182	127178
9	Section in Operation	Whole Line														

Table 6.2.21 Financial Investment Plan for Compared Alternative (7)

1) PNR not improved to rapid transit railway level
2) Partially elevated structure
3) Construction starting from Baclaran
4) Stage 4 included

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-		-	333	333	-	333	333
2	1977	333		23	23		23	333	356	-	356	689
3	1978	3000		47	47		47	4167	4214	-	4214	4903
4	1979	3430		257	257		257	4834	5091	-	5091	9994
5	1980	14066		487	497		497	25601	26098	-	26098	36092
6	1981	45597		1481	1481		1481	45666	47147	-	47147	83239
7	1982	58960		4673	4673		4673	64577	69250	-	69250	152489
8	1983	34003	13	8800	8813	159709	8813	33150	41963	-2865	44828	197317
9	1984	41383	27	11180	11207	201065	11207	50007	61214	-2983	64197	261514
10	1985	30807	147	14075	14222	231725	14222	24693	38915	-2846	41761	303275
11	1986	34373	284	16221	16505	265814	16505	32474	48979	-2913	51892	355167
12	1987	20453	846	18607	19453	285421	19453	12480	31933	1344	30589	385756
13	1988	21234	2670	19979	22649	303985	22649	13353	36002	1455	34547	420303
14	1989		5029	21279	26308	298956	26308		26308	-664	26972	447275
15	1990		6389	20927	27316	292567	27316		27316	-111	27427	474702
16	1991		8044	20480	28524	284523	28524		28524	436	28088	502790
17	1992		9276	19917	29193	275247	29193		29193	987	28206	530996
18	1993		10651	19267	29918	264596	29918		29918	1538	28380	559376
19	1994		11470	18522	29992	253126	29992		29992	2088	27904	587280
20	1995		12319	17719	30038	240807	30038		30038	2638	27400	614680
21	1996		12319	16856	29175	228488	29175		29175	3189	25986	640666
22	1997		12319	15994	28313	216169	28313		28313	3740	24573	665239
23	1998		12319	15132	27451	203850	27451		27451	4290	23161	688400
24	1999		12319	14270	26589	191531	26589		26589	4840	21749	710149
25	2000		12319	13407	25726	179212	25726		25726	5391	20335	730484
26	2001		12319	12545	24864	166893	24864		24864	5941	18923	749407
27	2002		12319	11683	24002	154574	24002		24002	6492	17510	766917
28	2003		12319	10820	23139	142255	23139		23139	7042	16097	783014
29	2004		12319	9958	22277	129936	22277		22277	7592	14685	797699
30	2005		12319	9096	21415	117617	21415		21415	8143	13272	810971
31	2006		12319	8233	20552	105298	20552		20552	8694	11858	822829
32	2007		12319	7371	19690	92979	19690		19690	9244	10446	833275
33	2008		12306	6509	18815	80673	18815		18815	9794	9021	842296
34	2009		12292	5647	17939	68381	17939		17939	10345	7594	849890
35	2010		12172	4787	16959	56209	16959		16959	10896	6063	855953
36	2011		12035	3935	15970	44174	15970		15970	11445	4523	860478
37	2012		11472	3092	14564	32702	14564		14564	11996	2568	863046
38	2013		9649	2289	11938	23053	11938		11938	11996	*58	862988
39	2014		7290	1614	8904	15763	8904		8904	11996	*3092	859896
40	2015		5930	1103	7033	9833	7033		7033	11996	*4963	854933
41	2016		4275	688	4963	5558	4963		4963	11996	*7033	847900
42	2017		3042	389	3431	2516	3431		3431	11996	*8565	839335
43	2018		1667	176	1843	849	1843		1843	11996	*10153	829182
44	2019		849	59	908	0	908		908	11996	*11088	818094
Total		307972	307972	409604	717576		717576	311668	1029244	211150	818094	

(in 1,000 US$)

Table 6.2.22
Cash Flow Plan for Compared Alternative (8)
(Estimated Annual Revenue and Operating Expenses)

1) PNR not improved to rapid transit railway level
2) All underground structure
3) Construction starting from U.P.
4) Stage 4 included

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	320.3	344.0	575.6	599.5	902.7	940.9	979.5	1014.9	1050.3	1085.7	1121.1	1156.5	1191.9	1227.3	1262.8
2	Annual Passenger Volume (million passengers)	116.9	125.6	210.1	218.8	329.4	343.4	357.5	370.4	383.4	396.3	409.2	422.1	435.1	448.0	460.9
3	Annual Fare Revenue (1,000 US$)(@US$1=P7.50)	5845	6299	10003	10437	17389	18175	18964	19689	20414	21139	21864	22589	23314	24039	24764
4	Miscellaneous Revenue (1,000 US$)	175	189	300	313	522	545	569	591	612	634	656	678	699	721	743
5	Total Annual Revenue (1,000 US$)	6020	6488	10303	10750	17911	18720	19533	20282	21026	21773	22520	23267	24013	24760	25507
6	Annual Operating Expenses (1,000 US$)	7863	8468	12247	12777	17817	18567	21387	21584	21752	21979	22176	22374	22571	22768	22965
7	Annual Profit/Loss (1,000 US$)	-1843	-1980	-1947	-2027	94	153	-1854	-1302	-726	-206	344	893	1442	1992	2542
8	Accumulated Profit/Loss (1,000 US$)	-1843	-3823	-5767	-7794	-7700	-7547	-9401	-10703	-11429	-11635	-11291	-10398	-8956	-6964	4422
9	Section in Operation	UP - FEU		UP-Rizal Park		UP - Baclaran			Whole Line (UP - Manila Domestic Airport)							

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1298.2	1333.6	1369.0	1404.4	1439.8	1475.2	1510.6	1546.0	1581.5	1616.9	1652.3	1687.7	1723.1	1758.5	1793.9
2	Annual Passenger Volume	473.8	486.8	499.7	512.6	525.5	538.5	551.4	564.3	577.2	590.2	603.1	616.0	628.9	641.9	654.8
3	Annual Fare Revenue	25489	26214	26939	27664	28389	29114	29839	30564	31289	32014	32737	33464	34189	34914	35639
4	Annual Miscellaneous Revenue	765	786	808	830	852	873	895	917	939	960	982	1004	1026	1047	1069
5	Total Annual Revenue	26254	27000	27747	28494	29241	29987	30734	31481	32228	32974	33721	34468	35215	35961	36708
6	Annual Operating Expenses	23163	23360	23557	23755	23952	24148	24345	24541	24737	24933	25130	25326	25522	25719	25915
7	Annual Profit/Loss	3091	3640	4190	4739	5289	5839	6389	6940	7491	8041	8591	9142	9693	10242	10793
8	Accumulated Profit/Loss	-1331	2309	6499	11238	16527	22366	28755	35695	43186	51227	59818	68960	78653	88895	99688
9	Section in Operation	Whole Line														

Table 6.2.23 Financial Investment Plan for Compared Alternative (8)

1) PNR not improved to rapid transit railway level
2) All underground structure
3) Construction starting from U.P.
4) Stage 4 included

No. of Year	Year	Foreign Currency Portion Expenditure								Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-	333	-	333	333	-		
2	1977	333		23	23	666	23	333	356	-		
3	1978	4167		47	47	4833	47	4433	4480	-		
4	1979	4923		338	338	9756	338	5244	5582	-		
5	1980	18137		683	683	27893	683	33196	33879	-		
6	1981	55236		1953	1953	83129	1953	56294	58247	-		
7	1982	68284		5819	5819	151413	5819	75916	81735	-	81735	184612
8	1983	32117	13	10599	10612	183517	10612	30950	41562	-1843	43405	228017
9	1984	44346	27	12846	12873	227835	12873	50148	63021	-1980	65001	293018
10	1985	30433	193	15949	16142	258076	16142	30867	47009	-1947	48956	341974
11	1986	34334	390	18065	18455	292020	18455	38406	56861	-2027	58888	400862
12	1987	20610	1116	20441	21557	311514	21557	12790	34347	94	34253	435115
13	1988	21217	3325	21806	25131	329406	25131	13460	38591	153	38438	473553
14	1989		6057	23058	29115	323349	29115		29115	-1854	30969	504522
15	1990		7341	22634	29975	316008	29975		29975	-1302	31277	535799
16	1991		9115	22121	31236	306893	31236		31236	-726	31962	567761
17	1992		10332	21483	31815	296561	31815		31815	-206	32021	599782
18	1993		11706	20759	32465	284855	32465		32465	344	32121	631903
19	1994		12530	19940	32470	272325	32470		32470	893	31577	663480
20	1995		13379	19063	32442	258946	32442		32442	1442	31000	694480
21	1996		13379	18126	31505	245567	31505		31505	1992	29513	723993
22	1997		13379	17190	30569	232188	30569		30569	2542	28027	752020
23	1998		13379	16253	29632	218809	29632		29632	3091	26541	778561
24	1999		13379	15317	28696	205430	28696		28696	3640	25056	803617
25	2000		13379	14380	27759	192051	27759		27759	4190	23569	827186
26	2001		13379	13444	26823	178672	26823		26823	4739	22084	849270
27	2002		13379	12507	25886	165293	25886		25886	5289	20597	869867
28	2003		13379	11571	24950	151914	24950		24950	5839	19111	888978
29	2004		13379	10634	24013	138535	24013		24013	6389	17624	906602
30	2005		13379	9697	23076	125156	23076		23076	6940	16136	922738
31	2006		13379	8761	22140	111777	22140		22140	7491	14649	937387
32	2007		13379	7824	21203	98398	21203		21203	8041	13162	950549
33	2008		13365	6888	20253	85033	20253		20253	8591	11662	962211
34	2009		13352	5952	19304	71681	19304		19304	9142	10162	972373
35	2010		13185	5018	18203	58496	18203		18203	9693	8510	980883
36	2011		12989	4095	17084	45507	17084		17084	10242	6842	987725
37	2012		12263	3185	15448	33244	15448		15448	10793	4655	992380
38	2013		10054	2327	12381	23190	12381		12381	10793	1588	993968
39	2014		7322	1623	8945	15868	8945		8945	10793	*1848	992120
40	2015		6038	1111	7149	9830	7149		7149	10793	*3644	988476
41	2016		4263	688	4951	5567	4951		4951	10793	*5842	982634
42	2017		3046	390	3436	2521	3436		3436	10793	*7357	975277
43	2018		1673	176	1849	848	1849		1849	10793	*8944	966333
44	2019		848	59	907	0	907		907	10793	*9886	956447
Total		334470	334470	444843	779313		779313	352370	1131683	175236	956447	

(in 1,000 US$)

Table 6.2.24
Cash Flow Plan for Compared Alternative (9)
(Estimated Annual Revenue and Operating Expenses)

1) PNR is improved to rapid transit railway level
2) All underground structure
3) Construction starting from Baclaran
4) Stage 4 included

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	126.9	134.4	362.6	375.9	826.2	861.0	896.2	931.1	966.0	1000.9	1035.8	1070.7	1105.6	1140.5	1175.4
2	Annual Passenger Volume (million passengers)	46.3	49.1	132.3	137.2	301.6	314.3	327.1	339.8	352.6	365.3	378.1	390.8	403.5	416.3	429.0
3	Annual Fare Revenue (1,000 US$)(@US$1=P7.50)	2355	2491	6424	6686	16159	16877	17599	18318	19037	19756	20474	21193	21912	22631	23350
4	Miscellaneous Revenue (1,000 US$)	71	75	193	201	485	506	528	550	571	593	614	636	657	679	701
5	Total Annual Revenue (1,000 US$)	2426	2566	6617	6887	16644	17383	18127	18868	19408	20349	21088	21829	22569	23310	24050
6	Annual Operating Expenses (1,000 US$)	6110	6375	10943	11317	17760	18512	21400	21596	21763	21989	22185	22382	22578	22774	22970
7	Annual Profit/Loss (1,000 US$)	-3684	-3809	-4326	-4430	-1116	-1129	-3273	-2728	-2355	-1640	-1097	-553	-9	536	1080
8	Accumulated Profit/Loss (1,000 US$)	-3684	-7493	-11819	-16249	-17365	-18494	-21767	-24495	-26850	-28490	-29587	-30140	-30149	-29613	-28533
9	Section in Operation	Baclaran-Rizal Park		Baclaran-UST		Baclaran-UP		Whole Line (Manila Demestic Airport - UP)								

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1210.3	1245.2	1280.1	1315.0	1349.9	1384.8	1419.7	1454.6	1489.5	1524.4	1559.3	1594.2	1629.1	1664.0	1698.9
2	Annual Passenger Volume	441.8	454.5	467.2	480.0	492.7	505.4	518.2	530.9	543.7	556.4	569.1	581.9	594.6	607.4	620.1
3	Annual Fare Revenue	24068	24787	25506	26225	26943	27662	28381	29100	29818	30537	31256	31975	32694	33412	34131
4	Annual Miscellaneous Revenue	722	744	765	787	808	830	851	873	895	916	938	959	981	1002	1024
5	Total Annual Revenue	24790	25531	26271	27012	27751	28492	29232	29973	30713	31453	32194	32934	33675	34414	35155
6	Annual Operating Expenses	23167	23363	23559	23756	23952	24148	24345	24541	24737	24933	25130	25326	25522	25719	25915
7	Annual Profit/Loss	1623	2168	2712	3256	3799	4344	4887	5432	5976	6520	7064	7608	8153	8695	9240
8	Accumulated Profit/Loss	-26910	-24742	-22030	-18774	-14975	-10631	-5744	-312	5664	12184	19248	26856	35009	43704	52944
9	Section in Operation	Whole Line														

Table 6.2.25 Financial Investment Plan for Compared Alternative (9)

1) PNR not improved to rapid transit railway level
2) All underground structure
3) Construction starting from Baclaran
4) Stage 4 included

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-		-	333	333	-	333	333
2	1977	333		23	23		23	333	356	-	356	689
3	1978	3000		47	47		47	4167	4214	-	4214	4903
4	1979	3477		257	257		257	4876	5133	-	5133	10036
5	1980	14066		500	500		500	25601	26101	-	26101	36137
6	1981	45884		1485	1485		1485	45259	46744	-	46744	82881
7	1982	59153		4697	4697		4697	65424	70121	-	70121	153002
8	1983	34524	13	8837	8850	160759	8850	32993	41843	-2865	44708	197710
9	1984	51170	27	11253	11280	211900	11280	64730	76010	-2983	78993	276703
10	1985	39347	147	14833	14980	251100	14980	39420	54400	-2846	57246	333949
11	1986	41873	286	17577	17863	292687	17863	43621	61484	-2913	64397	398346
12	1987	20417	848	22488	21336	312256	21336	12500	33836	151	33685	432031
13	1988	21183	2684	21858	24542	330755	24542	13223	37765	208	37557	469588
14	1989		5050	23153	28203	325705	28203	-	28203	-1867	30070	499658
15	1990		6431	22799	29230	319274	29230	-	29230	-1314	30544	530202
16	1991		8478	22349	30827	310796	30827		30827	-737	31564	561766
17	1992		10051	21756	31807	300745	31807		31807	-216	32023	593789
18	1993		11726	21052	32778	289019	32778		32778	335	32443	626232
19	1994		12543	20231	32774	276476	32774		32774	885	31889	658121
20	1995		13390	19353	32743	263086	32743		32743	1435	31308	689429
21	1996		13391	18416	31807	249695	31807		31807	1986	29821	719250
22	1997		13390	17479	30869	236305	30869		30869	2537	28332	747583
23	1998		13391	16541	29932	222914	29932		29932	3087	26845	774427
24	1999		13390	15604	28994	209524	28994		28994	3637	25357	799784
25	2000		13391	14667	28058	196133	28058		28058	4188	23870	823654
26	2001		13390	13729	27119	182743	27119		27119	4738	22381	846035
27	2002		13391	12792	26183	169352	26183		26183	5289	20894	866929
28	2003		13390	11855	25245	155962	25245		25245	5839	19406	886335
29	2004		13390	10917	24307	142572	24307		24307	6389	17918	904253
30	2005		13390	9980	23370	129182	23370		23370	6940	16430	920683
31	2006		13390	9043	22433	115792	22433		22433	7491	14942	935625
32	2007		13390	8105	21495	102402	21495		21495	8041	13454	949079
33	2008		13377	7168	20545	89025	20545		20545	8591	11954	961033
34	2009		13363	6232	19595	75662	19595		19595	9142	10453	971486
35	2010		13244	5296	18540	62418	18540		18540	9693	8847	980333
36	2011		13105	4369	17474	49313	17474		17474	10242	7232	987565
37	2012		12542	3452	15994	36771	15994		15994	10793	5201	992766
38	2013		10707	2574	13281	26064	13281		13281	10793	2488	995254
39	2014		8341	1824	10165	17723	10165		10165	10793	*628	994626
40	2015		6960	1241	8201	10763	8201		8201	10793	*2592	992034
41	2016		4913	753	5666	5850	5666		5666	10793	*5127	968907
42	2017		3339	410	3749	2511	3749		3749	10793	*7044	979863
43	2018		1664	176	1840	847	1840		1840	10793	*8953	970910
44	2019		847	59	906	0	906		906	10793	*9887	961023
Total		334760	334760	445230	779990		779990	352480	1132470	171447	961023	

(in 1,000 US$)

be increased by 4 to 6%. The difference in accumulated profit at the end of the period of analysis will be about 40 million US$.

3) The partially elevated structure will result in a lower annual operating expenses. The saving in operating expenses is about 5% for the partially elevated structure, and the accumulated total saving at the end of analysis period is about 35 million US$.

4) A larger initial year passenger volume is anticipated when the construction starts from U.P. rather than Baclaran. However, this increase in revenue is partially offset by a corresponding increase in operating expenses. Also, since the time period before the opening of the whole line is short, the effect on the accumulated total profit is rather small. Thus the surplus in accumulated profit is only 8 to 12 million US$.

5) The opening of the section between Baclaran and the future Manila Domestic Airport Terminal (MDA) will not result in big increase in traffic demand , but the operating expenses will substantially increase, thus greatly worsening the financial position of the system. It is estimated that should the Baclaran-MDA section be curtailed, an increase of 40 million US$ in accumulated profit at the end of the analysis period can be expected.

It was from the above observation that the conclusion was reached that the partially elevated structure should be adopted from the financial point of view. The comparative merit of starting construction from U.P. as against construction from Baclaran is relatively small, and although from the financial point of view, the construction from U.P. is more preferable, the construction may also be commenced from Baclaran if supported by other considerations.

It was also concluded that the extension of the Baclaran-MDA section be deferred to a later date and this section be served by other alternative modes of transport for the time being. The timing of implementation of this section may be studied in conjunction with the future increase in traffic demand.

As for the results of financial investment plans it may be seen that the repayment of the foreign loan will be completed on the 44th year after implementation of the construction program which include the Baclaran - MDA section, (Stage 4). The largest investment will be required from the 6th to the 11th year of construction. During this period the annual investment required of the government will range between 40 to 80 million US$. A major portion of this is the investment on the local currency portion of the construction cost. As for foreign currency payment, the peak years will be about 20 years after initiation of construction work, and the amount paid will be around 30 million US$ per year.

2.8 EFFECTS OF CHANGES IN ASSUMPTIONS ON THE CASH FLOW PLAN AND FINANCIAL INVESTMENT PLAN

The results of the financial analysis made so far, coupled with findings on traffic, engineering and economic analyses, have led to the adoption of a recommended alternative which may be summarized as follows.

(1) The section to be implemented will be the U.P.-Baclaran section (21.5 km), with the implementation of Baclaran-Airport deferred to a later date should it be warranted by increase in future traffic demand.

(2) The construction will be implemented in three stages, with the construction starting from U.P. side.

(3) The structure will be partially elevated, the elevated section being U.P.-Sto. Domingo.

In this section an analysis is made of the influence on the results of financial analysis should a deviation from the above recommendation be made or should there be any changes in the assumptions adopted in financial analysis.

2.8.1 In the Case the Fare Rate is Changed

The fare rates of the rapid transit railway system had been determined in consideration of its competitiveness with other existing means of public transport, and it had been analysed and vertified that the raising of the fare rates of the rapid transit when the fare rates of the existing modes of public transport remain unchanged will result in a drop in passenger volume so that the increase in annual fare revenues will be relatively small in comparison to the increase in fare rate.

A raise in fare rate, however, will not affect the passenger volume if a proportional raise is also effected for the existing modes of transport.

The fares for public transport in Manila is particularly low as compared to other similar cities of the world. With the world trend of high fuel cost and creeping inflation, the operating costs of public transport in Manila is constantly on the increase and it may be difficult for the operators to maintain the existing fare level and still be able to record a reasonable margin of profit. In fact, there are recently already discussions in the mass media on the topic of raising the fares of public transport, and the possibility is quite strong that by the time the first section of the rapid transit railway is put into operation, a revised fare rate may already be in effect.

Here an analysis is first made based on the assumption that the fare rates of the bus and the jeepney will be raised by 50% to a minimum fare of 30 ct. in the near future, so that *the fares for the rapid transit railway may be proportionally raised without* affecting the passenger volume of the railway. In this case, the minimum fare for the railway may be rounded up to 40 ct. and the multi-zone trips raised to 80 ct., 1.2 peso, and 50 ct. accordingly.

Table 6.2.26 and 6.2.27 are the resultant cash flow plan and financial plan of this additional case (1) for the recommended alternative.

It will be seen that under such an assumption, the operation will be a profitable one right from the first year of operation, and that the accumulated profit will be so large that it is estimated that the whole amount of capital investment cost including

Table 6.2.26
Cash Flow Plan—Additional Case for Recommended Alternative (1)
(Estimated Annual Revenue and Operating Expenses)

Assuming a 50% increase in fare rate of all modes of transport.

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	326.2	351.7	533.3	556.4	826.2	861.0	896.3	931.1	966.0	1000.9	1035.8	1070.7	1105.6	1140.5	1175.4
2	Annual Passenger Volume (million passengers)	119.1	128.3	194.7	203.1	301.6	314.3	327.1	339.8	352.6	365.3	378.1	390.8	403.5	416.3	429.0
3	Annual Fare Revenue (1,000 US$)(@US$1=P7.50)	9594	10373	15138	15821	25854	27003	28158	29309	30459	31610	32758	33909	35059	36210	37360
4	Miscellaneous Revenue (1,000 US$)	288	311	454	475	776	810	845	879	914	948	983	1017	1052	1086	1121
5	Total Annual Revenue (1,000 US$)	9882	10684	15592	16296	26630	27813	29003	30188	31373	32558	33741	34926	36111	37296	38481
6	Annual Operating Expenses (1,000 US$)	6663	7156	11043	11502	16563	17264	17971	18146	18320	18495	18670	18844	19019	19193	19368
7	Annual Profit/Loss (1,000 US$)	3219	3528	4549	4794	10067	10549	11032	12042	13053	14063	15071	16082	17092	18103	19113
8	Accumulated Profit/Loss (1,000 US$)	3219	6747	11296	16090	26157	36706	47738	59780	72833	86896	101967	118049	135141	153244	172357
9	Section in Operation	UP - FEU		UP - Rizal Park		UP - Baclaran (at an increased fare rate, minimum fare = 40 centavos)										

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1210.3	1245.2	1280.1	1315.0	1349.9	1384.8	1419.7	1454.6	1489.5	1524.4	1559.3	1594.2	1629.1	1664.0	1698.9
2	Annual Passenger Volume	441.8	454.5	467.2	480.0	492.7	505.4	518.2	530.9	543.7	556.4	569.1	581.9	594.6	607.4	620.1
3	Annual Fare Revenue	38509	39659	40810	41960	43109	44259	45410	46560	47709	48859	50010	51160	52310	53459	54610
4	Annual Miscellaneous Revenue	1155	1190	1224	1259	1293	1328	1362	1397	1431	1466	1500	1535	1569	1604	1638
5	Total Annual Revenue	39664	40849	42034	43219	44402	45587	46772	47957	49140	50325	51510	52695	53879	55063	56248
6	Annual Operating Expenses	19543	19717	19892	20067	20241	20416	20591	20765	20940	21114	21289	21464	21638	21813	21988
7	Annual Profit/Loss	20121	21132	22142	23152	24161	25171	26181	27192	28200	29211	30221	31231	32241	33250	34260
8	Accumulated Profit/Loss	192478	213610	235752	258904	283065	308236	334417	361609	389809	419020	449241	480472	512713	545963	580223
9	Section in Operation															

Table 6.2.27
Financial Investment Plan—Additional Case for Recommended Alternative (1)

Assuming a 50% increase in fare rate of all modes of transport.

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-	333	-	333	333		333	333
2	1977	333		25	25	666	25	333	358		358	691
3	1978	3000		50	50	3666	50	4000	4050		4050	4741
4	1979	3130		275	275	6796	275	4350	4625		4625	9366
5	1980	11774		510	510	18570	510	21559	22069		22069	31435
6	1981	47027		1393	1393	65597	1393	42640	44033		44033	75468
7	1982	60717		4920	4920	126314	4920	62793	67713		67713	143181
8	1983	32193	13	9474	9487	158494	9487	31207	40694	3219	37475	180656
9	1984	43940	27	11887	11914	202407	11914	49747	61661	3528	58133	238789
10	1985	30037	147	15181	15328	232297	15328	30463	45791	4549	41242	280031
11	1986	32823	272	17422	17694	264848	17694	34851	52545	4794	47751	327782
12	1987		743	19864	20607	264105	20607		20607	10067	10540	338322
13	1988		2624	19808	22432	261481	22432		22432	10549	11883	350205
14	1989		5053	19611	24664	256428	24664		24664	11032	13632	363837
15	1990		6340	19232	25572	250088	25572		25572	12042	13530	377367
16	1991		8098	18757	26855	241990	26855		26855	13053	13802	391169
17	1992		9299	18149	27448	232691	27448		27448	14063	13385	404554
18	1993		10612	17452	28064	222079	28064		28064	15071	12993	417547
19	1994		10612	16656	27268	211467	27268		27268	16082	11186	428733
20	1995		10612	15860	26472	200855	26472		26472	17092	9380	438113
21	1996		10612	15064	25676	190243	25676		25676	18103	7573	445686
22	1997		10612	14268	24880	179631	24880		24880	19113	5767	451453
23	1998		10612	13472	24084	169019	24084		24084	20121	3963	455416
24	1999		10612	12676	23288	158407	23288		23288	21132	2156	457572
25	2000		10612	11881	22493	147795	22493		22493	22142	351	457923
26	2001		10612	11085	21697	137183	21697		21697	23152	*1455	456468
27	2002		10612	10289	20901	126571	20901		20901	24161	*3260	453208
28	2003		10612	9493	20105	115959	20105		20105	25171	*5066	448142
29	2004		10612	8697	19309	105347	19309		19309	26181	*6872	441270
30	2005		10612	7901	18513	94735	18513		18513	27192	*8679	432591
31	2006		10612	7105	17717	84123	17717		17717	28200	*10483	422108
32	2007		10612	6309	16921	73511	16921		16921	29211	*12290	409818
33	2008		10599	5513	16112	62912	16112		16112	30221	*14109	395709
34	2009		10586	4718	15304	52326	15304		15304	31231	*15927	379782
35	2010		10466	3924	14390	41860	14390		14390	32241	*17851	361931
36	2011		10341	3140	13481	31519	13481		13481	33250	*19769	342162
37	2012		9870	2364	12234	21649	12234		12234	34260	*22026	320136
38	2013		7989	1624	9613	13660	9613		9613	34260	*24647	295489
39	2014		5560	1025	6585	8100	6585		6585	34260	*27675	267814
40	2015		4272	608	4880	3828	4880		4880	34260	*29380	238434
41	2016		2514	287	2801	1314	2801		2801	34260	*31459	206975
42	2017		1314	99	1413	0	1413		1413	34260	*32847	174128
43	2018									34260	*34260	139868
44	2019									34260	*34260	105608
45	2020									34260	*34260	71348
46	2021									34260	*34260	37088
47	2022									34260	*34260	2828
48	2023									34260	*34260	*31432
Total		265307	265307	378068	643375		643375	282276	925651	957083	*31432	

(in 1,000 US$)

Table 6.2.28
Cash Flow Plan—Additional Case for Recommended Alternative (2)
(Estimated Annual Revenue and Operating Expenses)

At 60% increase over recommended fare

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	280.2	301.8	458.1	477.9	709.7	739.6	769.8	799.8	829.8	859.8	889.8	919.7	949.7	979.7	1009.7
2	Annual Passenger Volume (million passengers)	102.3	110.1	167.2	174.5	259.1	270.0	281.0	291.9	302.9	313.8	324.8	335.7	346.6	357.6	368.5
3	Annual Fare Revenue (1,000 US$) (AUS$1=P7.50)	8394	9076	13643	14259	22623	23628	24639	25645	26652	27658	28664	29670	30677	31683	32690
4	Miscellaneous Revenue (1,000 US$)	252	272	409	428	679	709	739	769	800	830	860	890	920	950	981
5	Total Annual Revenue (1,000 US$)	8646	9348	14052	14687	23302	24337	25378	26414	27452	28488	29524	30560	31597	32633	33671
6	Annual Operating Expenses (1,000 US$)	6663	7156	11043	11502	16563	17264	17971	18146	18320	18495	18670	18844	19019	19193	19368
7	Annual Profit/Loss (1,000 US$)	1983	2192	3009	3185	6739	7073	7407	8268	9132	9993	10854	11716	12578	13440	14303
8	Accumulated Profit/Loss (1,000 US$)	1983	4175	7184	10369	17108	24181	31588	39856	48988	58981	69835	81551	94129	107569	121872
9	Section in Operation	U.P. - F.E.U.		U.P. - Rizal			U.P. - Baclaran				(minimum fare 40 ct for zone fare system)					

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1039.6	1069.6	1099.6	1129.6	1159.6	1189.5	1219.5	1249.5	1279.5	1309.5	1339.4	1369.4	1399.4	1429.4	1459.4
2	Annual Passenger Volume	379.5	390.4	401.4	412.3	423.2	434.1	445.1	456.0	467.0	477.9	488.9	499.9	510.8	521.8	532.7
3	Annual Fare Revenue	33695	34702	35708	36715	37720	38727	39733	40740	41745	42752	43758	44765	45772	46777	47783
4	Annual Miscellaneous Revenue	1011	1041	1071	1101	1132	1162	1192	1222	1252	1283	1313	1343	1373	1403	1433
5	Total Annual Revenue	34706	35743	36779	37816	38852	39889	40925	41962	42997	44035	45071	46108	47145	48180	49216
6	Annual Operating Expenses	19543	19717	19892	20067	20241	20416	20591	20765	20940	21114	21289	21464	21638	21813	21938
7	Annual Profit/Loss	15163	16026	16887	17749	18611	19473	20334	21197	22057	22921	23782	24644	25507	26367	27278
8	Accumulated Profit/Loss	137035	153061	169948	187697	206308	225781	246115	267312	289369	312270	336072	360716	386223	412590	439868
9	Section in Operation															

interest on foreign loan will be repaid through operation profit on the 37th year after the completion of the whole section, so that the project will not only be economically feasible but also be financially viable. The raising of the minimum fares of existing modes of transport is thus one of the possible ways of making the implementation and operation of the recommended alternative of RTR Line No. 1 self-paying.

Several cases were also analysed of the case whereby the fare rate is raised resulting in drop in passenger volume.

First the case of raising the zone fare by 60% to a minimum fare of 40 ct. was calculated. In this case, it will be seen that due to the 14% decrease in passenger volume, the actual increase in revenue comes to only 40%. As shonw in Tables 6.2.28 and 6.2.29, this increase in revenue will result in an operational profit right from the very first year of operation. However, the accumulated profit will be far from sufficient in repaying the capital csot, and the total expenditure by the government unrecovered in the year when the foreign currency loan is wholly repaid will come to about 350 million US$. Next, a raise of the zone fare by 180% to a minimum fare of 70 ct. was considered. This will result in a maximum revenue for the system (73% increase in revenue over recommended fare) at a sacrifice of loss of 42% of passenger volume. In this case, as may be seen from Tables 6.2.30 and 6.2.31, despite the increase in revenue, the capital cost will still not be entirely recovered and an outstanding expenditure of 59 million US$ will remain unrecovered at the end of the period.

The fare system so far used in financial analysis has been assumed to be the recommended zone fare system. For reference purpose, comparative analysis was made on the case of adoption of an uniform fare. The two uniform fare rates of 40 ct. and 80 ct. were taken for calculation.

Although the uniform fare of 40 ct. is a near equivalent to the weighted average fare per passenger under the zone fare system, the demerit of losing short-distance passengers is unavoidable, and, compared to the recommended fare system and level, a drop in revenue by about 10% is anticipated. As a result, as shown in Tables 6.2.32 and 6.2.33, the accumulated unrecovered expenditure by the government will come to about 765 million US$, which is slightly higher than that according to the recommended fare.

At an uniform fare rate of 80 ct. an increase in revenue of about 29% over that through the recommended fare is anticipated, and the accumulated unrecovered expenditure by the government will be reduced to about 447 million US$. (Tables 6.2.34 and 6.2.35)

2.8.2 In the Case of Completing Only a Part

Results of economic assessment show that the optimum section for implementation is the U.P.-Baclaran section and subsequent analyses had been performed basing on this conclusion so that while stage construction is proposed, the final section to be completed is the U.P. - Baclaran section.

Although the temporary exclusion of the Baclaran - Airport section had cut down the construction cost considerably to a total of 547 million US$, this is still a very enormous sum of capital investment on a single project, and, it may be necessary from the point of financial consideration to implement only a portion of the optimum section.

Table 6.2.29
Financial Investment Plan—Additional Case for Recommended Alternative (2)

At 60% increase over recommended fare.

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-	333	-	333	333		333	333
2	1977	333		25	25	666	25	333	358		358	691
3	1978	3000		50	50	3666	50	4000	4050		4050	4741
4	1979	3130		275	275	6796	275	4350	4625		4625	9366
5	1980	11774		510	510	18570	510	21559	22069		22069	31435
6	1981	47027		1393	1393	65597	1393	42640	44033		44033	75468
7	1982	60717		4920	4920	126314	4920	62793	67713		67713	143181
8	1983	32193	13	9474	9487	158494	9487	31207	40694	1983	38711	181892
9	1984	43940	27	11887	11914	202407	11914	49747	61661	2192	59469	241361
10	1985	30037	147	15181	15328	232297	15328	30463	45791	3009	42782	284143
11	1986	32823	272	17422	17694	264848	17694	34851	52545	3185	49360	333503
12	1987		743	19864	20607	264105	20607		20607	6739	13868	347371
13	1988		2624	19808	22432	261481	22432		22432	7073	15359	362730
14	1989		5053	19611	24664	256428	24664		24664	7407	17257	379987
15	1990		6340	19232	25572	250088	25572		25572	8268	17304	397291
16	1991		8098	18757	26855	241990	26855		26855	1132	17723	415014
17	1992		9299	18149	27448	232691	27448		27448	9993	17455	432469
18	1993		10612	17452	28064	222079	28064		28064	10854	17210	449679
19	1994		10612	16656	27268	211467	27268		27268	11716	15552	465231
20	1995		10612	15860	26472	200855	26472		26472	12578	13894	479125
21	1996		10612	15064	25676	190243	25676		25676	13440	12236	491361
22	1997		10612	14268	24880	179631	24880		24880	14303	10577	501938
23	1998		10612	13472	24084	169019	24084		24084	15163	8921	510859
24	1999		10612	12676	23288	158407	23288		23288	16026	7262	518121
25	2000		10612	11881	22493	147795	22493		22493	16887	5606	523727
26	2001		10612	11085	21697	137183	21697		21697	17749	3948	527675
27	2002		10612	10289	20901	126571	20901		20901	18611	2290	529965
28	2003		10612	9493	20105	115959	20105		20105	19473	632	530397
29	2004		10612	8697	19309	105347	19309		19309	20334	* 1025	529572
30	2005		10612	7901	18513	94735	18513		18513	21197	* 2684	526888
31	2006		10612	7105	17717	84123	17717		17717	22057	* 4340	522548
32	2007		10612	6309	16921	73511	16921		16921	22921	* 6000	516548
33	2008		10599	5513	16112	62912	16112		16112	23782	* 7670	508878
34	2009		10586	4718	15304	52326	15304		15304	24644	* 9340	499538
35	2010		10466	3924	14390	41860	14390		14390	25507	*11117	488421
36	2011		10341	3140	13481	31519	13481		13481	26367	* 12886	475535
37	2012		9870	2364	12234	21649	12234		12234	27278	* 15044	460491
38	2013		7989	1624	9613	13660	9613		9613	27278	* 17665	442826
39	2014		5560	1025	6585	8100	6585		6585	27278	* 20693	422133
40	2015		4272	608	4880	3828	4880		4880	27278	* 22398	399735
41	2016		2514	287	2801	1314	2801		2801	27278	* 24477	375258
42	2017		1314	99	1413	0	1413		1413	27278	* 25865	349393
Total		265307	265307	378068	643375		643375	282276	925651	576258	349393	

(in 1,000 US$)

Table 6.2.30
Cash Flow Plan—Additional Case for Recommended Alternative (3)
(Estimated Annual Revenue and Operating Expenses)

At 180% increase over recommended fare

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	188.2	202.7	307.7	321.0	476.7	496.8	517.1	537.2	557.4	577.5	597.7	617.8	637.9	658.1	678.2
2	Annual Passenger Volume (million passengers)	68.7	74.0	112.3	117.2	174.0	181.4	188.7	196.1	203.5	210.8	218.2	225.5	232.8	240.2	247.5
3	Annual Fare Revenue (1,000 US$) (@US$1=P7.50)	10373	11216	16368	17106	27955	29197	30446	31690	32934	34178	35420	36664	37908	39152	40396
4	Miscellaneous Revenue (1,000 US$)	311	336	491	513	839	876	913	951	988	1025	1063	1100	1137	1175	1212
5	Total Annual Revenue (1,000 US$)	10684	11552	16859	17619	28794	30073	31359	32641	33922	35203	36483	37764	39045	40327	41608
6	Annual Operating Expenses (1,000 US$)	6663	7156	11043	11502	16563	17264	17971	18146	18320	18495	18670	18844	19019	19193	19368
7	Annual Profit/Loss (1,000 US$)	4021	4396	5816	6117	12231	12809	13388	14495	15602	16708	17813	18920	20026	21134	22240
8	Accumulated Profit/Loss (1,000 USR)	4021	8417	14233	20350	32581	45390	58778	73273	88875	105583	123396	142316	162342	183476	205716
9	Section in Operation	U.P. - F.E.U.		U.P. - Rizal		U.P. - Baclaran (minimum fare: 70 ct for zone fare system)										

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	698.3	718.5	738.6	758.8	778.9	799.0	819.2	839.3	859.4	879.6	899.7	919.9	940.0	960.1	980.3
2	Annual Passenger Volume	254.9	262.2	269.6	277.0	284.3	291.6	299.0	306.3	313.7	321.0	328.4	335.8	343.1	350.5	357.8
3	Annual Fare Revenue	41638	42882	44125	45369	46611	47855	49099	50343	51585	52829	54073	55317	56561	57803	59047
4	Annual Miscellaneous Revenue	1249	1286	1324	1361	1398	1436	1473	1510	1548	1585	1622	1660	1697	1734	1771
5	Total Annual Revenue	42887	44168	45449	46730	48009	49291	50572	51853	53133	54414	55695	56977	58258	59537	60818
6	Annual Operating Expenses	19543	19717	19892	20067	20241	20416	20591	20765	20940	21114	21289	21464	21638	21813	21938
7	Annual Profit/Loss	23344	24451	25557	26663	27768	28875	29981	31088	32193	33300	34406	35513	36620	37724	38880
8	Accumulated Profit/Loss	229060	253511	279068	305731	333499	362374	392355	423443	455636	488936	523342	558855	595475	633199	672079
9	Section in Operation															

Table 6.2.31
Financial Investment Plan—Additional Case for Recommended Alternative (3)

At 180% increase over recommended fare

No. of Year / Year	Foreign Currency Portion					Expenditure			Income		
	Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1 1976	333				333		333	333		333	333
2 1977	333		25	25	666	25	333	358		358	691
3 1978	3000		50	50	3666	50	4000	4050		4050	4741
4 1979	3130		275	275	6796	275	4350	4625		4625	9366
5 1980	11774		510	510	18570	510	21559	22069		22069	31435
6 1981	47027		1393	1393	65597	1393	42640	44033		44033	75468
7 1982	60717		4920	4920	126314	4920	62793	67713		67713	143181
8 1983	32193	13	9474	9487	158494	9487	31207	40694	4021	36673	179854
9 1984	43940	27	11887	11914	202407	11914	49747	61661	4396	57265	237119
10 1985	30037	147	15181	15328	232297	15328	30463	45791	5816	39975	277094
11 1986	32823	272	17422	17694	264848	17694	34851	52545	6117	46428	323522
12 1987		743	19864	20607	264105	20607		20607	12231	8376	331898
13 1988		2624	19808	22432	261481	22432		22432	12809	9623	341521
14 1989		5053	19611	24664	256428	24664		24664	13388	11276	352797
15 1990		6340	19232	25572	250088	25572		25572	14495	11077	363874
16 1991		8098	18757	26855	241990	26855		26855	15602	11253	375127
17 1992		9299	18149	27448	232691	27448		27448	16708	10740	385867
18 1993		10612	17452	28064	222079	28064		28064	17813	10251	396118
19 1994		10612	16656	27268	211467	27268		27268	18920	8348	404466
20 1995		10612	15860	26472	200855	26472		26472	20026	6446	410912
21 1996		10612	15064	25676	190243	25676		25676	21134	4542	415454
22 1997		10612	14268	24880	179631	24880		24880	22240	2640	418094
23 1998		10612	13472	24084	169019	24084		24084	23344	740	418834
24 1999		10612	12676	23288	158407	23288		23288	24451	* 1163	417671
25 2000		10612	11881	22493	147795	22493		22493	25557	* 3064	414607
26 2001		10612	11085	21697	137183	21697		21697	26663	* 4966	409641
27 2002		10612	10289	20901	126571	20901		20901	27768	* 6867	402774
28 2003		10612	9493	20105	115959	20105		20105	28875	* 8770	394004
29 2004		10612	8697	19309	105347	19309		19309	29981	* 10672	383332
30 2005		10612	7901	18513	94735	18513		18513	31088	* 12575	370757
31 2006		10612	7105	17717	84123	17717		17717	32193	* 14476	356281
32 2007		10612	6309	16921	73511	16921		16921	33300	* 16379	339902
33 2008		10599	5513	16112	62912	16112		16112	34406	* 18294	321608
34 2009		10586	4718	15034	52326	15304		15304	35513	* 20209	301399
35 2010		10466	3924	14390	41860	14390		14390	36620	* 22230	279169
36 2011		10341	3140	13481	31519	13481		13481	37724	* 24243	254926
37 2012		9870	2364	12234	21649	12234		12234	38880	* 26646	228280
38 2013		7989	1624	9613	13660	9613		9613	38880	* 29267	199013
39 2014		5560	1025	6585	8100	6585		6585	38880	* 32295	166718
40 2015		4272	608	4880	3828	4880		4880	38880	* 34000	132718
41 2016		2514	287	2801	1314	2801		2801	38880	* 36079	96639
42 2017		1314	99	1413	0	1413		1413	38880	* 37467	59172
Total	265307	265307	378068	643375		643375	282276	925651	866479	59130	

(in 1,000 US$)

Table 6.2.32
Cash Flow Plan—Additional Case for Recommended Alternative (4)
(Estimated Annual Revenue and Operating Expenses)

At uniform fare rate of 40 ct

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	311.5	335.5	509.3	531.4	789.0	822.3	855.9	889.2	922.5	955.9	989.2	1022.5	1055.8	1089.2	1122.5
2	Annual Passenger Volume (million passengers)	113.7	122.4	185.9	194.0	288.0	300.2	312.4	324.5	336.7	348.9	361.1	373.2	385.3	397.6	409.7
3	Annual Fare Revenue (1,000 US$) (@US$1=P7.50)	5576	6029	8799	9196	15028	15696	16367	17036	17704	18373	19041	19709	20378	21047	21716
4	Miscellaneous Revenue (1,000 US$)	167	181	264	276	451	471	491	511	531	551	571	591	611	631	651
5	Total Annual Revenue (1,000 US$)	5743	6210	9063	9472	15479	16167	16858	17547	18235	18924	19612	20300	20989	21678	22367
6	Annual Operating Expenses (1,000 US$)	6663	7156	11043	11502	16563	17264	17971	18146	18320	18495	18670	18844	19019	19193	19368
7	Annual Profit/Loss (1,000 US$)	-920	-946	-1980	-2030	-1084	-1097	-1113	-599	-85	429	942	1456	1970	2485	2999
8	Accumulated Profit/Loss (1,000 US$)	-920	-1866	-3846	-5876	-6960	-8057	-9170	-9769	-9854	-9425	-8483	-7027	-5057	-2572	427
9	Section in Operation	U.P. - F.E.U.		U.P. - Rizal		U.P. - Baclaran		(Uniform fare rate of 40 ct)								

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1155.8	1189.2	1222.5	1255.8	1289.2	1322.5	1355.8	1389.1	1422.5	1455.8	1489.1	1522.5	1555.8	1589.1	1622.4
2	Annual Passenger Volume	421.9	434.0	446.3	458.4	470.5	482.7	494.9	507.0	519.2	531.4	543.5	555.7	567.8	580.1	592.2
3	Annual Fare Revenue	22383	23052	23721	24389	25057	25726	26394	27063	27731	28399	29068	29739	30405	31073	31742
4	Annual Miscellaneous Revenue	671	692	712	732	752	772	792	812	832	852	872	892	912	932	952
5	Total Annual Revenue	23054	23744	24433	25121	25809	26498	27186	27875	28563	29251	29940	30631	31317	32005	32694
6	Annual Operating Expenses	19543	19717	19892	20067	20241	20416	20591	20765	20940	21114	21289	21464	21638	21813	21938
7	Annual Profit/Loss	3511	4027	4541	5054	5568	6082	6595	7110	7623	8137	8651	9167	9679	10192	10756
8	Accumulated Profit/Loss	3938	7965	12506	17560	23128	29210	35805	42915	50538	58675	67326	76493	86172	96364	107120
9	Section in Operation															

Table 6.2.33
Financial Investment Plan—Additional Case for Recommended Alternative (4)

At uniform fare rate of 40 ct.

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333				333		333	333		333	333
2	1977	333		25	25	666	25	333	358		358	691
3	1978	3000		50	50	3666	50	4000	4050		4050	4741
4	1979	3130		275	275	6796	275	4350	4625		4625	9366
5	1980	11774		510	510	18570	510	21559	22069		22069	31435
6	1981	47027		1393	1393	65597	1393	42640	44033		44033	75468
7	1982	60717		4920	4920	126314	4920	62793	67713		67713	143181
8	1983	32193	13	9474	9487	158494	9487	31207	40694	-920	41614	184795
9	1984	43940	27	11887	11914	202407	11914	49747	61661	-946	62607	247402
10	1985	30037	147	15181	15328	232297	15328	30463	45791	-1980	47771	295178
11	1986	32823	272	17422	17694	264848	17694	34851	52545	-2030	54575	349748
12	1987		743	19864	20607	264105	20607		20607	-1084	21691	371439
13	1988		2624	19808	22432	261481	22432		22432	-1097	23529	394968
14	1989		5053	19611	24664	256428	24664		24664	-1113	25777	420745
15	1990		6340	19232	25572	250088	25572		25572	-599	26171	446916
16	1991		8098	18757	26855	241990	26855		26855	-85	26940	473856
17	1992		9299	18149	27448	232691	27448		27448	429	27019	500875
18	1993		10612	17452	28064	222079	28064		28064	942	27122	527997
19	1994		10612	16656	27268	211467	27268		27268	1456	25812	553809
20	1995		10612	15860	26472	200855	26472		26472	1970	24502	578311
21	1996		10612	15064	25676	190243	25676		25676	2485	23191	601502
22	1997		10612	14268	24880	179631	24880		24880	2999	21881	623383
23	1998		10612	13472	24084	169019	24084		24084	3511	20573	643956
24	1999		10612	12676	23288	158407	23288		23288	4027	19261	663217
25	2000		10612	11881	22493	147795	22493		22493	4541	17952	681169
26	2001		10612	11085	21697	137183	21697		21697	5054	16643	697812
27	2002		10612	10289	20901	126571	20901		20901	5568	15333	713145
28	2003		10612	9493	20105	115959	20105		20105	6082	14023	727168
29	2004		10612	8697	19309	105347	19309		19309	6595	12714	739882
30	2005		10612	7901	18513	94735	18513		18513	7110	11403	751285
31	2006		10612	7105	17717	84123	17717		17717	7623	10094	761379
32	2007		10612	6309	16921	73511	16921		16921	8137	8784	770163
33	2008		10599	5513	16112	62912	16112		16112	8651	7461	777624
34	2009		10586	4718	15304	52326	15304		15304	9167	6137	783761
35	2010		10466	3924	14390	41860	14390		14390	9679	4711	788472
36	2011		10341	3140	13481	31519	13481		13481	10192	3289	791761
37	2012		9870	2364	12234	21649	12234		12234	10756	1478	793239
38	2013		7989	1624	9613	13660	9613		9613	10756	* 1143	792096
39	2014		5560	1025	6585	8100	6585		6585	10756	* 4171	787925
40	2015		4272	608	4880	3828	4880		4880	10756	* 5876	782049
41	2016		2514	287	2801	1314	2801		2801	10756	* 7955	774094
42	2017		1314	99	1413	0	1413		1413	10756	* 9243	764751
Total		265307	265307	378068	643375		643375	282276	925651	160900	764751	

(in 1,000 US$)

Table 6.2.34
Cash Flow Plan—Additional Case for Recommended Alternative (5)
(Estimated Annual Revenue and Opera ing Expenses)

At uniform fare rate of 80 ct.

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	215.6	232.2	352.5	367.8	546.1	569.1	592.4	615.5	638.5	661.6	684.7	707.7	730.8	753.9	776.9
2	Annual Passenger Volume (million passengers)	78.7	84.7	128.7	134.2	199.4	207.8	216.2	224.6	233.1	241.5	249.9	258.3	266.7	275.2	283.6
3	Annual Fare Revenue (1,000 US$)(@USR1=P7.50)	7735	8363	12205	12756	20845	21771	22703	23630	24558	25485	26411	27339	28266	29194	30122
4	Miscellaneous Revenue (1,000 US$)	232	251	366	383	625	653	681	709	737	765	792	820	848	876	904
5	Total Annual Revenue (1,000 US$)	7967	8614	12571	13139	21470	22424	23384	24339	25295	26250	27204	28159	29114	30070	31026
6	Annual Operating Expenses (1,000 US$)	6663	7156	11043	11502	16563	17264	17971	18146	18320	18495	18670	18844	19019	19193	19368
7	Annual Profit/Loss (1,000 US$)	1304	1458	1528	1637	4907	5160	5413	6193	6975	7755	8534	9315	10095	10877	11658
8	Accumulated Profit/Loss (1,000 US$)	1304	2762	4290	5927	10834	15994	21407	27600	34575	42330	50864	60179	70274	81151	92809
9	Section in Operation	U.P. - F.E.U.		U.P. - Rizal		U.P. - Baclaran		(At uniform fare rate of 80 ct)								

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	800.0	823.1	846.1	869.2	892.3	915.4	938.4	961.5	984.6	1007.6	1030.7	1053.8	1076.8	1099.9	1123.0
2	Annual Passenger Volume	292.0	300.4	308.9	317.3	325.7	334.1	342.5	350.9	359.4	367.8	376.2	384.6	393.0	401.5	409.9
3	Annual Fare Revenue	31048	31975	32903	33830	34756	35684	36611	37539	38465	39393	40320	41248	42175	43101	44029
4	Annual Miscellaneous Revenue	931	959	987	1015	1043	1070	1098	1126	1154	1182	1210	1237	1265	1293	1321
5	Total Annual Revenue	31979	32934	33890	34848	35799	36754	37709	38665	39610	40575	41530	42485	43440	44394	45350
6	Annual Operating Expenses	19543	19717	19892	20067	20241	20416	20591	20765	20940	21114	21289	21464	21638	21813	21938
7	Annual Profit/Loss	12436	13217	13998	14778	15558	16338	17118	17900	18670	19461	20241	21021	21802	22581	23412
8	Accumulated Profit/Loss	105245	118462	132460	147238	162796	179134	196252	214152	232822	252283	272524	293545	315347	337928	361340
9	Section in Operation															

Table 6.2.35
Financial Investment Plan—Additional Case for Recommended Alternative (5)

At uniform fare rate of 80 ct.

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333				333		333	333		333	333
2	1977	333		25	25	666	25	333	358		358	691
3	1978	3000		50	50	3666	50	4000	4050		4050	4741
4	1979	3130		275	275	6796	275	4350	4625		4625	9366
5	1980	11774		510	510	18570	510	21559	22069		22069	31435
6	1981	47027		1393	1393	65597	1393	42640	44033		44033	75468
7	1982	60717		4920	4920	126314	4920	62793	67713		67713	143181
8	1983	32193	13	9474	9487	158494	9487	31207	40694	1304	39390	182571
9	1984	43940	27	11887	11914	202407	11914	49747	61661	1458	60203	242774
10	1985	30037	147	15181	15328	232297	15328	30463	45791	1528	44263	287037
11	1986	32823	272	17422	17694	264848	17694	34851	52545	1637	50908	337945
12	1987		743	19864	20607	264105	20607		20607	4907	15700	353645
13	1988		2624	19808	22432	261481	22432		22432	5160	17272	370917
14	1989		5053	19611	24664	256428	24664		24664	5413	19251	390168
15	1990		6340	19232	25572	250088	25572		25572	6193	19379	409547
16	1991		8098	18757	26855	241990	26855		26855	6975	19880	429427
17	1992		9299	18149	27448	232691	27448		27448	7755	19693	449120
18	1993		10612	17452	28064	222079	28064		28064	8534	19530	468650
19	1994		10612	16656	27268	211467	27268		27268	9315	17953	486603
20	1995		10612	15860	26472	200855	26472		26472	10095	16377	502980
21	1996		10612	15064	25676	190243	25676		25676	10877	14799	517779
22	1997		10612	14268	24880	179631	24880		24880	11658	13222	531001
23	1998		10612	13472	24084	169019	24084		24084	12436	11648	542649
24	1999		10612	12676	23288	158407	23288		23288	13217	10071	552720
25	2000		10612	11881	22493	147795	22493		22493	13998	8495	561215
26	2001		10612	11085	21697	137183	21697		21697	14778	6919	568134
27	2002		10612	10289	20901	126571	20901		20901	15558	5343	573477
28	2003		10612	9493	20105	115959	20105		20105	16338	3767	577244
29	2004		10612	8697	19309	105347	19309		19309	17118	2191	579435
30	2005		10612	7901	18513	94735	18513		18513	17900	613	580048
31	2006		10612	7105	17717	84123	17717		177[illegible]	186[illegible]	* 953	579095
32	2007		10612	6309	16921	73511	16921		16921	19461	*2540	576555
33	2008		10599	5513	16112	62912	16112		16112	20241	*4129	572426
34	2009		10586	4718	15304	52326	15304		15304	21021	*5717	566709
35	2010		10466	3924	14390	41860	14390		14390	21802	*7412	559297
36	2011		10341	3140	13481	31519	13481		13481	22581	*9100	550197
37	2012		9870	2364	12234	21649	12234		12234	23412	*11178	539019
38	2013		7989	1624	9613	13660	9613		9613	23412	*13799	525220
39	2014		5560	1025	6585	8100	6585		6585	23412	*16827	508393
40	2015		4272	608	4880	3828	4880		4880	23412	*18532	489861
41	2016		2514	287	2801	1314	2801		2801	23412	*20611	469250
42	2017		1314	99	1413	0	1413		1413	23412	*21999	447251
Total		265307	265307	378068	643375		643375	282276	925651	478400	447251	

(in 1,000 US$)

Here an analysis is made of the portion that is economically and financially next to the optimum section in viability, which is the U.P. - Rizal Park section, with the construction starting from U.P. Table 6.2.36 to 6.2.39 show the results of these analyses both for the case of the proposed fare rate and that of the increased fare rate.

It will be seen that the construction cost drops by over 30% to 375 million US$, as compared to 547 million US$ for the U.P. - Bacralan section. For the years in which the U.P. - Bacralan is expected to be put into operation, the partial construction plan will register a 31% saving in operating expenses. However, a drop in passenger volume results in a 39% decrease in annual revenue on the other hand, so that at the proposed fare rate the operation is expected to be in a deficit for the first 13 yeras of operation. The accumulated total government expenditures in the year of completion of payment of the entire foreign loan comes to 624 million US$.

Should the increased fare rate be adopted, then the operation will register a profit right from the first year of operation. However, the annual profit amount is small so that in the year when the foreign loan payment is completed, an accumulated total government expenditure of 306 million is estimated. This government investment, however, will be wholly recovered 20 years after the completion of repayment of foreign loan.

The merit of this alternative is that the financial burden during the construction stage is considerably lightened, so that, despite its lack of attractiveness in profitability , the alternative may be considered if the financial demand for the construction of the whole section cannot be met. In this case, of course, it is beyond saying that when future finance is available, the extension of the Rizal Park - Baclaran section should be implemented as soon as possible.

2.8.3 In the Case that the NPC Unit Price of Electricity is Made Applicable

The annual operating expenses used so far for financial analysis are estimated based on the assumption that the more unfavorable MERALCO unit price of electricity is applied. However, since the cost on electricity consumption makes up a very large portion of the annual operating expenses, it is necessary to check the implication of applying the much more favorable NPC unit price. As seen from Tables 6.2.40 and 6.2.41, although the annual operating expenses will be substantially reduced when the NPC unit price of electricity is made applicable, the overall results of financial analysis will not be greatly affected, and an accumulated unrecovered government expenditure of over 544 million will be recorded.

2.8.4 In the Case that Construction is Implemented at the Shortest Possible Time Schedule

The recommended implementation schedule was decided with considerations on the economic, technical and financial advantages of dividing the implementation of a project of such large scale into several stages spreaded over a long span of time. However, other considerations may require the completion of the whole project within as short a period as possible. Here, an analysis is therefore made to identify the implications of such a case whereby the whole project is assumed to be completed within six years, which is the physically shortest possible time period from the technical points. From the financial shown in Table 6.2.42, it is clearly seen that despite the fact that an investment plan

Table 6.2.36
Cash Flow Plan—Additional Case for Recommended Alternative (6)
(Estimated Annual Revenue and Operatin Expenses)

Only U.P. - Rizal Park Section Implemented.

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	326.2	351.3	533.3	556.4	579.5	604.0	628.5	653.0	677.5	702.0	726.5	750.9	775.4	799.9	824.4
2	Annual Passenger Volume (million passengers)	119.1	128.2	194.7	203.1	211.5	220.4	229.4	238.3	247.2	256.2	265.1	274.0	282.9	291.9	300.8
3	Annual Fare Revenue (1,000 US$)(@US$1=¥27.50)	5996	6483	9461	9888	10315	10774	11233	11692	12151	12610	13069	13528	13987	14446	14905
4	Miscellaneous Revenue (1,000 US$)	180	194	284	297	309	323	337	351	365	378	392	406	420	433	447
5	Total Annual Revenue (1,000 US$)	6176	6677	9745	10185	10624	11097	11570	12043	12516	12988	13461	13934	14407	14879	15352
6	Annual Operating Expenses (1,000 US$)	6663	7156	11043	11502	11961	12283	12605	12926	13248	13570	13892	14213	14535	14857	15179
7	Annual Profit/Loss (1,000 US$)	-487	-479	-1298	-1317	-1337	-1186	-1035	-883	-732	-582	-431	-279	-128	22	173
8	Accumulated Profit/Loss (1,000 US$)	-487	-966	-2264	-3581	-4918	-6104	-7139	-8022	-8754	-9336	-9767	-10046	-10174	-10152	-9979
9	Section in Operation	U.P. - F.E.U.		U.P.-Rizal Park												

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	848.9	873.4	897.9	922.4	946.9	971.4	995.9	1020.4	1044.9	1069.3	1093.8	1118.3	1142.8	1167.3	1191.8
2	Annual Passenger Volume	309.7	318.7	327.6	336.5	345.5	354.4	363.3	372.3	381.2	390.1	399.0	408.0	416.9	425.8	434.8
3	Annual Fare Revenue	15364	15823	16282	16741	17200	17659	18118	18577	19036	19495	19954	20413	20872	21331	21790
4	Annual Miscellaneous Revenue	461	475	488	502	516	530	544	557	571	585	599	612	626	640	654
5	Total Annual Revenue	15825	16298	16770	17243	17716	18189	18662	19134	19607	20080	20553	21025	21498	21971	22444
6	Annual Operating Expenses	15500	15822	16144	16466	16788	17109	17431	17753	18075	18396	18718	19040	19362	19683	20005
7	Annual Profit/Loss	325	476	626	777	928	1080	1231	1381	1532	1684	1835	1985	2136	2288	2439
8	Accumulated Profit/Loss	-9654	-9178	-8552	-7775	-6847	-5767	-4536	-3155	-1623	61	1896	3881	6017	8305	10744
9	Section in Operation															

Table 6.2.37
Financial Investment Plan—Additional Case for Recommended Alternative (6)

Only U.P. - Rizal Park Section Implemented.

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion		Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333		-	-	333	-	333	333		333	333
2	1977	333		25	25	666	25	333	358		358	691
3	1978	3000		50	50	3666	50	4000	4050		4050	4741
4	1979	3130		275	275	6796	275	4350	4625		4625	9366
5	1980	11774		510	510	18570	510	21559	22069		22069	31435
6	1981	47027		1393	1393	65597	1393	42640	44033		44033	75468
7	1982	60717		4920	4920	126314	4920	62793	67713		67713	143181
8	1983	29360	13	9474	9487	155661	9487	25807	35294	-487	35781	178962
9	1984	31273	27	11675	11702	186907	11702	26733	38435	-479	38914	217876
10	1985		147	14018	14165	186760	14165		14165	-1298	15463	233339
11	1986		272	14007	14279	186488	14279		14279	-1317	15596	248935
12	1987		743	13987	14730	185745	14730		14730	-1337	16067	265002
13	1988		2624	13931	16555	183121	16555		16555	-1186	17741	282743
14	1989		5052	13734	18786	178069	18786		18786	-1035	19821	302564
15	1990		6227	13355	19582	171842	19582		19582	-883	20465	323029
16	1991		7478	12888	20366	164364	20366		20366	-732	21098	344127
17	1992		7478	12327	19805	156886	19805		19805	-582	20387	364514
18	1993		7478	11766	19244	149408	19244		19244	-431	19675	384189
19	1994		7478	11206	18684	141930	18684		18684	-279	18963	403152
20	1995		7478	10645	18123	134452	18123		18123	-128	18251	421403
21	1996		7478	10084	17562	126974	17562		17562	22	17540	438943
22	1997		7478	9523	17001	119496	17001		17001	173	16828	455771
23	1998		7478	8962	16440	112018	16440		16440	325	16115	471886
24	1999		7478	8401	15879	104540	15879		15879	476	15403	487289
25	2000		7478	7841	15319	97062	15319		15319	626	14693	501982
26	2001		7478	7280	14758	89584	14758		14758	777	13981	515963
27	2002		7478	6719	14197	82106	14197		14197	928	13269	529232
28	2003		7478	6158	13636	74628	13636		13636	1080	12556	541788
29	2004		7478	5597	13075	67150	13075		13075	1231	11844	553632
30	2005		7478	5036	12514	59672	12514		12514	1381	11133	564765
31	2006		7478	4475	11953	52194	11953		11953	1532	10421	575186
32	2007		7478	3915	11393	44716	11393		11393	1684	9709	584895
33	2008		7464	3354	10818	37252	10818		10818	1835	8983	593878
34	2009		7451	2794	10245	29801	10245		10245	1985	8260	602138
35	2010		7331	2235	9566	22470	9566		9566	2136	7430	609568
36	2011		7206	1685	8891	15264	8891		8891	2288	6603	616171
37	2012		6735	1145	7880	8529	7880		7880	2439	5441	621612
38	2013		4854	640	5494	3675	5494		5494	2439	3055	624667
39	2014		2425	276	2701	1250	2701		2701	2439	262	624929
40	2015		1250	94	1344	0	1344		1344	2439	*1095	623834
41	2016											
42	2017											
43	2018											
44	2019											
Total		186947	186947	266400	453347		453347	188548	641895	18061	623834	

(in 1,000 US$)

Table 6.2.38
Financial Investment Plan—Additional Case for Recommended Alternative (7)

Only U.P. - Rizal Park section implemented and at increased fare rate of 40 ct minimum fare.

	No. of Years in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	326.2	351.3	533.3	556.4	579.5	604.0	628.5	653.0	677.5	702.0	726.5	750.9	775.4	799.9	824.4
2	Annual Passenger Volume (million passengers)	119.1	128.2	194.7	203.1	211.5	220.4	229.4	238.3	247.2	256.2	265.1	274.0	282.9	291.9	300.8
3	Annual Fare Revenue (1,000 US$)(@US$1=P7.50)	9594	10373	15138	15821	16504	17238	17973	18707	19442	20176	20910	21645	22379	23114	23848
4	Miscellaneous Revenue (1,000 US$)	288	311	454	475	495	517	539	561	583	605	627	649	671	693	715
5	Total Annual Revenue (1,000 US$)	9882	10684	15592	16296	16999	17755	18512	19268	20025	20781	21537	22294	23050	23807	24563
6	Annual Operating Expenses (1,000 US$)	6663	7156	11043	11502	11961	12283	12605	12926	13248	13570	13892	14213	14535	14857	15179
7	Annual Profit/Loss (1,000 US$)	3219	3528	4549	4794	5038	5472	5907	6342	6777	7211	7645	8081	8515	8950	9384
8	Accumulated Profit/Loss (1,000 US$)	3219	6747	11296	16090	21128	26600	32507	38849	45626	52837	60482	68563	77078	86028	95412
9	Section in Operation	U.P. - F.E.U.		U.P. - Rizal			(At increased fare rate, minimum fare = 40 centavos)									

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	848.9	873.4	897.9	922.4	946.9	971.4	995.9	1020.4	1044.9	1069.3	1093.8	1118.3	1142.8	1167.3	1191.8
2	Annual Passenger Volume	309.7	318.7	327.6	336.5	345.5	354.4	363.3	372.3	381.2	390.1	399.0	408.0	416.9	425.8	434.8
3	Annual Fare Revenue	24582	25317	26051	26786	27520	28254	28989	29723	30458	31192	31926	32661	33395	34130	34864
4	Annual Miscellaneous Revenue	737	760	782	804	826	848	870	892	914	936	958	980	1002	1024	1046
5	Total Annual Revenue	25319	26077	26833	27590	28346	29102	29859	30615	31372	32128	32884	33641	34397	35154	35910
6	Annual Operating Expenses	15500	15822	16144	16466	16788	17109	17431	17753	18075	18396	18718	19040	19362	19683	20005
7	Annual Profit/Loss	9819	10255	10689	11124	11558	11993	12428	12862	13297	13732	14166	14601	15035	15471	15905
8	Accumulated Profit/Loss	105231	115486	126175	137299	148857	160850	173278	186140	199437	213169	227335	241936	256971	272442	288347
9	Section in Operation															

Table 6.2.39
Financial Investment Plan-Additional Case for Recommended Alternative (7)

Only U.P. - Rizal Park section implemented and at increased fare rate of 40 ct minimum fare.

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333				333		333	333		333	333
2	1977	333		25	25	666	25	333	358		358	691
3	1978	3000		50	50	3666	50	4000	4050		4050	4741
4	1979	3130		275	275	6796	275	4350	4625		4625	9366
5	1980	11774		510	510	18570	510	21559	22069		22069	31435
6	1981	47027		1393	1393	65597	1393	42640	44033		44033	75468
7	1982	60717		4920	4920	126314	4920	62793	67713		67713	143181
8	1983	29360	13	9474	9487	155661	9487	25807	35294	3219	32075	175256
9	1984	31273	27	11675	11702	186907	11702	26733	38435	3528	34907	210163
10	1985		147	14018	14165	186760	14165		14165	4549	9616	219779
11	1986		272	14007	14279	186488	14279		14279	4794	9485	229264
12	1987		743	13987	14730	185745	14730		14730	5038	9692	238956
13	1988		2624	13931	16555	183121	16555		16555	5472	11083	250039
14	1989		5052	13734	18786	178069	18786		18786	5907	12879	262918
15	1990		6227	13355	19582	171842	19582		19582	6342	13240	276158
16	1991		7478	12888	20366	164364	20366		20366	6777	13589	289747
17	1992		7478	12327	19805	156886	19805		19805	7211	12594	302341
18	1993		7478	11766	19244	149408	19244		19244	7645	11599	313940
19	1994		7478	11206	18684	141930	18684		18684	8081	10603	324543
20	1995		7478	10645	18123	134452	18123		18123	8515	9608	334151
21	1996		7478	10084	17562	126974	17562		17562	8950	8612	342763
22	1997		7478	9523	17001	119496	17001		17001	9384	7617	35038
23	1998		7478	8962	16440	112018	16440		16440	9819	6621	357001
24	1999		7478	8401	15879	104540	15879		15879	10255	5624	362625
25	2000		7478	7841	15319	97062	15319		15319	10689	4630	367255
26	2001		7478	7280	14758	89584	14758		14758	11124	3634	370889
27	2002		7478	6719	14197	82106	14197		14197	11558	2639	373528
28	2003		7478	6158	13636	74628	13636		13636	11993	1643	375171
29	2004		7478	5597	13075	67150	13075		13075	12428	647	375818
30	2005		7478	5036	12514	59672	12514		12514	12862	*348	375470
31	2006		7478	4475	11953	52194	11953		11953	13297	*1344	374126
32	2007		7478	3915	11393	44716	11393		11393	13732	*2339	371787
33	2008		7464	3354	10818	37252	10818		10818	14166	*3348	368439
34	2009		7451	2794	10245	29801	10245		10245	14601	*4356	364083
35	2010		7331	2235	9566	22470	9566		9566	15035	*5469	358614
36	2011		7206	1685	8891	15264	8891		8891	15471	*6580	352034
37	2012		6735	1145	7880	8529	7880		7880	15905	*8025	344009
38	2013		4854	640	5494	3675	5494		5494	15905	*10411	333598
39	2014		2425	276	2701	1250	2701		2701	15905	*13204	320394
40	2015		1250	94	1344	0	1344		1344	15905	*14561	305833
41	2016											
42	2017											
43	2018											
44	2019											
Total		186947	186947	266400	453347		453347	188548	641895	336062	305833	

(in 1,000 US$)

Table 6.2.40
Cash Flow Plan—Additional Case for Recommended Alternative (7)
(Estimated Annual Revenue and Operating Expenses)

NPC unit cost of electricity applied

	No. of Year in Operation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Daily Passenger Volume (1,000 passengers)	326.2	351.3	533.3	556.4	826.2	861.0	896.2	931.1	966.0	1000.9	1035.8	1070.7	1105.6	1140.5	1175.4
2	Annual Passenger Volume (million passengers)	119.1	128.2	194.7	203.1	301.6	314.3	327.1	339.8	352.6	365.3	378.1	390.8	403.5	416.3	429.0
3	Annual Fare Revenue (1,000 US$) (@US$1=P7.50)	5996	6483	9461	9888	16159	16877	17599	18318	19037	19756	20474	21193	21912	22631	23350
4	Miscellaneious Revenue (1,000 US$)	180	194	284	297	485	506	528	550	571	593	614	636	657	679	701
5	Total Annual Revenue (1,000 US$)	6176	6677	9745	10185	16644	17383	18127	18868	19408	20349	21088	21829	22569	23310	24050
6	Annual Operating Expenses (1,000 US$)	5313	5706	8577	8934	12543	13074	13609	13742	13874	14006	14139	14270	14403	14535	14667
7	Annual Profit/Loss (1,000 US$)	863	971	1168	1251	4101	4309	4518	5126	5534	6343	6949	7559	8166	8775	9383
8	Accumulated Profit/Loss (1,000 US$)	863	1834	3002	4253	8354	12663	17181	22307	27841	34184	41133	48692	56858	65633	75016
9	Section in Operation	U.P. - F.E.U.		U.P. - Rizal			U.P. - Baclaran									

Cont'd

	No. of Years in Operation	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Daily Passenger Volume	1210.3	1245.2	1280.1	1315.0	1349.9	1384.8	1419.7	1454.6	1489.5	1524.4	1559.3	1594.2	1629.1	1664.0	1698.9
2	Annual Passenger Volume	441.8	454.5	467.3	480.0	492.7	505.4	518.2	530.9	543.7	556.4	569.1	581.9	594.6	607.4	620.1
3	Annual Fare Revenue	24068	24787	25506	26225	26943	27662	28381	29100	29818	30537	31256	31975	32694	33412	34131
4	Annual Miscellaneous Revenue	722	744	765	787	808	830	851	873	895	916	938	959	981	1002	1024
5	Total Annual Revenue	24790	25531	26271	27012	27751	28492	29232	29973	30713	31453	32194	32934	33675	34414	35155
6	Annual Operating Expenses	14800	14931	15064	15197	15328	15461	15593	15725	15858	15989	16122	16254	16386	16519	16651
7	Annual Profit/Loss	9990	10600	11207	11815	12423	13031	13639	14248	14855	15464	16072	16680	17289	17895	18504
8	Accumulated Profit/Loss	85006	95606	106813	118628	131051	144082	157721	171969	186824	202288	218360	235040	252329	270224	288728
9	Section in Operation															

Table 6.2.41
Financial Investment Plan-Additional Case for Recommended Alternative (7)

NPC unit cost of electricity applied

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	333				333		333	333		333	333
2	1977	333		25	25	666	25	333	358		358	691
3	1978	3000		50	50	3666	50	4000	4050		4050	4741
4	1979	3130		275	275	6796	275	4350	4625		4625	9366
5	1980	11774		510	510	18570	510	21559	22069		22069	31435
6	1981	47027		1393	1393	65597	1393	42640	44033		44033	75468
7	1982	60717		4920	4920	126314	4920	62793	67713		67713	143181
8	1983	32193	13	9474	9487	158494	9487	31207	40694	863	39831	183012
9	1984	43940	27	11887	11914	202407	11914	49747	61661	971	60690	243702
10	1985	30037	147	15181	15328	232297	15328	30463	45791	1168	44623	288325
11	1986	32823	272	17422	17694	264848	17694	34851	52545	1251	51294	339619
12	1987		743	19864	20607	264105	20607		20607	4101	16506	356125
13	1988		2624	19808	22432	261481	22432		22432	4309	18123	374248
14	1989		5053	19611	24664	256428	24664		24664	4518	20146	394394
15	1990		6340	19232	25572	250088	25572		25572	5126	20446	414840
16	1991		8098	18757	26855	24199C	26855		26855	5534	21321	436161
17	1992		9299	18149	27448	232691	27448		27448	5343	22105	457266
18	1993		10612	17452	28064	222079	28064		28064	6949	21115	478381
19	1994		10612	16656	27268	211467	27268		27268	7559	19709	498090
20	1995		10612	15860	26472	200855	26472		26472	8166	18306	516396
21	1996		10612	15064	25676	190243	25676		25676	8775	16901	533297
22	1997		10612	14268	24880	179631	24880		24880	9383	15497	548794
23	1998		10612	13472	24084	169019	24084		24084	9990	14094	562888
24	1999		10612	12676	23288	158407	23288		23288	10600	12688	575576
25	2000		10612	11881	22493	147795	22493		22493	11207	11286	586862
26	2001		10612	11085	21697	137183	21697		21697	11815	9882	596744
27	2002		10612	10289	20901	126571	20901		20901	12423	8478	605222
28	2003		10612	9493	20105	115959	20105		20105	13031	7074	612296
29	2004		10612	8697	19309	105347	19309		19309	13639	5670	617966
30	2005		10612	7901	18513	94735	18513		18513	14248	4265	622231
31	2006		10612	7105	17717	84123	17717		17717	14855	2862	625093
32	2007		10612	6309	16921	73511	16921		16921	15464	1457	626550
33	2008		10599	5513	16112	62912	16112		16112	16072	40	626590
34	2009		10586	4718	15304	52326	15304		15304	16680	* 1376	625214
35	2010		10466	3924	14390	41860	14390		14390	17289	* 2899	622315
36	2011		10341	3140	13481	31519	13481		13481	17895	* 4414	617901
37	2012		9870	2364	12234	21649	12234		12234	18504	* 6270	611631
38	2013		7989	1624	9613	13660	9613		9613	18504	* 8891	602740
39	2014		5560	1025	6585	8100	6585		6585	18504	*11919	590821
40	2015		4272	608	4880	3828	4880		4880	18504	*13624	577197
41	2016		2514	287	2801	1314	2801		2801	18504	*15703	561494
42	2017		1314	99	1413	0	1413		1413	18504	*17091	544403
43	2018											
44	2019											
Total		265307	265307	378068	643375		643375	282276	925651	381248	544403	

(in 1,000 US$)

Table 6.2.42
Financial Investment Plan—Additional Case for Recommended Alternative (9)

Construction of entire route within shortest period

No. of Year	Year	Foreign Currency Portion					Expenditure			Income		
		Foreign Currency Loan	Payment of Loan Capital	Payment of Loan Interest	Total Payment in Foreign Currency	Balance of Loan Outstanding	Total Payment in Foreign Currency	Investment on Local Currency Portion	Total Expenditure	Operational Profit/Loss Transferred	Total Annual Government Expenditure	Accumulated Total Government Expenditure
1	1976	666				666		666	666		666	666
2	1977	4667		50	50	5333	50	5667	5717		5717	6383
3	1978	8180		400	400	13513	400	13200	13600		13600	19983
4	1979	34804		1013	1013	48317	1013	62543	63556		63556	83539
5	1980	104207		3624	3624	152524	3624	95460	99084		99084	182623
6	1981	112783		11439	11439	265307	11439	104740	116179		116179	298802
7	1982			19898	19898	265307	19898		19898		19898	318700
8	1983		27	19898	19925	265280	19925		19925	-71	19996	338696
9	1984		213	19896	20109	265067	20109		20109	-33	20142	358838
10	1985		541	19880	20421	264526	20421		20421	5	20416	379254
11	1986		1933	19839	21772	262593	21772		21772	43	21729	400983
12	1987		6101	19694	25795	256492	25795		25795	81	25714	426697
13	1988		10612	19237	29849	245880	29849		29849	119	29730	456427
14	1989		10612	18441	29053	235268	29053		29053	156	28897	485324
15	1990		10612	17645	28257	224656	28257		28257	722	27535	512859
16	1991		10612	16849	27461	214044	27461		27461	1088	26373	539232
17	1992		10612	16053	26665	203432	26665		26665	1854	24811	564043
18	1993		10612	15257	25869	192820	25869		25869	2418	23451	587494
19	1994		10612	14462	25074	182208	25074		25074	2985	22089	609583
20	1995		10612	13666	24278	171596	24278		24278	3550	20728	630311
21	1996		10612	12870	23482	160984	23482		23482	4117	19365	649676
22	1997		10612	12074	22686	150372	22686		22686	4682	18004	667680
23	1998		10612	11278	21890	139760	21890		21890	5247	16643	684323
24	1999		10612	10482	21094	129148	21094		21094	5814	15280	699603
25	2000		10612	9686	20298	118536	20298		20298	6379	13919	713522
26	2001		10612	8890	19502	107924	19502		19502	6945	12557	726079
27	2002		10612	8094	18706	97312	18706		18706	7510	11196	737275
28	2003		10612	7298	17910	86700	17910		17910	8076	9834	747109
29	2004		10612	6503	17115	76088	17115		17115	8641	8474	755583
30	2005		10612	5707	16319	65476	16319		16319	9208	7111	762694
31	2006		10612	4911	15523	54864	15523		15523	9773	5750	768444
32	2007		10612	4115	14727	44252	14727		14727	10339	4388	772832
33	2008		10585	3319	13904	33667	13904		13904	10905	2999	775831
34	2009		10398	2525	12923	23269	12923		12923	11470	1453	777284
35	2010		10071	1745	11816	13198	11816		11816	12037	* 221	777063
36	2011		8679	990	9669	4519	9669		9669	12601	* 2932	774131
37	2012		4519	339	4858	0	4858		4858	13167	* 8309	765822
38	2013											
39	2014											
40	2015											
41	2016											
42	2017											
43	2018											
44	2019											
	Total	265307	265307	378067	643374		643374	282276	925650	159828	765822	

(in 1,000 US$)

anticipated increase in construction cost is not considered, the eventual accumulated unrecovered government expenditure will be larger than that envisaged for the recommended alternative, indicating the disadvantage of such an implementation schedule.

2.9 FINANCIAL RESOURCES

Since the investment on a rapid transit railway will be enormous, it will be difficult that the whole amount be financed by the ordinary government budget. Although the government will bear a part of the capital cost, particularly the local currency portion, it can be anticipated that a large portion of the investment will be made available through external assistance, either in the form of bilateral loan or multi-lateral loan.

In the planning stage, it is important that the domestic financial source that may be relied upon for the repayment of foreign loan be clearly identified in order that a realistic repayment plan may be prepared.

Needless to say, since the operating body will be subsidized by the government, any annual operating surplus will have to be contributed to the government for repayment purposes. Also, the government may annually allot a part of the ordinary budget for infrastructure development for the payment of the loan. However, the above resources only will not be adequate for the repayment of the loan and the establishement of a special fund in order to secure a constant financial source for financing the Rapid Transit Railway Line No. 1 as well as further lines of the network is considered neces-

The decision on the resources for the special fund rests with the government since the decision has to be made in the context of the overall national development policy. However, in this study, several possible domestic resources will be discussed purely from the point of benefit derived through the completion of the rapid transit railway. These will hopefully serve as a reference in the government decision on the establishment of the special fund.

a) From the passenger not diverted to the rapid transit railway

As may be seen from the results of the economic analysis, although the passengers on the rapid transit railway greatly benefit from the completion of the railway line, the largest portion of the benefit is the accrued benefits of the passengers not diverted to the rapid transit railway. Thus due to the diversion of a large volume of passengers to the rapid transit railway, the congestion on the road network of the metropolitan area is greatly relieved resulting in a saving in travel time and saving in travel cost of the road vehicles. It is therefore logical for the government to retrieve a part of the benefits enjoyed by the road users by making the road users bear a small extra cost for transportion on the road. The following are some of the forms of taxes that may be considered for making the road users bear the extra cost.

(i) Gasoline tax: The relief in road congestion results in a smoother running of the vehicle on the road and consequently a saving in gasoline consumption. By raising the gasoline tax of the Metropolitan and alotting the revenue from the tax raised to the special fund, the road users are thus made to contribute part of the saving to the special fund. It may

be added that this is a method adopted by many countries as financial source for rapid transit railway.

(ii) Drivers licence fees: Through the relief in congestion, the drivers enjoy a saving in travel time, and this saving may be partially retrieved by increasing the derivers licence fees and alotting the increased revenue to the special fund for rapid transit railway.

(iii) Vehicles registration fees: Besides a saving in gasoline consumption, the road vehicles also enjoy saving in lubricant consumption, and in maintenance cost through smooth travelling on the road, and this saving may be tapped through increase in vehicle registration fees.

b) From other mass transit operators

The road surface mass transit operators also benefit from the relief in road traffic congestion. Besides saving in fuel consumption and other operating costs, the bus and jeepney, through speedier travelling on the road, will be able to negotiate more trips per day, thus resulting in an increase in revenue per vehicle. It may therefore be proper that these mass transit operators be made to bear part of the costs of investment for the rapid transit railway. However, in this regard, it should be noted also that due to the diversion of passengers to the railway line, the bus and jeepney along the railway route also suffer a drop in passenger volume, and consequently a corresponding loss in revenue, and the levying of too great a burden on these operators is not desirable. If tapping of resources from the bus and jeepney operators should be considered, the following may be some of the possibilities.

(i) Increase of corporation registration fees of bus and jeepney operators.

(ii) Increase of corporation income tax of bus and jeepney operators.

c) From the residents along the corridor of the rapid transit railway

The biggest beneficiaries of the direct and indirect benefits of rapid transit railway are the residents along the corridor of the line. Directly, the line serves as a convenient means of transport to the residents. Indirectly, the business and commercial establishments along the line, with an improved accessibility, will see a flourishment in their business. With the improvement in accessibility, the utility of the land will be greatly enhanced and consequently the land value of the corridor will greatly increase. It is proper for the government to recover part of this financial benefit enjoyed by the residents along the corridor. The various taxes that may be considered in this respect are as follows.

(i) Increase of the real estate tax.

(ii) Increase of the corporation income tax.

d) From the profit through redevelopment of the corridor

As mentioned above, the land value of the corridor can be expected to be greatly increased, and consequently, a more intensified utilization of the land will naturally result. In this respect, a planned redevelopment of the corridor

with the assistance or co-operation of the government authorities is the best way to take advantage of the intensification in land use. The Government or the operating organization of the rapid transit railway, may organize the residents along the corridor to form a redevelopment corporation, which with equity participation of the authorities and the residents, will replace the low structures of one or two storys with multi-story buildings, and the usage of the floor space will also be converted from the low-value residence use to that of higher-value usage such as business or commercial use. Through this process of redevelopment a substantial profit can be expected of the corporation after reducting the cost of redevelopment and the original land value. The authorities' share of the profit from equity participation may be used to repay part of the capital investment on the rapid transit railway. Generally, a regional redevelopment program will require again a very enormous sum in investment, and it is considered that the railway operating organization may start with the building of station terminal buildings at major railway stations. In this regard, a case study of the possible profit for several sample locations had been made in Section 2.6, "Suggested Financing System" of Part V of this report, and careful study may be made to adopted a system most adoptable to the Philippines.

Although several possibilities of securing domestic financial source have been discussed from the point of economic benefit, it should be stressed that they are only listed for reference and do not represent the recommendation of the survey team. The final decision has to be made by the government with due consideration given to the relation with the overall national financial policy and national dvelopment plans.

APPENDICES

APPENDIX 1

TERMS OF REFERENCE FOR THE FEASIBILITY STUDY OF THE QUEZON-TAFT RAILWAY LINE

I. INTRODUCTION

1.1 This terms of reference shall be applicable to the feasibility study (hereinafter referred to as the Study) of the Quezon-Taft railway line (hereinafter referred to as the Line), which is requested to the Government of Japan by the Government of the Philippines.

1.2 That Metropolitan Manila, with its 4.7 million plus population, needs a rapid mass transit system is a foregone conclusion even as early as five years ago. Various study groups, foremost among which was the Study Committee on Urban Transportation for Metropolitan Manila created pursuant to the provisions of Memorandum Circular of the President of the Philippines, No. 327 dated 6 March 1970, have recommended the urgent need for such a system.

1.3 The Line is also Line No. 1 as proposed by the Urban Transport Study for Metropolitan Manila which was completed under the technical assistance of the Government of Japan in cooperation with the Department of Public Works, Transportation and Communications/ Department of Public Highways/University of the Philippines Institute of Planning/United Nations Development Programme study group in September 1973.

1.4 The section of the Line, shown in Appendix 1, is described as follows:

The Line originates in the vicinity of the University of the Philippines in Quezon City and runs

along Commonwealth Ave., Quezon Blvd., Espana St. and Claro M. Recto Ave. It crosses the Pasig River near Del Pan Bridge and enters A. Bonifacio Drive at the west of Intramuros. It passes under Rizal Park, shifting to Taft Avenue. It runs almost straight southward beyond the end of Taft Avenue and ends at the immediate west of the Manila International Airport.

The total length of the Line is estimated to be approximately 21.7 kms. However, the alignment as described above including the starting and end points shall be subject to modification depending upon the results of the Study.

1.5 The Government of the Philippines has concluded that:

(a) the urban rapid transit system be introduced urgently in the Metropolitan Manila Area in order to solve the existing problem of urban transport and to support the future metropolitan development in general;

(b) the development of the proposed mass rapid transit program be pursued in a most practical, expeditious and orderly fashion, using the already completed Urban Transport Study for Metropolitan Manila as the primary take-off point;

(c) the principal system of urban rapid transit be of the two-rail type; and

(d) the top priority project be Quezon-Taft railway line (Line No. 1) for the study be immediately undertaken.

2. OBJECTIVES

2.1 The primary purpose of the Study is to undertake a feasibility study for the Line and, based on the find-

ings of the technical and economic feasibility analyses, to prepare a pre-investment report.

2.2 The detailed engineering phase of subsequent construction of part or all of the Line, if found feasible, is intended to be undertaken after completion of the Study.

2.3 This Study shall be of such quality as to be suitable for presentation by the Government of the Philippines to any foreign or international financing institutions for loan application to finance the construction of the Line.

2.4 The Study shall plan the Line so as to lead to the total development plan in the Metropolitan Manila Area as proposed in the said Urban Transport Study and as modified thereafter including some development projects established recently.

2.5 The Study shall take into consideration the total urban transport system, especially the mass transit system as a whole, in planning the Line and let the Line function fully at every construction stage, if any.

2.6 The Study shall investigate:

2.6.1 alternative(s), including extensions or curtailments of alignments, location of stations, the track gauge, structure types, construction methods, the electric system, car structures, and the disaster prevention system; and

2.6.2 stage construction of line segments, facilities, etc. and stage procurement of cars, etc.

2.7 The Study shall pay due attention to the existing experience and technology in the operation of the two-rail system in the Philippines to provide further study and implementation of the project with all necessary precautions.

3. SCOPE OF WORK

3.1 General

3.1.1 To attain the objectives set out in the Section 2, the Study shall undertake all components of a feasibility study such as patronage forecast, operation and revenue estimating, preliminary engineering and economic and financial analysis, taking into consideration all important aspects, including land use, transport demand, transport behavior, topography, soils, public utilities, geology, drainage, flood control, public nuisance, environment, organization, and regulation;

3.1.2 The Study shall perform all works incident to a feasibility study in such detail as required including field surveys, computer work, mapping, and drafting, if they are found necessary and

3.1.3 The contents of the final report (see Section 4) are suggested in Appendix 2, reflecting the following discussion in this Section.

3.2 Relationship to Other Development Plans

Special attention shall be paid to, and careful study shall be made about, relevant reports, particularly projects of both existing and planned mass transit, among which the most important are the fol-

lowing:

3.2.1 The Urban Transport Study of Metropolitan Manila Area and the Manila Bay Metropolitan Region Strategic Plan.

3.2.2 Metropolitan Manila Ring Development Projects and the National Government Center Project.

3.2.3 Improvement Plan of the Manila International Airport.

3.2.4 Drainage and Flood Control Projects in Manila

3.2.5 Highway Improvement Plan

3.2.6 Metropolitan Manila Traffic Management Study and Implementing Committee Programs

3.2.7 Manila Transit Corporation Programs

3.2.8 Philippine National Railways Programs

3.2.9 Jeepney Cooperatives Report

3.2.10 Policy on the establishment of industries within a 50-km. radius with the MMA.

3.3 Corridor Impact Study

The development of a new major public transit facility in Metro Manila will have an important impact on the travel habits of residents and non-residents of the area and will have significant effects on the general development within the corridors and spheres of influence of the Line. This Study should provide the necessary guidance to the end that the community effects and impacts of the rapid transit fit within an orderly development framework. It must also provide a concurrent town planning and design inputs to the route location studies and to the ensuing preliminary design which will complement the transportation engineering consideration and at least attempt to produce a balanced transport system.

3.3.1 The analyses on the available projections of land use of public and private development plans in the vicinity of the chosen Line and station sites shall be made. To evaluate the impact of the rapid transit facility, consideration shall be made of what steps Metro Manila should take in terms of directing land-use changes, zoning controls, and development planning and the objectives that should be met or encouraged by the development of both Line and stations. The route location work will be guided in these respects with the aim of achieving a system acceptable and suitable to the urban environment.

3.3.2 The Study shall recognize and identify opportunities for associated improvements in the social and economic well-being of the city to be afforded by the development of the RTS. The possibilities for the multiple use of its right-of-way, including the development of air rights, assembly of land parcels into tracts suitable for higher-use development, encouragement for the development of housing, development of parks, recreational facilities, protected pedestrian ways and the amenities, shall be considered.

3.3.3 The Study shall define the system right-of-way requirements, including land takings, construction easements, and permanent easements, necessary to implement a plan for the Line and related developments. The impact of the Line on the affected property and development of acceptable methods to handle relocation of households and businesses displaced by the same shall be included in the Study.

3.4 Forecast of Patronage, Operations and Revenue Estimations

3.4.1 The Study shall analyze all existing data on transport demand and factors affecting it in the areas served and influenced by the Line, especially the person trip survey conducted in 1971. It shall carry out additional traffic counts and other field surveys if necessary to determine the present and future transport demand and characteristics in the areas.

3.4.2 Based upon the economic development within the Manila Bay Metropolitan Region and the Metropolitan Manila Area, and all relevant factors, the Study shall forecast the future patronage of every alternative proposed on each segment and each station of the Line and on each fare level not only of the Line but also of other existing and planned modes and lines.

The forecast of patronage shall be made for the daily total and the peak hour, for the week day and week end, and for commuting workers and students and other passengers, adults and children. The forecast shall be made in the year of opening of the life of the Line, and the intermediate year(s) of completion of every construction stage, if any. This is to determine the reasonable capacity of the Line, the suitable reinforcement of facilities and cars, timing of stage construction as a basis for quantifying benefits.

3.4.3 The Study shall assess the effect of all alternative plan(s) of the Line including location of stations, and the total transport demand of the entire urban transport system during the construction stage, based upon the analysis

and forecast.

3.4.4 The system patronage data shall form the basis of final operation planning, revenue estimating, estimating of operating expense and much of estimating of community benefits. A plan of operations should be developed for the evolving system, headways and coordinated transfer allowance, if possible, with other modes of travel. Estimates of cars required and of operating and maintenance expense shall be made for the same levels of development for which patronage and other usage estimates shall be made.

3.4.5 A fare structures shall be developed reflecting the objectives of system development, considering the out of pocket costs of transportations by future competing modes, trip lengths, the practical aspects of fare collection, and the results of the studies on city bus operation currently being done by the Manila Transit Corporation and other agencies concerned.

3.4.6 The estimates shall be made of gross fare revenues and any other income to be expected from the rapid transit system such as that from leases and concessionaires. Net revenues to be expected from the rapid transit system shall be derived as shall requirements for pre-operating expenses.

3.5 Preliminary Engineering and Architectural Design

3.5.1 The Study shall undertake all necessary field investigations, including topographic surveys and sub-surface exploration, in determining principal quantities of excavation and filling, types of structures, construction methods and

civil engineering work.

3.5.2 The Study shall investigate the existing situation of underground structures, drainage, flood control, electric power supply, telecommunications, and other information necessary for the preliminary engineering designs.

3.5.3 The Study shall identify the final alignment of the Line and conduct preliminary engineering works for the Line, including all alternative plan(s) and construction stages as deemed necessary.

3.5.4 The Study shall submit plans, alignments, and cross-sections (including the right-of-way) of the Line including stations.

3.5.5 The Study shall submit plans for tracks, rails, switching devices, tunnels, bridges, station facilities including shops and stores, power system, transformer stations, power feeder devices, blocking devices signals, connecting devices between switches and signals, car bodies, running gears, traction devices, suspension devices, car sheds, workshops, lighting equipment, telecommunication system, operation system, inspection system, maintenance and all other facilities attached to a railway line.

3.5.6 The design standards and criteria to be used conform with:

(a) those required by the Philippine National Railways for railways.

(b) those required by the Department of Public Highways for highways, and

(c) those required by the Bureau of Public Works for Waterworks, flood control facilities, and structures over rivers.

3.5.7 The Study shall estimate the construction cost and build up a contractor type of estimate for each major item of construction cost. The operation and maintenance costs shall be estimated for the period of the economic life span of the Line.

3.5.8 The Study shall separately identify the components of foreign and local currency (with taxes and subsidies shown separately) for the proposed construction works and maintenance. The foreign currency component shall include such items as equipment depreciation, materials and supplies, of which the Philippines is a net importer, wages of foreign personnel, overhead and profit of foreign firms, and interest and other financial charges payable abroad. The local currency components shall include right-of-way acquisition costs, local materials and supplies, local wages, taxes, etc. The cost estimates should include identifiable contingency allowances for (i) quantities and (ii) price escalation from the date of the estimate to completion of the works.

3.5.9 Preliminary engineering for the Study shall be carried out to a degree that will permit estimates with an accuracy of a plus or minus 20 percent of principal quantities of construction.

3.5.10 The Study on preliminary engineering and architectural design for each type of rapid transit line structures in the final location plan shall be developed suitable for establishing system alignment, construction cost, aesthetic values, and right of way requirements and for subsequent use as a basis of detailed design. The typical line structures may include sections

such as cut and cover (or tunneled), cut and embankment, at grade and serial structures. The technical feasibility and relative practicality if these alternative methods of construction shall be evaluated considering the relative economic costs of construction, right of way, traffic maintenance, utility relocations, underpinning and construction easements. A set of preliminary plans of these typical and special line structures shall be produced.

3.5.11 The Study on the preliminary engineering and architectural design for each type of the rapid transit station in the final location plan shall be developed suitable for establishing construction cost, aesthetic values and right of way requirements and for subsequent use as a basis for detailed design. Typical stations may include subway types, at grade stations may include subway types, at grade types and aerial types; it may also include within these variations side platforms, center platform and flexible alternative arrangements of access, entrances and fare collection areas.

3.6 Financial Analysis

The financial analysis shall investigate the financial possibility and profitability to construct and maintain the Line from the viewpoint of the operating entity, based upon the above components of the Study, determining and recommending the optimum level and system of fares.

3.6.1 Cost of construction, operation, maintenance, interest and other items incident to the Line, if any shall be estimated for the Line, any portion(s) thereof, the alternative(s) and/or construction stage(s) as the case may be necessary, including taxes and subsidies.

3.6.2 The optimum fare system shall be proposed for an urban rapid transit, including seasonal tickets, different rates for adults, minors and infants, etc. The fare rate shall be established just to be able to compensate all necessary financial costs based on optimum distribution of traffic for economic feasibility, plus profit. However another fare rate shall be studied considering the role of an urban rapid transit and the existing fares of buses, jeepneys and PNR commuter service. The sensitivity analysis shall be made between the estimated patronage and the fare rate.

3.6.3 The fare revenue shall be estimated for the Line and/or any portions thereof for all alternatives, construction stage(s) and fare rate(s) of the Line over its economic life span, including taxes and subsidies.

3.6.4 Comparison shall be made between the revenue and the costs, estimated for the Line.

3.7 Economic Analysis

The economic analysis shall finalize the Study, based upon the above components of the Study, determining and recommending the optimum location, alignment, construction staye, and facilities of the Line.

3.7.1 Direct benefits shall be estimated with and without the Line and/or any portion(s) thereof, in necessary cases of the alternative(s) and construction stage(s) of the Line for the economic life span of the Line, excluding taxes/and possible subsidies.

3.7.2 Other social and economic benefits shall be estimated, if they are not negligible.

3.7.3 Economic costs of construction, maintenance,

administration, interest and other items incident to the Line, if any, shall be estimated for the Line, any portion(s) thereof, the alternative(s) and/or construction stage(s), as the case may be necessary, excluding taxes/and subsidies for the following comparison with the benefits.

3.7.4 Comparison shall be made between the economic benefits and costs thus estimated, indicating the net present value, benefit/cost ratio of the first year and the whole period of the economic life span and internal rate of return in the necessary cases of the alternative(s) and the construction stage(s), including sensitivity analysis.

3.8 Implementation Program

The Study shall investigate all necessary preparations for implementation of this project, based upon the findings of the above components of the Study.

3.8.1 The Study shall finalize all alternative plan(s) and stage construction plan(s), and determine the basic plan to the extent possible.

3.8.2 The Study shall include the timetable for detailed engineering, construction works, training necessary personnel, procurement of cars and other equipments, etc.

3.8.3 The Study shall propose financing scheme(s) to cover the project cost in accordance with the above timetable and reimbursement schemes in accordance with the the estimated revenue.

3.8.4 The Study shall recommend the detailed training plan of personnel necessary to operate

and maintain the Line, mentioning especially the components of training abroad.

3.8.5 The Study shall propose a suitable organization to own, manage and run the Line, comparing merits and demerits of a governmental body, a private company and public corporations and variations thereof.

3.8.6 The Study shall include proposals for the restructuring of existing bus and jeepney operations to complement the operations of the Line.

3.8.7 The Study shall propose passenger terminals combined with stations of the Line, considering the existing and planned routes of and patronage for buses and jeepneys.

3.8.8 The Study shall recommend to the Government of the Philippines development strategies for land use control, land price control, taxation system on land and related development measures, in order to avoid excessive congestion, prevent speculative land price increase and recover and redistribute to the public any unearned profits generated by the Line and of accruing to the owners of land influenced by the Line. The above measures shall be considered in conjunction with the government support of the Line mentioned under the Paragraph 3.5.5.

4. REPORTS AND TIME SCHEDULE

4.1 The Study shall be prepared in final report summarizing all work performed the findings and recommendations, with necessary maps, plans, diagrams, calculations, and other supporting data.

4.2 Interim Reports shall be prepared at the end of field surveys, indicating outlines of the Study, major alternatives to be investigated further, tentative conclusions, and so on in such detail as possible.

4.3 The final report shall be submitted within the 8 month period after the effective date of this terms of reference.

4.4 During the preparation of the Study, full coordination shall be maintained with group(s) undertaking the feasibility study of the other related development projects.

4.5 The Study and the preparation of the report shall be conducted to the extent possible in the Philippines in coordination with the Government of the Philippines.

4.6 All detailed study pertaining to the project shall be turnover to the Government of the Philippines upon submittal of the report.

5. DATA, LOCAL SERVICES, AND FACILITIES TO BE PROVIDED BY THE GOVERNMENT OF THE PHILIPPINES

5.1 The Department of Public Works, Transportation and Communications shall be the main counterpart agency of the Government of the Philippines.

5.2 The Government of the Philippines will cooperate in providing, to the extent possible, all necessary information for the Study such as economic data, population distribution, production, sales, income, development programs, an inventory of highway facilities, topographic maps, geologic data, soil data, design

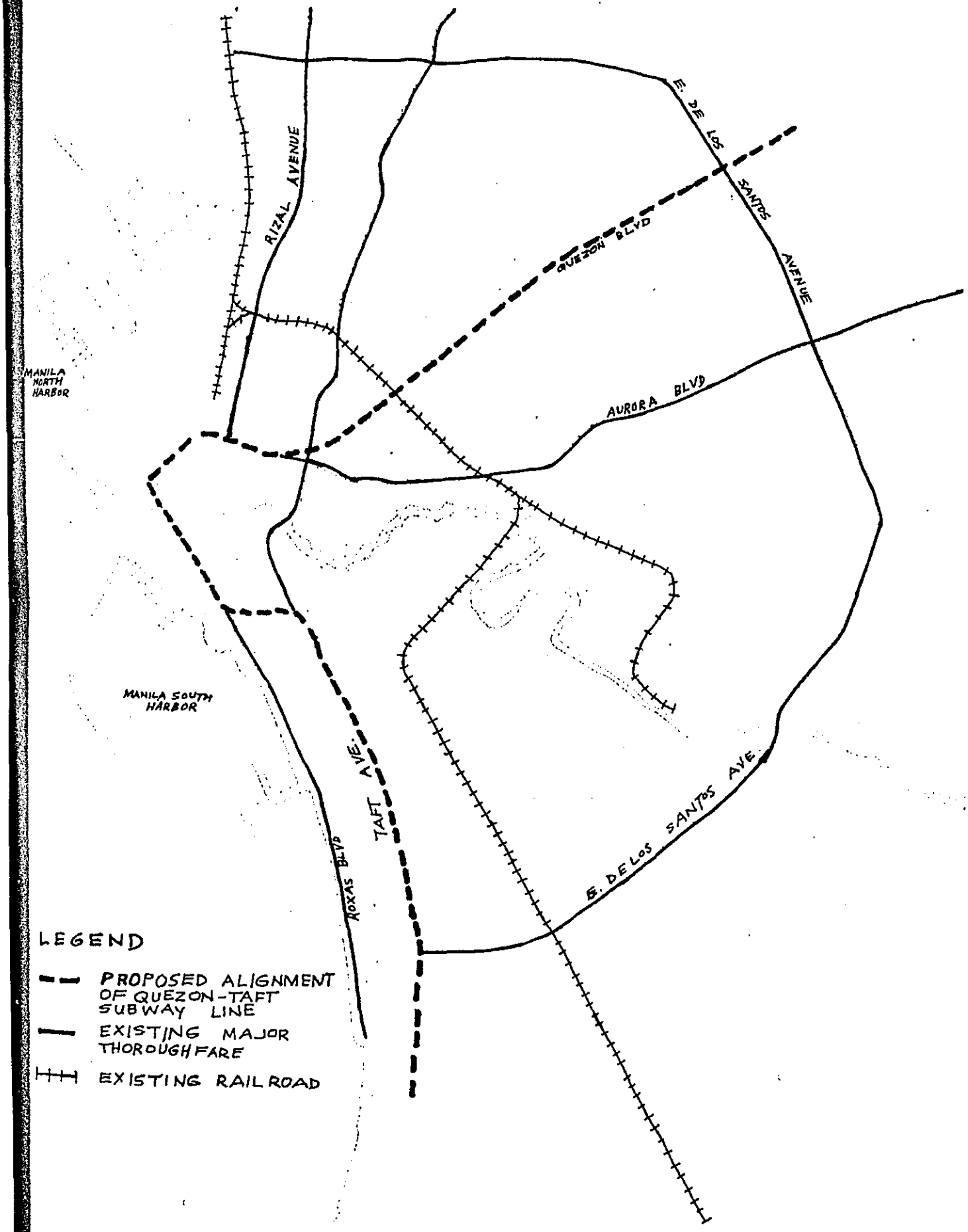
standards, cost incurred on recent construction projects, transportation cost, and other relevant data.

5.3 The Government of the Philippines will provide counterpart personnel to assist in conducting the Study.

5.4 The Government of the Philippines will provide all available facilities necessary to perform the Study, such as office space and clerical services.

APPENDIX 1

PROPOSED ALIGNMENT OF QUEZON-TAFT SUBWAY LINE



APPENDIX 2

SUGGESTED CONTENTS OF THE REPORT

1. Background Information
   - 1.1 General
   - 1.2 Total Urban Development in MMA
   - 1.3 Transport System Development Plan in MMA
   - 1.4 Role of Philippine National Railways and MTC
   - 1.5 Justification for the Project
   - 1.6 Scope of Work

2. Planning Framework
   - 2.1 Population Projection
   - 2.2 Land Use Planning

3. Forecast of Patronage
   - 3.1 Methodology
   - 3.2 Supplementary Field Survey
   - 3.3 Total Trips
   - 3.4 Trip Generation and Attraction
   - 3.5 Trip Distribution
   - 3.6 Modal Split
   - 3.7 Trip Assignment
   - 3.8 Estimated Patronage by Segment and Station

4. Preliminary Engineering
   - 4.1 Design Standards
   - 4.2 Field Survey (Topography, Soil, etc.)
   - 4.3 Proposed Alignment
   - 4.4 Types of Structures

POSITION PAPER
PRIORITY RANKING OF URBAN RAPID TRANSIT IN METROPOLITAN MANILA

DEPARTMENT OF PUBLIC WORKS, TRANSPORTATION AND COMMUNICATIONS
PLANNING AND PROJECT DEVELOPMENT OFFICE

APPENDIX 2

POSITION PAPER
PRIORITY RANKING OF URBAN RAPID TRANSIT IN METROPOLITAN MANILA

A comprehensive system of urban transportation in the Metropolitan Manila Area has been proposed to be composed of streets, expressways and urban rapid transit by the Urban Transport Study, which was completed under the technical assistance of the Japanese government in cooperation with the DPWTC/DPH/UPIP/UNDP Study group on September 1973, and this proposal has been authorized as a guideline for implementation program by DPWTC/DPH.

The urban rapid transit in particular has been concluded to be mainly of the two-rail system, which as to be large scaled to comply with the future transport demand. The existing facility of the Philippine National Railways (PNR) seems almost nothing compared to the proposed system consisting of 183 kms. long railways. Furthermore, PNR itself has to be upgraded to a great extent.

Since the total urban transport system has been established as a master plan now, the coming study of urban rapid transit should look into feasibility of the proposed lines. Before undertaking feasibility study, it is necessary to rank priority among the proposed lines of urban rapid transit in order to determine the sequential order of study and implementation.

This paper tries to provide basic materials to rank priority among the proposed projects. Regretfully, it can not go far beyond suggesting a few alternatives, which are expected to be solved into a definite priority plan by further study.

I. Review of Proposed Network

The proposed network of railways is composed of the two PNR (north and south) lines, one circumferential line and four radial lines, three of which pass through the downtown of Manila and one stops there. The proposal

covers with railway lines all major transportation arteries, which are enumerated as follows from the north to the south clockwise;

(1) the PNR north line, covering Juan Luna and A. Mabini,

(2) the line of Jose Abad Santos and Rizal Avenue Ext., covering Rizal Avenue,

(3) the line of Dimasalang and A. Bonifacio,

(4) the line of Espana and Quezon Blvd.,

(5) the line of R. Magsaysay Boulevard and Aurora Blvd.,

(6) Shaw Boulevard,

(7) the PNR south line,

(8) Taft Avenue,

(9) Ro as Boulevard, covering A. Mabini and M.H. del Pilar, (which are all radial), and

(10) a circumferencial like of Epifanio de los Santos.

The proposed system composed of the above lines is reviewed as follows, based upon the projected patronage of each line;

(1) All proposed lines are indispensable, since they carry the heavy demand reaching almost the maximum capacity of the two-rail system. This fact that all lines are fully loaded is quite natural, considering the proposed system has only 183 kms. length including the improvement of PNR to serve commuters, while the population will amount to 7.5 million in the Metropolitan Manila Area which the proposed system should serve.

(2) Some areas are left not to be provided with the access to the proposed system, like the area south of the Pasig River along Tejeron and Pasig Line and the area along the north coast of the Manila Bay. Both areas will have many residents who need the urban rapid transit. Especially the latter will be

inhabitated by such people after the resettlement project Dagat-dagatan.

(3) Sections of the subway line No. 2 and the PNR south line over the Pasig River do not seem to coincide with the direction of the transport demand. The passengers taking PNR from the south transfer to the line No. 2 to the downtown of Ermita and Intramuros, but do not cross the Pasig River. On the other hand, the passengers taking the line No. 2 along Shaw Boulevard do not cross the Pasig River, but go straitwards to the north side of the river. Therefore, the phenomena are found that passengers transfer between two lines in a large number and cross the river in a less number compared to the adjacent sections of the said two lines.

(4) The southern section of the subway line No. 3 is proposed along Pasay Rd., detaching from Epifanio de los Santos. But Ayala avenue and Buendia might be recommendable instead of Pasay Rd., considering the land use in the vicinity.

(5) Line configuration in the downtown seems subject to further study related to the above-mentioned facts and priority ranking, while major radial and circumferential arteries are confirmed to be necessary to be provided with urban rapid transit lines.

2. Criteria of Priority Ranking and Their Evaluation

The criteria would be enumerated and described before discussing priority ranking. They are the transportation demand, the traffic congestion, the development policy, the project cost, and the time period for implementation of the project. Each of them is discussed as follows:

(1) The Transportation demand

Needless to say, the transportation demand is the most important factor for priority ranking. Justification of an urban rapid transit line requires a big volume of demand compared to other modes of urban transport. And it is considered natural that higher priority is given to the line where the bigger demand is found.

The demand as a criteria to rank priority should be at the time when the project is completed and open for the traffic, or for the time period for which the project is expected to serve the traffic without fundamental improvement.

(2) The traffic congestion

This criterion is similar to the former in the sense that both are related to transport demand, but the capacity of transport facilities is taken into consideration in the latter, which means relationship of demand to capacity. Supposing two areas have the same volume of demand but the different capacity, the area with smaller capacity should be given higher priority than the area with bigger capacity.

(3) The development policy

In the above criteria is included such development as to take place spontaneously and to be reflected in the increased transport demand over existing one.

This development policy means the development which is materialized only with the improved accessibility of urban rapid transit. This kind of development is desirable because it can easily be promoted in a planned and orderly manner. In this sense, the transportation system is the tool of

future development.

(4) The project cost and the implementation period

Both can be considered identical, because they are related to easiness of implementation of the project. And there is much difference among different systems such as the monorail, the elevated railways and the subways, but not among different lines of the same system.

The fact could be pointed out that priority project can be implemented cheaper and faster, if technology and price remain at the same level and different lines cross each other, because a new line goes deeper under or higher above the line constructed previously.

Now the above criteria are evaluated with their relative importance in the Metropolitan Manila Area.

The third criteria, the development policy can not be taken into account. Priority of future development should be given to consider this criterion, but such a policy or a plan is not existent. Naturally this criteria is very important. Here is found the reason why this paper has to hold a definite conclusion.

The fourth and the fifth, the project cost and the period for implementation are unnecessary to be considered in a broad comparison of different lines, since there is no such differences among them as mentioned above. They have to be taken into consideration only in choice of PNR improvement and subway construction. According to the Urban Transport Study, the construction cost (excl. car cost) of PNR improvement is estimated at 36 million Pesos/km., while that of subway is 100 to 130 million Pesos/km. The former costs less than one-third of the latter. The ratio of the total project costs (incl. car cost)

is still less than one half. This big difference in costs would favor higher priority of PNR improvement than to subway construction.

The second criterion, the traffic congestion requires detailed informations which is not available now. But a very general observation can point out the following at least. The north area of the Pasig River within the Metropolitan Manila Area has much poorer transport facility compared to the transport demand than the south area. Moreover mass transit is more relied on in the north area than in the south area because of the character of the demand. For instance, high class presidential areas are located mostly in the south area. Therefore, traffic congestion, especially of mass transit is bigger and the travel speed is lower, both of which affects favorably priority ranking of the north area.

The first criteria, the transport demand, which is most important among five criteria, has to be determined for each line proposed in the Urban Transport Study by a detailed and exact production. But the existing demand for mass transportation is big enough to justify a subway system, as mentioned in details under the next section. Therefore, analysis of the existing demand seems critical and decisive in priority ranking. To aid a remark, justifiability of subways under the existing demand is a matter of course, considering the Metropolitan Manila Area has the population of four million at present and a subway line is feasible in a city with the population least than one million, if the city pattern and the transportation custom are oriented to mass transit.

3. Existing Demand for Mass Transit

There are existent three modes of mass transportation, PNR, buses and jeepneys in the Metropolitan Manila Area.

PNR operates as commuter service diesel each consisting of four cars along the south and north lines and of two cars along the Hulo line. The south end of the commuter service is Carmona, 40 km. distant from Tutuban central station, while the north end is Caloocan, 3 km. distant from Tutuban. The end of the Hulo Line is Hulo, 12 km. east of Tutuban. Eight round trips are made along the south line and four along the north line carrying 7,500 passengers a day in all. Four round trips are made along the Hulo line with the daily passengers of 830.

But the existing demand, especially, for the south line is such bigger than the figure, since congestion is found so excessive during peak hours and service is so infrequent to pick up all possible passengers. And obviously PNR has a limit to get more patronage because of its alignment avoiding the downtown of Manila.

Buses are for regular line service (PUB), schooling service and chartering service. The second of the above three are supposed to carry considerable demand. But only PUB is taken into account in the following analysis.

Jeepneys have two categories, PUJ and AC. PUJ plays along a pre-determined line, while AC takes passengers to their final destination, going off from a line. PUJ is allocated to lines with heavier demand, while AC is allocated to lines with comparatively less demand.

Only PUJ is considered in the following analysis, because AC is allocated to minor routes.

The existing transport demand is estimated by route for the above three modes of travel as shown in the attached map. Estimate is made for buses and jeepneys as follows:

(1) The demand = the no. of vehicle units licensed to a route
x the rate of operable units
x the rate of trips per unit per day
x the average no. of passengers passing at a point (not carried by a trip)

(2) Only major routes of PUB and PUJ, but not all are indicated in the map.

Accordingly, to the exact, the map is considered to show capacity of mass transit than demand for it. But the map can serve enough to give rough idea of the existing demand.

Heavily loaded routes are enumerated in the map as follows:

(1) Major radial routes between the downtown and Epifanio de los Santos (EDSA)

(1-1) Espana - Quezon Boulevard 100,000 - 200,000 passengers per day

(1-2) Magsaysay - Aurora Blvd. 90,000 - 150,000 passengers per day

(1-3) Taft Avenue 80,000 - 180,000 passengers per day

(1-4) Rizal Avenue - Rizal Avenue Ext. 60,000 passengers per day

(2) Circumferential route

(2-1) Epifanio de los Santos approximately 50,000 passengers per day

(3) Other minor routes of shorter length

(3-1) In the downtown: C.M. Recto 60,000 passengers per day

(3-2) In the downtown: South Port Area 130,000 passengers per day

(3-3) Within EDSA: Espana Extension 50,000 passengers per day

(3-4) Within EDSA: Roosevelt Avenue 50,000 passengers per day

(3-5) Within EDSA: N. Domingo-Old Sta. Mesa 50,000 passengers per day

(3-6) Within EDSA: Pedro Gil-Herran 60,000 90,000 passengers per day

(3-7) Outside EDSA: Aurora Boulevard 60,000
100,000 passengers per day

The map is commented as follows:

(1) The demand for mass transportation concentrates on the northern part of the Metropolitan Manila Area, i.e. the sector between Aurora Boulevard and Rizal Avenue. Among four major radial routes mentioned under the category (1), three are located in the north area, while only one is in the south area. And among seven minor routes mentioned under the category (3) five belong to the north, two belong to the south. Especially the northeast corridor composed of Quezon Boulevard and Aurora Boulevard together with minor routes around them carries 300,000 passengers, which exceeds 50% of the total radial movement.

(2) The biggest demand is found along two routes, i.e. Espana Quezon Blvd. and Magsaysay - Aurora Boulevard. At first sight, the former seems to have much bigger demand than the latter. But a greater part of the demand along Espana Extension is assumed to be easily diverted to Aurora Boulevard from Quezon Blvd. And Aurora Boulevard has bigger demand in the influence area like N. Domingo - Old Sta. Mesa to be able to attract, if service is improved along Aurora. Both Quezon Boulevard and Aurora Boulevard carry almost 150,000 passengers each including demand in the influence area.

(3) Aurora Boulevard is the only radial route which has demand in the order of 60,000 to 100,000 passengers beyond Epifanio de los Santos.

(4) Taft Avenue is the only major route which has remarkable demand in the southern part of the Pasig River.

(5) Much less demand is found in the other major routes than the above three, i.e. Quezon Boulevard, Aurora

Boulevard and Taft Avenue except Rizal Avenue and Epifanio de los Santos 50,000 passengers, but other major routes carry less than 30,000 passengers.

(6) Big demand along Quezon Boulevard and Aurora Boulevard is due to residential areas which have been developed up to outside of Epifanio de los Santos and merged with each other. Residential areas as traffic generation are San Francisco del Monte, Projects 6,7,8 and 8B, Pag-asa and Villages around the University of the Philippines for Quezon Boulevard and San Juan, Projects 2,3, and 4, and Murphy for Aurora Boulevard. And Aurora Boulevard has another generator in Marikina further east. These residential areas have brought about prosperity of Cubao Commercial quarter located at the intersection of Aurora Boulevard and Epifanio de los Santos.

The above comments on the existing transport demand by route can be summarized as follows in conjunction with feasibility of subways:

Subways could be justified strongly enough along Quezon Boulevard, Aurora Boulevard and Taft Avenue under the existing demand. The demand of 100,000 daily passengers requires pretty dense operation, for instance, the service of trains consisting of 6 cars with 5 minute headway during peak hours. Needless to say, there are many possibilities that the present patronage will remain as street traffic because of short trip length.

Both Quezon Boulevard and Aurora Boulevard might not require subways simultaneously, since both have traffic generators close to one another and accordingly demand can be diverted from one to the other easily.

Subways along other routes seem unfeasible at present moment only from the viewpoint of the existing

demand.

4. Conclusion of Priority Ranking

Here can be summarized all the above discussion about priority ranking of the lines proposed in the Urban Transport Study. There are two main alternatives with each inclusive of some variations.

Alternative No. 1

If the existing problem of urban transportation are tried to be solved immediately, Quezon - Taft line (proposed as Line No. 1) or Aurora line (proposed as a section of Line No. 4) should be given top priority. Although apparently Quezon section has higher priority than Taft section of Line No. 1, it is difficult within this paper to determine which has higher priority, Quezon Boulevard or Aurora Boulevard. Whichever line or section will be chosen as the first project among the above alternatives, there would be accompanied by many serious problems, financial, technical, and other because of huge investment, poor experience and long time requirement for implementation.

Alternative No. 2

If the above mentioned problems should be avoided, PNR improvement proposed in the Urban Transport Study, seems recommendable as an alternative, because it requires much less cost, technology and time period.

The improved PNR line can attract pretty big transport demand along Rizal Avenue and Rizal Avenue Extension, yet does not seem able to get enough patronage which makes the improvement feasible. Therefore, the following two measures are suggested:

The alignment has to be modified to pass the downtown in order to get more patronage and to avoid traffic congestion caused around the terminus by impossibility

of street transportation to carry the demand from railways.

Further future development has to center around the area along the PNR line to supply more patronage, which seems difficult especially along the south line, since the area in its vicinity have been developed more or less for high-class residential areas, industrial area, etc., such as areas requiring not urban rapid transit badly.

Although this alternative is accompanied by the above difficulty and does not contribute much solution of the existing traffic problem, this alternative can not be abandoned lightly because of easy implementation including cheap cost. But this alternative is meaningful only when it is combined with other development projects which require careful implementation and huge amount of investment.

To add another point to the end of this paper, the network especially in the downtown of urban transit lines proposed in the Urban Transport Study would better be reviewed in conjunction with findings mentioned under the section 1 of this paper and priority ranking.

ADDENDUM TO THE POSITION PAPER ON PRIORITY RANKING OF URBAN RAPID TRANSIT IN METROPOLITAN MANILA

Subject: Selection of Line #1 as Top Priority among all mass transit lines.

Line 1 (See Map "A") is selected as the most preferred among all proposed mass transit lines for the following reasons:

1. Transport Demand

Present transport demand along line #1 is the biggest of all proposed subway lines and very much greater than along the present PNR line. It is noted that the line 1 runs through the trafficheavy university belt, and the populous Sampaloo and Quiapo Districts, to name only a few.

2. Tie-up to Future Development

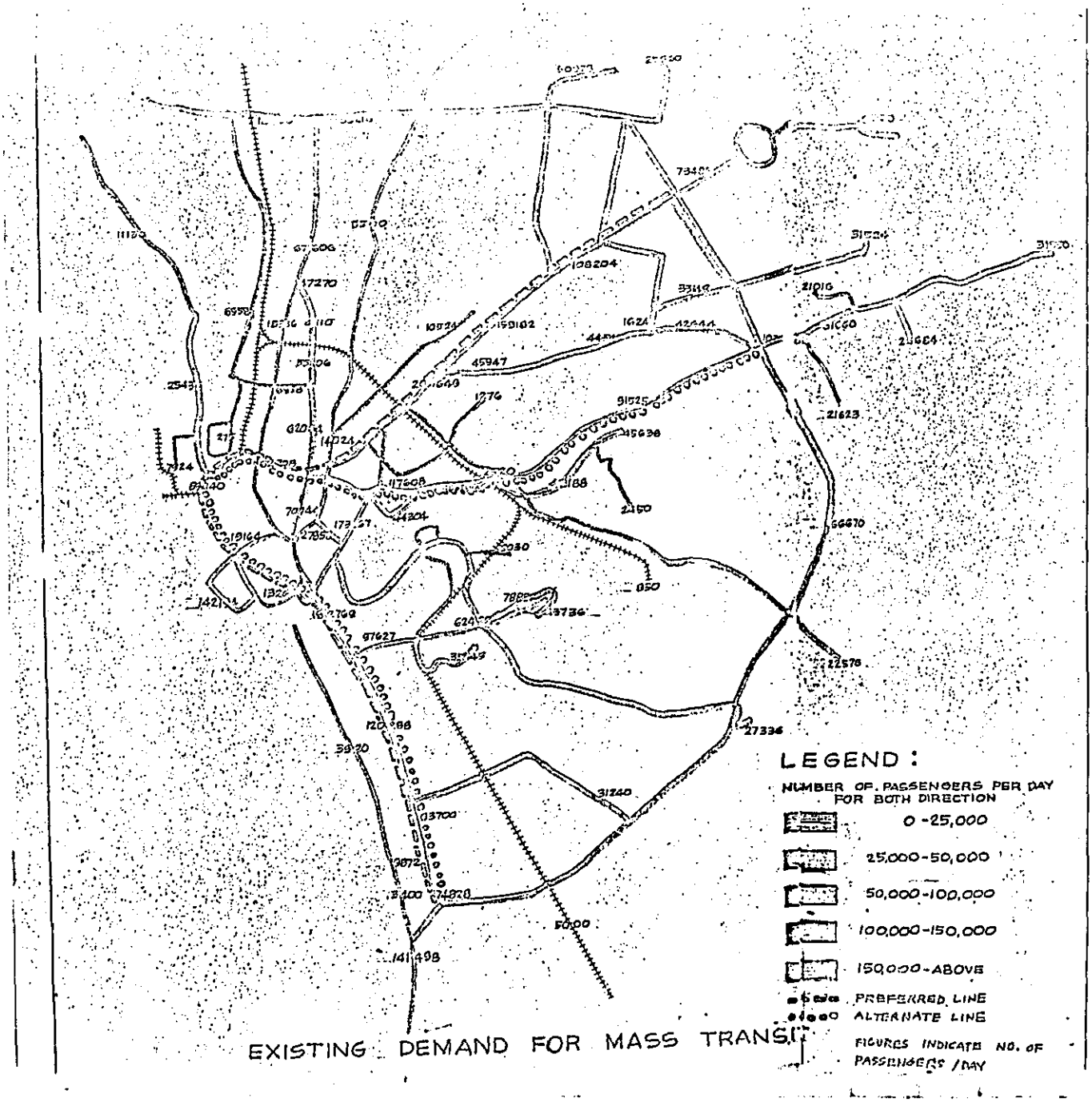
Line 1 very well fits with the pattern of future development. For instance, its northern terminus lies in close proximity to the site of the future Government Center and other housing projects. Moreover large scale developments are envisioned in the outer zones of this line, i.e., Land Development along the Manila-Cavite Coastal Road, the Las Pinas Housing & Commercial Center & other housing projects, the MIA expansion plan, the Mangahan project Complex etc. The strategic location of this line in relation to the above development plans makes it a stand-out among the other transit lines.

3. Superiority over other Alternative Lines

The only other alternative mass transit construction proposed that may be considered as competitive are the PNR lines as explained in the first parts of the position paper. It is strongly felt that in terms of urgency and future

expectations, for instance, future development along PNR lines would be difficult in contrast with the proposed line 1, the superiority of the former is beyond doubt.

Construction of line #1 should not however, mean that the government stops its commuter train expansion program.



EXISTING DEMAND FOR MASS TRANSIT