

**JAPAN INTERNATIONAL
COOPERATION AGENCY (JICA)**

**DEPARTMENT OF TRANSPORTATION
AND COMMUNICATIONS
REPUBLIC OF THE PHILIPPINES**

**The Study on the Standardization
for
Integrated Railway Network
of
Metro Manila
(SIRNMM)**

**Final Report
(Summary)**

March 2001

***Japan Railway Technical Service (JARTS)
Pacific Consultants International (PCI)***

1 Peso = 2.28Yen
(October 2000)

PREFACE

In response to a request from the Government of Republic of Philippines, the Government of Japan decided to conduct a master plan study on the standardization for integrated railway network of Metro Manila and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Naofumi Takashige of Japan Railway Technical Service, (and consist of Japan Railway Technical Service and Pacific Consultants International) to Republic of Philippines, 3 times between February 2000 and March 2001.

In addition, JICA set up an advisory committee headed by Mr. Kiyoto Yoshinaga, Director, Railway Department, Chubu District Transportation Bureau, Ministry of Transport (present-Ministry of Land, Infrastructure and Transport) between February 2000 and March 2001, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of Republic of Philippines and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Republic of Philippines for their close cooperation extended to the Team.

March 2001



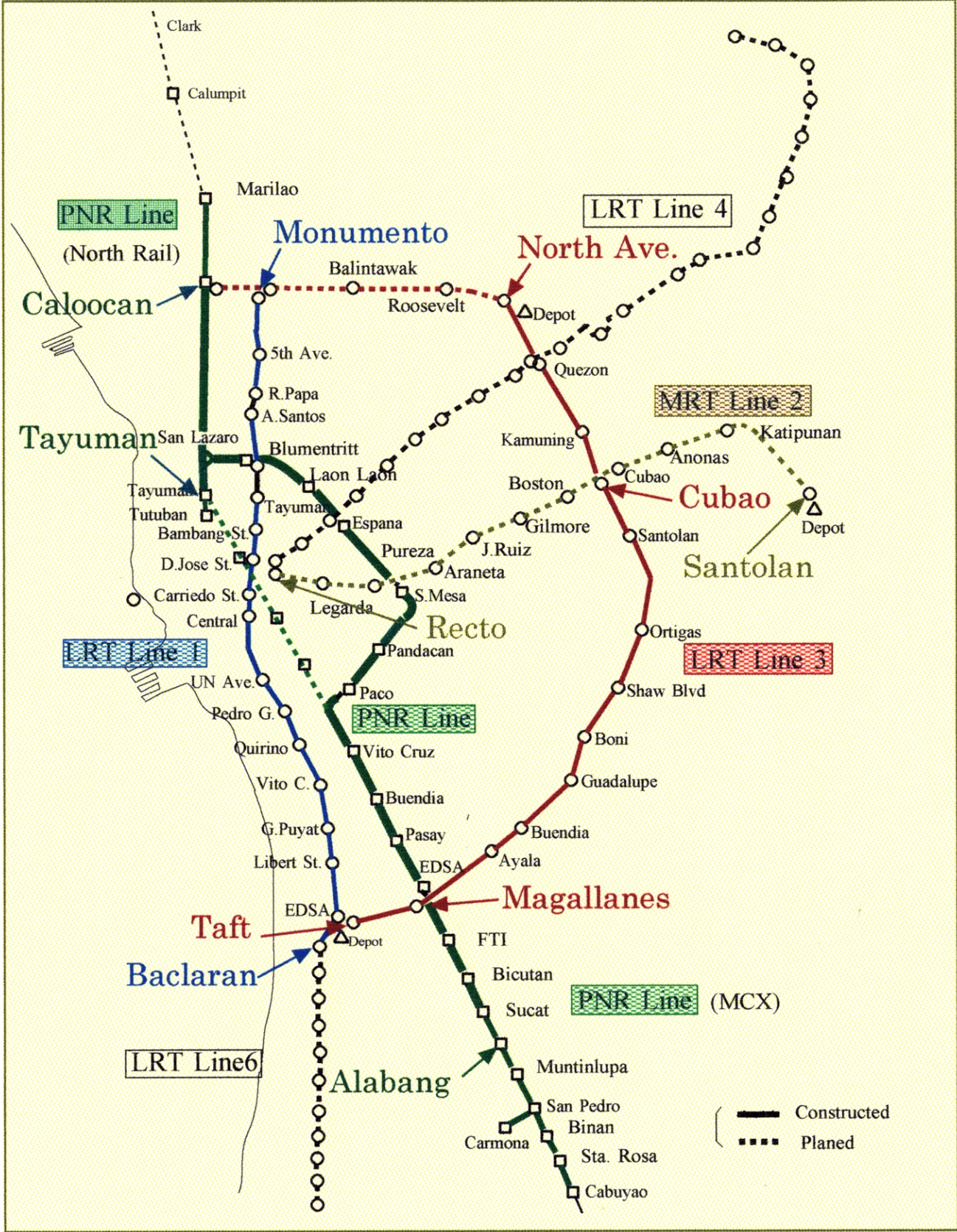
Kunihiko Saito
President

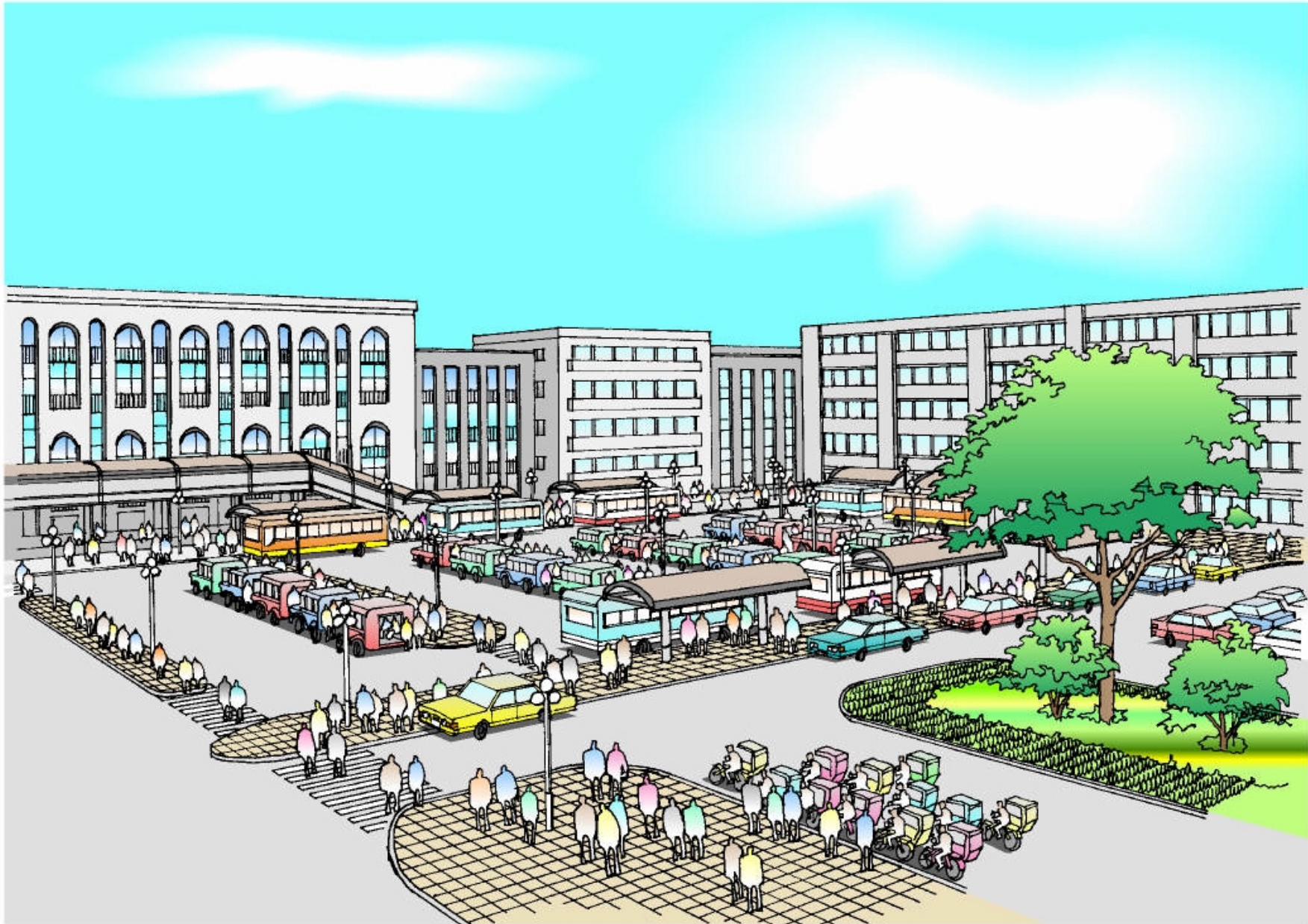
Japan International Cooperation Agency

SIRNMM STUDY AREA

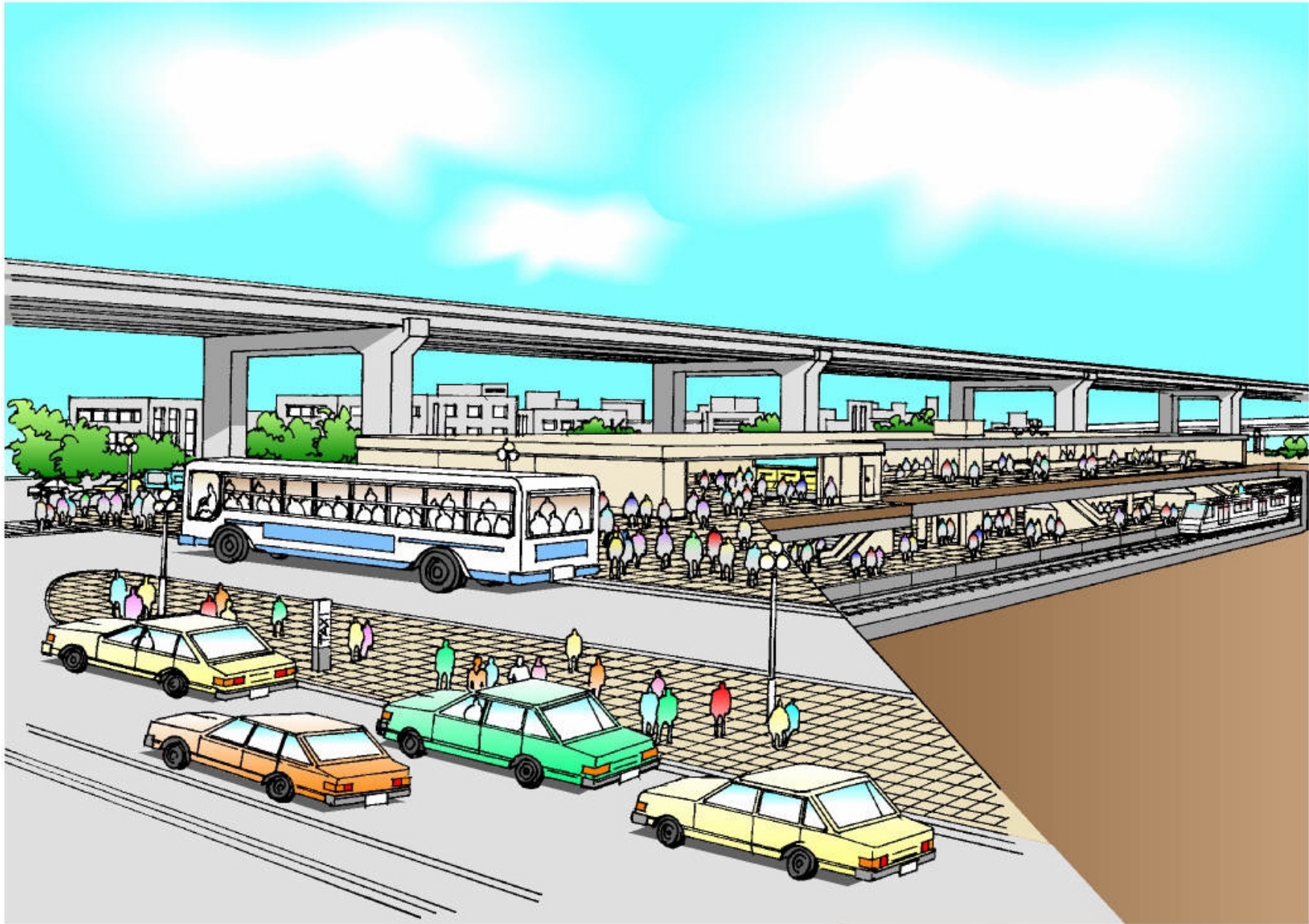


Metro Manila Railway Network





Envisioned LRT Monumento Station Plaza



Envisioned PNR Magallanes Station

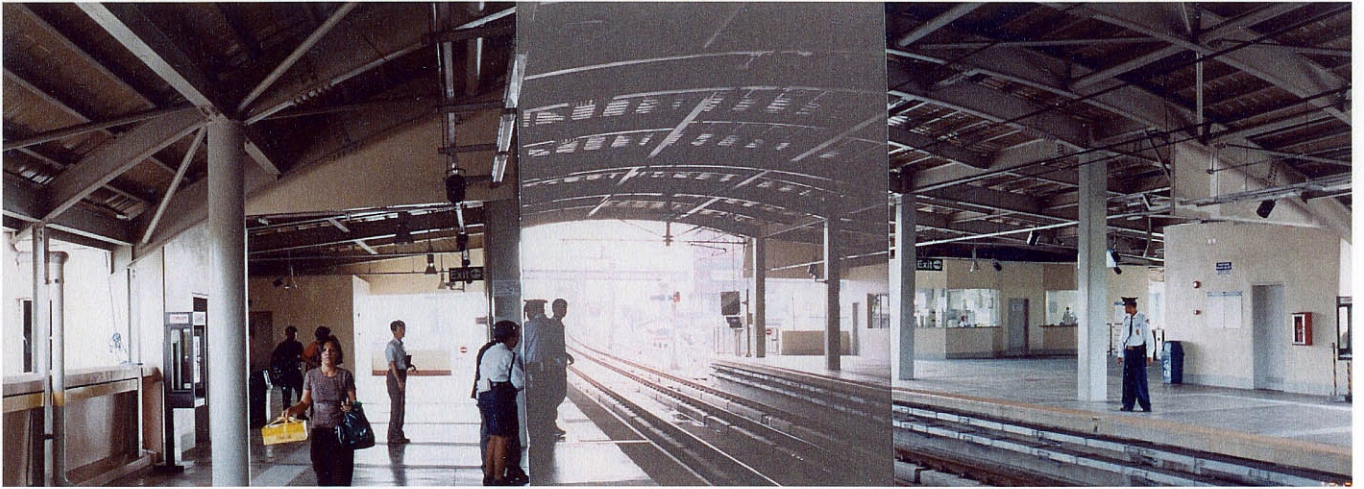
PNR



LINE 1



LINE 3 MAGALLANES



LINE 3 MAGALLANES



LINE 3 MAGALLANES



LINE 2 Under Construction



THE STUDY ON THE STANDARDIZATION FOR INTEGRATED RAILWAY NETWORK OF METRO MANILA

(EXECUTIVE SUMMARY)

Study Period : February 2000 ~ March 2001
Accepting Organization : Transportation Planning Service,
Department of Transportation
and Communications

1. Objectives of the Study

The Study intends the formulation of a master plan for the integration of the rail transport system in Metro Manila and the implementation of a basic design study on model stations.

In addition, technology transfer to counterparts in the Philippines who will participate in the Study during the study period will be conducted through field survey work.

2. Study Method

The study team conducted on-site surveys in order to gain an understanding of the actual situation in Philippines. It exchanged views with the Philippine steering committee, technical working committee and counterpart team, and gathered information. Based on the results of the survey in the Philippines and Japanese experience, the study team drew up a report.

3. Study overview

The operation, construction as well as planning of urban railway lines are currently in progress in Metro Manila so as to enhance the convenience of transport and to ease the traffic congestion in the region.

However, the inadequate consideration of mutual links between different lines and the subsequent lack of a plan for the introduction of services on different lines could create major inconvenience as the public transport, and the construction of new railway lines without proper examination of their conformity with urban planning around new stations has led to problems. Meanwhile, in the software aspect, the introduction of through tickets for passengers using more than one railway line are less than ideal.

Consequently, this study covers such matters as railway technical standard, railway fare and passenger service policy, through operation policy, station and station plaza design standards, station plaza development, and preliminary design of stations and station plazas.

(1) Development scenario for integration and standardization in Metro Manila

- 1) With due consideration to the population pressure of 24 million in the greater Metro Manila area by year 2015, it will be necessary to develop railways as a means of public mass transportation system in order to vitalize socio-economic activities. On the other hand, the construction of railways is obliged to have huge initial investment cost with relatively expensive operation and maintenance costs. From this point of view, management of railways is considered to have relatively low financial viability.

In the Metro Manila case, the advantages have often been negated by fragmented developments of the railway lines, sparseness of the railway network, and disregard of user' convenience.

- 2) In order to accelerate the use of railways by citizen, it is necessary to promote standardization and integration of railway transport by introducing railway technical standard, service improvement, through operation, station and station area development in addition to the construction of new lines.

(2) Railway technical standard

- 1) In order for railways to operate safely, speedily, accurately and efficiently, it is necessary to have set rules and standards. Therefore, it is essential for the national government to clearly indicate standards on safety condition and so forth so that railway operators can satisfy a specific level of social requirements by meeting the standards.

Railway technical standards are divided into compulsory standards which prescribe for safety and voluntary standards aimed at improving production efficiency and removing trade impediments, etc. In the Study, examination was carried out on compulsory standards.

Compulsory standards prescribe necessary performance items for securing required safety levels, maintaining networks, displaying railway characteristics, securing convenience of users, and adopting environmental countermeasures.

Proposed railway technical standard consists of 11 chapters with 75 articles and describes the performance requirements for respective items. Furthermore, the way of thinking as the background of these items is explained Interpretation Guidelines by showing examples.

- 2) Compulsory technical standards must be clearly stated in legislation of the Philippine government and widely informed to railway operators. The legislative system of the Philippine government consists of Acts, Executive Orders, Presidential Orders and Department Orders, etc. It is appropriate that railway technical standards are prescribed in Department Order of the DOTC.

Also, it is necessary to establish a responsible organization for establishing technical standards and carrying out revisions according to technical progress, etc. In this context, the Railway Transport Planning Division within the DOTC is considered to be appropriate as the responsible department. Moreover, in order to handle opinions in the practical running of the railway, it is proposed that a railway technical standards council composed of railway experts is set up within the Railway Transport Planning Division.

(3) Railway fare and passenger service policy

- 1) It is necessary to set the basic fare for railways upon giving careful consideration to the ability to pay of general users and competition with other public modes of transport. Accordingly, in this Study, a fare roughly 25% higher than that for air cooling buses was set as a provisional standard, and parameters were used to compute the fare where optimum transport volume and revenue are realized. As a result, it was found that optimum transport volume and fare revenue were achieved in the case of reducing the above provisional standard fare by 15%.

In order to promote railway use and realize labor saving, it is proposed that introduction of commuter passes, issue of inter-railway transit tickets, introduction of transit fare settlement system will be effective.

- 2) Passenger services should be discussed roughly from the viewpoints of station arrangements and functions to transportation services, face-to-face passenger services, etc. In this Study, it is recommended that shortening of distances between stations, installation of escalators, bolstering of ticket windows, enhancement of communication and transport functions between railways should be considered. In

addition, promotion of related businesses, improvement of PNR services, and securing links between railways and other transport modes are proposed.

(4) Through operation policy

- 1) Implementation of through operation improves convenience for passengers and also has merits for the railway companies. Therefore, through operation is something which should definitely be implemented on sections where it is possible. In this Study, through operation between line 1 and line 3, line 1 and line 6, North rail and MCX be taken up as lines which through operation is possible and discussed in detail.
- 2) Through operation between line 1 and line 3 is possible under set conditions. Therefore, Monument station should be reformed to enable through operation between line 1 and line 3..

According to the rough estimate in the Study, transfer time will be cut by 20 minutes, passenger will increase by 31 million per year(2015), and administration expenses will be reduced. Meanwhile, it is estimated that the increase in works costs accompanying through operation will be 2.6 billion peso. However, rough survey of the merits and demerits found the plan to be attractive.

- 3) Through operation between line 1 and line 6, which connects two lines at Baclaran, improves convenience for passengers and increase transportation volume. In addition, it will be possible to move the rolling stock depots from the current inconvenient sites in the city to land alongside line 6.
- 4) Through operation between North rail and MCX has problems on the section between Tayuman and Vitocruz, where facilities are deteriorated, there are numerous crossings, and squatters live alongside the track. Therefore, in the Study, it is proposed to carry out through operation by constructing underground line on the section of approximately 7 km between Tayuman and Victocruz and semi-underground line between Victocruz and FTJ.

(5) Station and station plaza design standard.

- 1) In order for stations and station plazas to provide services which are safe, comfortable and convenient, it is necessary to design appropriate scale and functions and plan an effective arrangement of facilities. For this reason, it is effective to establish the standard scale, equipment, functions and layout of station and station

plazas according to the local characteristics, number of users and type of each station, and to develop stations and station plazas based on this standard. In the Study, station and station plaza design standards (manual) are proposed.

2) Important points in the use of this manual are as follows.

The size of stations is generally set based on the estimated number of users 15 years in the future. It is important to carry out computation based on standard figures which the Study proposed.

To make user-friendly station, it is necessary to install escalators and elevators. It is also necessary to adopt a sign system and introduce pictographs based on ISO international standards to make boarding and alighting and transfer of trains easier. In addition, it is necessary to install facilities for physically challenged persons (guide and warning blocks, etc.)

Since station plazas are strongly connected to land use plans and urban facilities plans in addition to railway plans, it is important to coordinate with local governments and other related agencies.

(6) Institutional and financial methods for station plaza development

Station plazas not only provide sites for changing between railways and other modes of transport, they are integral part of urban facilities around stations.

For this reason, since station plaza development is development of common social infrastructure and can only be implemented by the private sector (railway companies, etc.) to a certain extent, public sector involvement is necessary.

However, it would be financially difficult for the Philippine public sector to develop station plazas using its own funds; rather, public sector involvement should center around preparation of the business environment and provision of tax and financial incentives.

A possible means of realizing this is to designate station plazas and surrounding areas, and establish a Priority Area Development System.

It is also effective to enhance the business environment through implementing deregulation, and to offer tax reduction and financial incentives on securities, etc.

Concerning the raising of funds, private capital should be utilized to the full: a promising alternative would be to receive investment from Philippine citizens at home and abroad through establishing an SPC (special purpose company) and issuing bonds.

Moreover, rather than raising funds separately for individual projects, it is better to set up a long-term stable fund (Urban Development Fund) and examine introduction of urban development tax, etc. as a new source of funds.

(7) Preliminary design of stations and station plazas

- 1) Concerning preliminary design of station facilities, on the two stations targeted for preliminary design, i.e. Monumento and Magallanes, the basic specifications of station facilities (length and width of platform, number of ticket machines, width of stairs, number of escalators, etc.) were computed based on the station design standards with consideration given to the number of users in 2015.

Moreover, facilities layouts, section drawings and improvement work procedure drawings were prepared for Monumento station and Magallanes station. Also, economic and financial analysis and initial environmental examination in the case of station improvement and station plaza development was carried out.

- 2) Concerning preliminary design of station plaza on two stations, rough estimation was carried out on the required number of bus, taxi and jeepneys berths and the necessary station plaza area based on the station plaza design standards.

However, since areas around stations consist of commercial and residential land, it will not be easy to secure site land for station plazas as planned. For this reason, it is necessary to secure station plaza sites by utilizing the institutional and financial methods as described in Chapter 7 and to design realistic station plazas which are compatible with that land.

Moreover, evaluation was carried out on six alternatives for station plaza sites in the case of Monumento station and seven alternatives in the case of Magallanes station. Out of these, the optimum sites were selected and preliminary design was carried out on the station plazas and corridors linking them to the stations. Also, economic and financial analysis and initial environmental examination were carried of for the case of station plaza construction at both stations.

(8) Comprehensive Recommendation

1) Realization of planned lines

The most important thing in order to increase the number of rail users in Metro Manila is to achieve the earliest possible realization of these already proposed rail network plans. In addition to the operating line 1, line 3 and PNR, if construction of line 2 and the planned line 3 extension, line 4, line 6, North rail and MCX is realized, dramatic increase in the number of rail users can be anticipated.

In advancing construction of the railway network, it will be necessary to promote cooperation between related Departments and Agencies such as the DOTC, NEDA, MMDA and DPWH, etc. under the guidance of the President, to hear the views of local government representatives, railway operators, urban transportation experts and transportation users, and to seek the understanding of citizens by presenting specific railway construction plans, cost benefits and sources of construction funds, etc. before the public.

In order to carry out the planned construction of rail network in Metro Manila, it will be necessary to pay attention to the introduction of appropriate rail system based on detailed demand forecasts, introduction of maximum private sector funding by providing institutional and financial incentives to private companies while seeking an appropriate burden from users, integrated development of the railways and urban functions by working together with road and city officials in promoting projects.

Moreover, since PNR connects the center of Metro Manila to districts with growth potential in the north and south, it is an attractive route as a commuter main line. It is important to develop PNR as a key route of the rail network in Metro Manila through improving the north and south lines and carrying out drastic revision of the central section. Accordingly, in the Study, it is proposed that improvement of services through raising speeds, free rider countermeasures and squatter countermeasures be sought by turning the central section into an underground line.

2) Recommendation on the main subjects of the study

Recommendation is reported taking into consideration of the conclusion of main subjects such as Railway technical standard, Railway fare and passenger service policy, Through operation policy, Station and station plaza design standards, Station plaza development, Preliminary design of stations and station plazas.

3) Implementation plan and schedule

For the purpose of carrying out projects proposed in the Study, Action Plan was prepared. Action Plan includes eight items of project lists, evaluation of projects, priority and implementation schedule.

The proposed projects are shown as follows.

Multi-modal station area development

Station facilities improvement project

Through operation project

Bus and jeepneys rerouting project focused on stations.

Establishment of taskforce team for materializing integrated transport policy and planning

Urban development fund raising program

Human resource development for railway sector

New residential area development with railway transport

THE STUDY ON THE STANDARDIZATION FOR INTEGRATED RAILWAY NETWORK OF METRO MANILA

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The Government of the Republic of the Philippines has requested the Government of Japan to conduct the Study on Standardization of an Integrated Railway Network in Metro Manila (the Study). In response to this request, the Government of Japan has decided to implement the Study and the Japan International Cooperation Agency (JICA), the organization implementing the technical cooperation of the Government of Japan, sent the JICA Preparatory Study Team to the Philippines in August, 1999 to ensure the smooth and effective progress of the Study. The JICA Preparatory Study Team concluded the Implementation Agreement (I/A) for the Study with the Government of the Philippines on 25th August, 1999. Following this Agreement, the JICA established the full-scale Study Team (the Study Team) as well as JICA Advisory Committee.

1.2 Objectives of the Study

Against the background described in 1.1, the Study intends the formulation of a master plan for the integration of the rail transport system in Metro Manila and the implementation of a preliminary design study on model stations in accordance with the I/A agreed on 25th August, 1999 by the Government of the Philippines and the JICA Preparatory Study Team. In addition, technology transfer to counterparts in the Philippines who participated in the Study during the study period was conducted through field survey work.

1.3 Study Schedule

The basic study schedule is shown Fig. 1.3.1

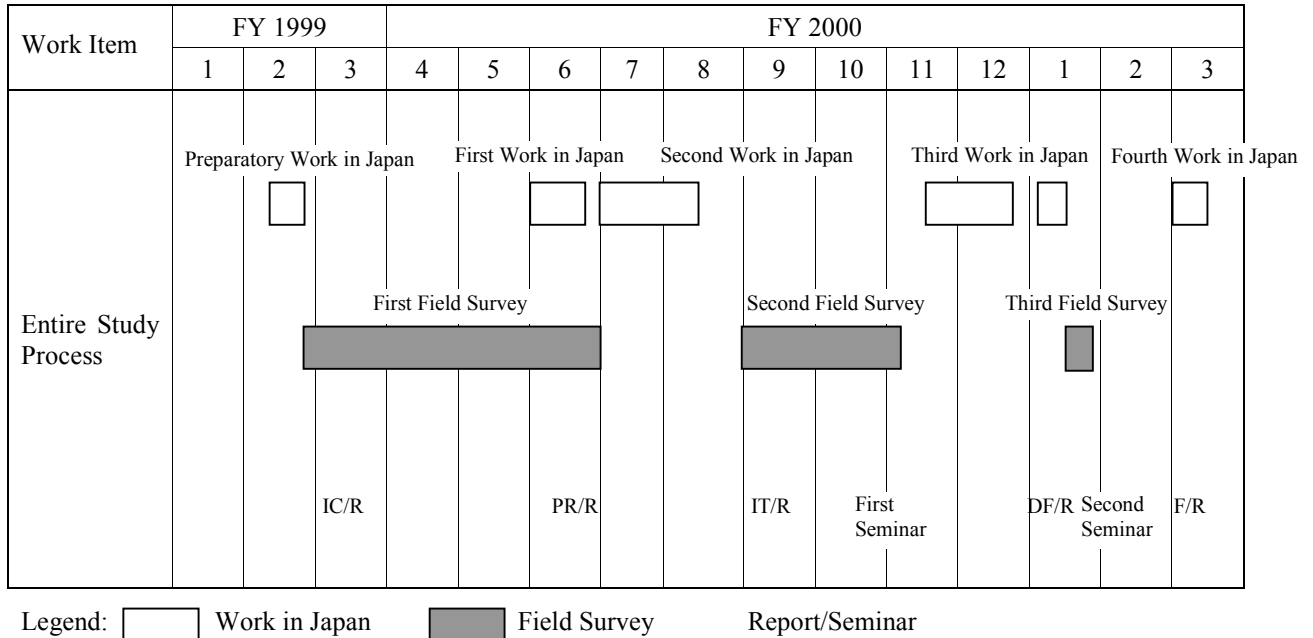


Fig. 1.3.1 Brief Schedule

1.4 Organization of the Study

For the execution of the Study, the Japanese side is composed of the JICA, the JICA Advisory Committee, and the Study Team. The Philippine side is comprised of the Government representative, the Steering Committee, Technical Working Committee and Philippine Counterpart Team.

The Organization chart is shown in Fig. 1.4.1

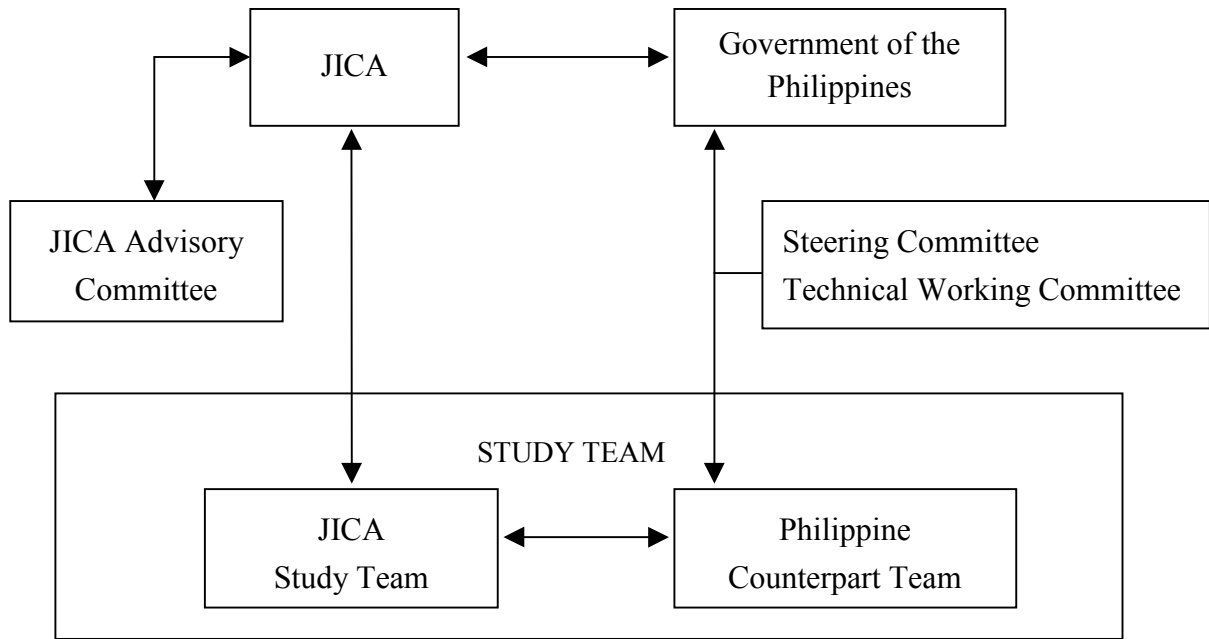


Fig. 1.4.1 Organization Chart

The names of the JICA Advisory Committee Members, the JICA Coordinator, the Study Team Members, and the Steering Committee Members, the Technical Working Committee Members, Philippine Counterpart Team Members are as follows :

(1) The Advisory Committee:

Name	Assignment	Present position
Kiyoto YOSHINAGA	Leader	Director, Railway Department, Chubu District Transportation Bureau, Ministry of Transport
Hiroaki TAKIZAWA	Railway Finance/ Management	Deputy Director, Railway Industries Division, Railway Bureau, Ministry of Transport
Yoshinobu MIURA (1999.2 ~ 2000.8)	Railway Rolling Stock/ Safety	Deputy Director, Operating Safety and Rolling Stock Division, Ministry of Transport
Noboru MATSUMURA (2000.9 ~ 2001.3)	"	Deputy Director, Facilities Division, Railway Bureau, Ministry of Transport

(2) JICA

Name	Present position
Takao KAIBARA (1999.2-2000.9)	Director, First Development Study Division, Social Development Study Department, Japan International Cooperation Agency (JICA)
Toshio HIRAI (2000.10-2001.3)	Director, First Development Study Division, Social Development Study Department, Japan International Cooperation Agency (JICA)
Hidenori KUMAGAI	Deputy Director, First Development Study Division, Social Development Study Department, Japan International Cooperation Agency (JICA)
Kazuyuki SHIBAYAMA	Staff, First Development Study Division, Social Development Study Department, Japan International Cooperation Agency (JICA)
Hideo ONO	Resident Representative, Philippine Office, Japan International Cooperation Agency (JICA)
Toshiyuki KUROYANAGI	Deputy Resident Representative, Philippine Office, Japan International Cooperation Agency (JICA)
Hiroyuki ABE	Assistant Resident Representative, Philippine Office, Japan International Cooperation Agency (JICA)

(3) Study Team

Name	Assignment
Naofumi TAKASHIGE	Team Leader/ Technical Standards
Shuichi YUMOTO	Deputy Leader/ Development Planning and Development System
Takashi JORAKU	Marketing Planning and Fare System
Akira HACHIGA	Automated Ticket Gate Planning
Shingo SAITO	Structure and Track Planning
Yoshiaki ENDO	Rolling Stock and Machinery Planning
Nobuaki KUMABE	Electric Power, Signalling, Telecommunication Planning
Isamu YOSHITAKE	Train Operation and Transport Planning
Kazuo KUSUGI	Station Terminal Planning
Taro IWATA	Financial Analysis
Naoshi OKAMURA	Traffic Demand Forecast and Economic Analysis
Masamichi TAKIZAWA	Station Facility Design
Hiroshi TANAKA	Station Plaza Design
Hideaki YAMAKAWA	Organizational Frame
Hiroshi TANAKA	Environmental Consideration and Scenic View
Rene SANTIAGO	Traffic Planning

(4) Steering Committee, Technical Working Committee and Counterpart Team

1) Steering Committee

Undersecretary Carlos M. Borromeo (DOTC)	Chairman
Undersecretary Crisostomo Abanes (DOTC)	Vice-Chairman
Assistant Secretary George D. Esguerra (DOTC)	Member
Assistant Director General Augusto B. Santos (NEDA)	Member

Administrator Antonio C. San Luis (LRTA)	Member
General Manager Antonio C. Macaranas (PNR)	Member
Project Manger Mario Miranda (EDSA MRT)	Member
Assistant Secretary Jose H. Espiritu (DPWH)	Member
General Manager Violera Seva (MMDA)	Member
2) Technical Working Committee	
Director Samuel C. Custodio (DOTC)	Chairman
Director Ruben S. Reinoso, Jr. (NEDA)	Member
Assistant General Manager Rafael Mosura (PNR)	Member
Evangeline Razon (LRTA)	Member
Director Elisa Joson (DPWH)	Member
Director Cora Cruz (MMDA)	Member
3) Counterpart Team	
PROJECT MANAGEMENT	
Assistant Secretary George D. Esguerra (DOTC)	Project Director
Director Samuel C. Custodio (DOTC)	Project Manager
EleuterIo. C. Galvante (DOTC)	Asst.Project Manager
TECHNICAL STAFF	
Marites E. Tuazon (DOTC)	Member
Joel R. Magbanua (DOTC)	Member
Rafael E. Penafiel (DOTC)	Member
Deo Leo Manalo (DOTC)	Member
Dolores Pua (DOTC)	Member
Annabelle Ganancial (LRTA)	Member
Raman Jimenez (PNR)	Member
ADMINISTRATIVE SUPPORT STAFF	
Grace R. de Guzman	Member
Rizal C. Morales	Member
Irene F. Dimapilis	Member
Teresita S. Rosales	Member

CHAPTER 2

DEVELOPMENT SCENARIO FOR INTEGRATION AND STANDARDIZATION IN METRO MANILA

The total length of operational railway lines in Metro Manila currently stands at about 63 km – LRT Line 1, LRT Line 3, and the Tutuban to Muntinlupa section of PNR. Compared with other metropolitan areas extent of railway services in Metro Manila – with its population of 9.5 million as of 1995 is rather sparse. Coupled with insufficient road network, it is no wonder that severe traffic congestion occurs daily in Metro Manila.

2.1 Railway Development Scenario for Metro Manila

(1) Transport Development Issues

The transport problem is already bad and is expected to get worse due to: 1) continued concentration of population and economic activities in the National Capital Region; 2) disorderly expansion of the urbanized areas; 3) rapid rate of motorization triggered by income and population growths; 4) slow pace of road network development; and 5) lack of integration among different public transport modes.

Poor urban aesthetics as well as heavy reliance on carbon-emitting motor vehicles have conspired to create high levels of air pollution. Relief is not foreseen, without a drastic change in the transport system.

(2) Necessity of Railway Network

Historical experience on road developments without complementary railway networks in large metropolitan areas has shown the futility of such efforts. New roads simply induce more vehicles, requiring more roads in a never-ending loop.

Population pressure of 24 million is expected in the Greater Metro Manila Region by year 2015. In this context, current transport network depended on road traffic can not meet with the future traffic demand and the economic and social activities would be more seriously suffered from a shortage of the capacity.

In order to vitalize the economic and social activities, expansion of the railway network in Metro Manila will contribute greatly to the following: 1) alleviation of traffic congestion, 2) improvement of environmental condition through a reduction of air

pollution and global warming, 3) savings in travel time and 4) safer and more reliable urban commuting.

(3) Development Strategies for Railway Network

Establishment of hierarchical railway line

For establishment of railway network as a dominant transport and promoting the railway development in Metro Manila, coupled with a trunk line as north-south transport axis and a circular line to be served for accumulated commerce, business and educational areas, within the rail mode of transport, there must be a hierarchical network of lines running the heavier density corridors of Metro Manila including feeder lines such as other LRT lines, mono-rail, guiderail system etc.

Re-enforcing railway as a dominant public transport

In order to maximize utilization of railway assets, the following measures should be put in place: 1) development of bus and jeepney terminals, pedestrian decks and road improvements to upgrade accessibility to the railway stations from other transport modes, 2) improvement of railway station facilities and amenities; 3) adherence to railway technical standards to secure reliability and safety of the operation, 4) introduction of through operation where viable, 5) adoption of a common railway tariff system designed for users convenience, 6) re-orienting railway organizations toward higher utilization and efficiency of operations, 7) re-structuring of bus and jeepney routes, as well as utilization of tricycles to serve access within a short radius of the station, and 8) formulation of supporting rules and regulations to realize the above.

Integration with land use

From the medium to long-term viewpoints, integration between land use development and transport development is crucial to formulate an efficient transport network. Future large-scale developments should incorporate and take into consideration railway transport. In particular,

- In order to strengthen the circumferential railway line (LRT Line.3) and to disperse the urban functions, urban redevelopment in the northern parts of EDSA should be promoted, in tandem with development restrictions in the inner areas of C4.
- New residential estates shall be constructed and supported by railway services within a 30-km radius to meet the population pressure of 24 million in the Greater Metro Manila Region by year 2015.

- In order to minimize undue inflows of inter-regional traffic to the CBD, bus and truck terminals need to be developed at the entrance points of the northern and southern parts

Zoning controls around stations should be imposed to promote the railway utilization. For this reason, station area developments should be designated in the comprehensive development plans of the LGUs including the legislation as a special development area.

2.2 Standardization of Railway Transport

(1) Obstacles to Railway Development

Essential characteristics of rail transport include: 1) alleviation of road congestion by mass transit, 2) ensuring safety and stable operation, 3) environment-friendly and energy-efficient. On the minus side are the huge initial investment cost, relatively expensive operation and maintenance costs, aside from low financial viability.

In the Metro Manila case, the advantages have often been negated by fragmented developments of the railway lines, sparseness of the railway network, and disregard of users' convenience. As a result, low rider-ships and low profitability have being occurred.

In the absence of an explicit technical standard on railways in the Philippines, compatibility of the railway facilities and equipment—tracks, rolling stocks, signal/telecommunication and operation aspects—among the various railway lines cannot be assured. In such a situation, high procurement cost and inefficiency of operation and maintenance are not surprising.

(2) Establishment Strategy for Railway Technical Standard

To formulate the contents of mandatory technical standards, it is necessary to define the rules—from the early stage of design concerning the strength of materials of facilities and rolling stock, safety level of structures, and so forth. If the design and construction are carried out on the basis of these rules (design standards), consistently good structures can be realized automatically. Obviously, the structures constructed in accordance with the prescribed design standards can be regarded as meeting the safety thresholds or conditions.

Technical standards usually cover the following aspects: 1) tracks, 2) station facilities, 3) rolling stock, 4) operation, 5) signal/communication, 6) power supply, 7) depot, 8) safety measures, and 9) environmental measures.

2.3 Integration of Railway Transport

The station facilities and station area developments should be planned in accordance with its role or function, e.g., CBD central station, general central station, terminal station and transfer station.

An implementation plan for station facilities and station area developments should be drawn up to meet demand, enhance profitability, and maximize benefits to both the railway users and operators.

Through operation shall be introduced between the different lines based on evaluation of the feasibility in order to generate additional passengers, reduce construction cost, realize savings in the purchase of rolling stock and in operation and maintenance expenses, to save travel time, and to boost overall convenience to the user.

Over the medium-term horizon, it is feasible to achieve integration of tariff system of LRT Line1, LRT Line 2, and LRT Line 3. Extending the system so as to cover other transport modes may take a longer time—as it would entail consensus building among various contending stakeholders, re-structuring of bus and jeepney routes, and division of profits or benefits. Such a tariff system would encompass a discount system (distance-base tariff) between the different railway lines and among different road transport modes. LTFRB and DOTC would have to take a more aggressive role to realize the benefits of a common tariff system.

It will take more than policy pronouncements and zoning classifications to realize inter-modal station developments. It is necessary, but not a sufficient condition, to designate rail stations as priority area development in the Comprehensive Development Plans of LGUs.

Faced by budget constraints, the central and local government entities tend to hesitate about station area developments. To get private developers to take on the challenge of station developments, it may be necessary to grant incentives, such as exemption or moratorium on property tax and income taxes, aside from credit enhancements (e.g., access to low interest loans, capital grants.), and concessions in the use of public lands.

CHAPTER 3

RAILWAY TECHNICAL STANDARD

3.1 Purposes of Establishing Railway Technical Standards

Specific rules and standards are necessary for railways to carry out safe, high-speed, punctual, and efficient train operation. Therefore, it is essential for the national government to clearly indicate standards on safety conditions and so forth so that railway operators can satisfy a specific level of social requirements by meeting the standards.

The clarification of the technical standards by the national government will enhance the transparency of national administration. Furthermore, various railway operators with different technological power, past achievements and so forth will become able to observe the standards and secure safety conditions and so forth higher than a specific level.

3.2 Kinds of Railway Technical Standards

Railway technical standards are broadly classified into: compulsory standards which stipulate safety and so forth; design standards which complement the compulsory standards; and optional standards which aim at the enhancement of production efficiency, elimination of trade barriers, and so forth. The details of these standards are as follows.

(1) Compulsory Standards

The governments and national railways of individual countries have established compulsory technical standards on railway construction and operation, for such purposes as ensuring of railway safety and maintaining of railway networks. The titles of some of these standards centering on safety and so forth established in the countries of the world are as follows.

Japan : Regulations on Railway Structure

Germany : Regulations on Railway Construction and Operation

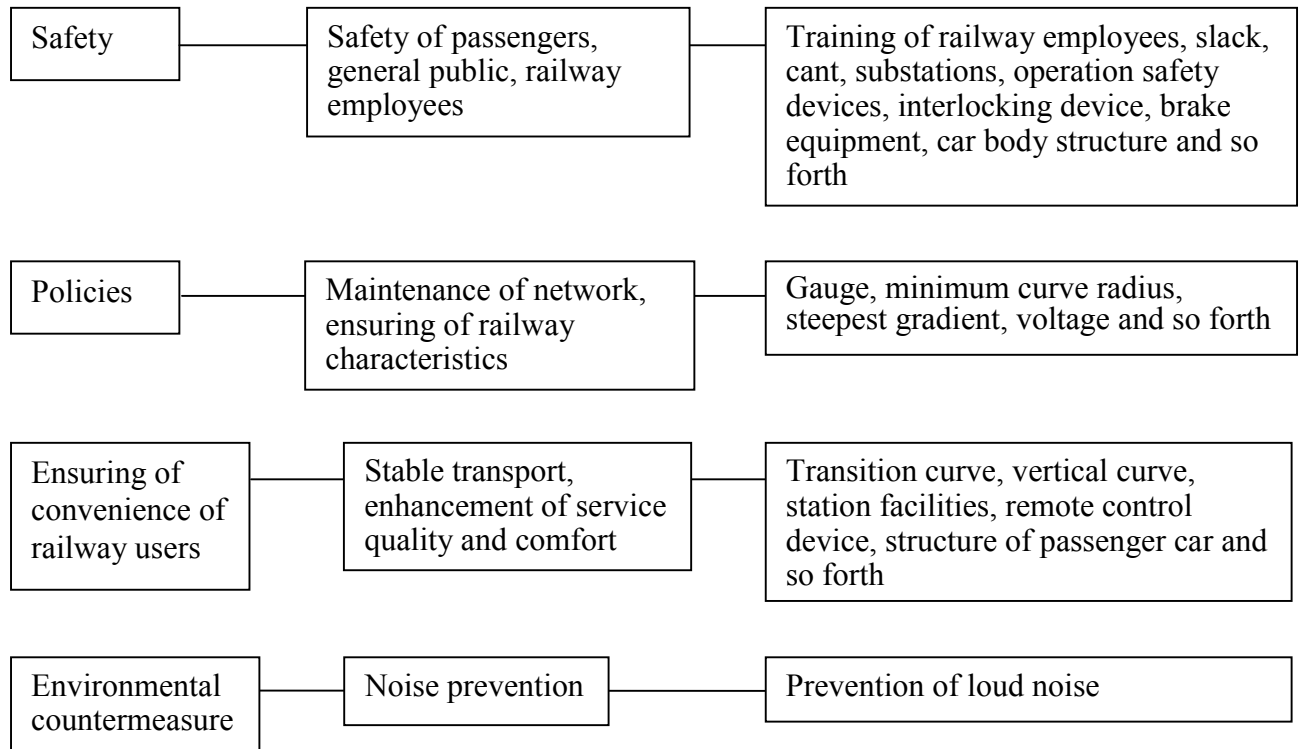
France : Official Administrative Regulations on Safety and Commercial Services on Nationwide and Regional Railway Lines

U.K. : Railway Safety Principles and Guidance

U.S.A. : FRA (Federal Railroad Administration) Regulations (State safety participation regulations, etc.)

EU : EU Directives
 (COUNCIL DIRECTIVE 96/48/EC on the interoperability of the trans-European high speed rail system, etc.)

The framework of the compulsory railway technical standards in Japan is as follows.



In Japan, based on the framework of railway technical standards, concrete items and contents of technical standards have been stipulated.

(2) Voluntary Standards

For industrial products, there are various international, regional, national, and group standards. The main purposes of these standards are to improve the quality of products, enhance production efficiency, rationalize production, reduce production costs, and eliminate trade barriers, by the unification of production methods, work methods, test methods, dimensions, structure, design methods, and so forth.

There are similar standards for railway sectors as well, and each country is making efforts to adjust its regional, national and group standards to the national standards. The voluntary standards for railway sectors are as follows.

By the national standards PS of the Philippines, 57 industrial sectors are covered. However, standards on railway sectors have not yet been established. It is advisable, therefore, to introduce national standards on railway sectors to the Philippines as well.

3.3 Drawing Up of Railway Technical Standards in Metro Manila

As the railways in Metro Manila, PNR lines and LRT Lines 1 and 3 are in operation at present. Furthermore, LRT Lines 2, 4 and 6 are under construction or in the stage of planning, and projects on North Rail and MCX are also in progress. In drawing up the Railway Technical Standards (draft) of this time, compulsory technical standards to be applied to Mass Rapid Transit (MRT) and Light Rail Transit (LRT) systems in Metro Manila have been studied.

In the Japanese railway technical standards, specifications are regulated by concretely stipulating numerical values concerning railway standards, such as track gauge, construction gauge, and standard voltage. However, numerical value regulations can become a factor which hampers development and introduction of new technologies, and also can nullify peculiarities of individual railway organizations or routes, eventually leading to the increase in railway operation costs. Furthermore, there is a possibility that technologies of a specific country (or countries) will become advantageous.

Therefore, in drafting the Technical Standards for the Philippines, the so-called “performance regulations” stipulating performance essential for railways have been adopted, in order to expand the scope of technological freedom of respective railways. As for the contents of the Technical Standards, detailed analysis has been made by conducting surveys on the actual situation of railway operation and construction in the Philippines, and through consultations with the Philippine counterparts as well as through the workshop on technical standards which were held five times. As for the specific difference from the Japanese standards, based on the actual situation of transfer facilities of railways in the Philippines, the two items (smooth transfers between railway lines; and smooth transfers between railway and road-based and other modes of transport) have been added to Chapter 4 concerning station facilities. At the same time, stipulations prohibiting new crossings on the ground level have been excluded, because new construction of level crossings will be inevitable in the future. Furthermore, standards for high speed railways such as those for the Japanese Shinkansen have been excluded. In introducing the performance standards, these ways of thinking would satisfy the demand of the Philippine side that the new standards should be based not only on Japanese railway technologies but also on technologies in the world.

However, since it might be difficult to make technical judgment according to the performance standards alone, such items as “the principles and interpretation of the technical standards” and “the concrete numerical values for reference” are described in Appendix as the interpretation standards (explanation).

The Technical Standards in the main text have been drawn up, based on the assumption that official standards should be established and put in forth by the Government. The interpretation standards (explanation) have been prepared for the reference of individual railway organizations in making judgment for establishing their technical by-standards.

The composition of the Railway Technical Standards is as follows.

3.3.1 Railway Technical Standards for Metro Manila

I. Purpose of Technical Standards

Railway traffic must be supported by an integrated system of which the priority concern is to ensure passenger safety while also aiming at ensuring reliable transportation, caring for the disabled as well as the environment and fulfilling its characteristic functions. For this purpose, Technical Standards which are applicable to railway services in general and the currently operating PNR, LRT1 and LRT3 lines as well as planned lines to be opened in the future in particular are established here.

II. Main Contents of Railway Technical Standards

Outline of the Contents to be stipulated for Technical Standards is as follows.

1. General

- This Chapter stipulates for Definition of Terminology and Preparation of Implementation Standards
- It is stipulated that, since the technical standards established by the Government are the minimum performance standards necessary for ensuring safety and so forth, railway operators should decide, based on these standards, their own standards on the structure and maintenance of their specific railway facilities and rolling stock as well as on the handling of train operation.

Railway operators are also obliged to submit such standards to the Government.

2. Qualification, Education and Training of Railway Employees

- Railway operators are obliged to carry out training of their employees and to enforce train operation by employees with qualifications.

3. Structure and Maintenance of Facilities and Rolling Stock

- This Provisions describe Functions required for facilities and Rolling Stock in light of Ensuring of Safety, Ensuring of Planned Transportation, Consideration for Disabled Persons and Consideration for Environmental preservation.

(1) Tracks

- This Chapter stipulates for Gauge and Slack, Curve Radius, Cant, Transition Curve, Grade, Vertical Curve, Construction Gauge, Width of Formation Level, Center-to-Center Distance of Adjacent Tracks, Track and Civil Engineering Structures, Building Construction, Disasters Prevention Devices, Safety Devices and Evacuation Devices.

(2) Station Facilities

- This Chapter stipulates for Specifications for Station Facilities, Smooth Transfers between Railway Lines, and Smooth Transfers between Railway and Other Modes of Transport.

(3) Power Facilities

- This Chapter stipulates for Contact Line, Substations and Lighting Facilities.

(4) Operation Safety Devices

- This Chapter stipulates for Installation of Operation Safety Devices, Devices to Ensure Safety between Trains, Indicating Device of Railway Signals, Interlocking Device, Remote Control Device, Train Detection Device, Railway Crossing Safety Facilities, Communication system for Safety Purposes, and Installation of Communication Cables.

(5) Rolling Stock

- This Chapter stipulates for Size Limits of Rolling Stock, Constrains with respect to Tracks and Structures, Stability of Rolling Stock, Running Gear, Motive Power Apparatuses, Brake Equipment, Structure of Car Body and so forth, Coupling Device, Structure of Rolling Stock for Transport of Special Cargo, Equipment of Driver Section, Automatic Door Control Device, Air Compressor and Accessories, On-Board Devices, Marking on Rolling stock, Fire Prevention and Control Measures for Rolling Stock, and Continued Functioning of Some devices during Power Interruption.

(6) Maintenance of Facilities and Rolling Stock

- This Chapter stipulates for Maintenance of Railway Facilities and Rolling Stock, Inspection and Trial Operation of New Facilities and Rolling Stock, Patrolling for Natural Disaster, and Regular Inspection of Railway Facilities and Rolling Stock.

4. Train Operation

- In order to secure safety, train operation handling are stipulated. Specifically, such items as Boundary of station, Train Composition, Emergency Braking Distance of Trains, Train Operation, Shunting of Rolling Stock, Operation Speed, Safety between Trains, Railway Signals and Operation, Train Protection, Track Closure, and Response to Natural Disaster are stipulated.

5. Report on Railway Accidents

- In order to serve for the identification of the actual situations of railway accidents and incidents as well as for the prevention of accident recurrence, the contents of the report which railway operators should make to the Government on accidents are stipulated.

Specifically, such items as the scope application, terminology, railway operation accidents, accidents for which railways are responsible, and reporting of railway operation accidents are stipulated.

6. Environment

- This Chapter stipulates that the measures for alleviating noise pollution due to train operation should be taken.

III. Railway Technical Standards

Chapter 1 General

1.1 Definition of Terminology

1.2 Preparation of Implementation Standards

Chapter 2 Qualification, Education and Training of Railway Employees

2.1 Education and Training of Railway Employees

2.2 Qualification of Railway Employees (Obtaining of Certificate)

Chapter 3 Tracks

3.1 Gauge and Slack

3.2 Curve Radius

3.3 Cant

3.4 Transition Curve

3.5 Grade

3.6 Vertical Curve

3.7 Construction Gauge

3.8 Width of Formation Level

3.9 Center-to-Center Distance of Adjacent Tracks

3.10 Track and Civil Engineering Structures

3.11 Building Construction

3.12 Disaster Prevention Devices, Safety Devices and Evacuation Devices

Chapter 4 Station Facilities

4.1 Specifications for station

4.2 Smooth transfers between railway lines

4.3 Smooth transfers between railway and road-based and other modes of transport

Chapter 5 Power Facilities

5.1 Contact Line (Overhead trolley wire and third rail)

5.2 Substations

5.3 Lighting Facilities

Chapter 6 Operation Safety Devices

6.1 Installation of Operation Safety Devices

6.2 Devices to Ensure Safety between Trains

6.3 Indicating Device of Railway Signals

- 6.4 Interlocking Device
- 6.5 Remote Control Device
- 6.6 Train Detection Device
- 6.7 Railway Crossing Safety Facilities
- 6.8 Communication System for Safety Purposes
- 6.9 Installation of Communication Cables

Chapter 7 Rolling Stock

- 7.1 Size Limits of Rolling Stock
- 7.2 Constrains with respect to Tracks and Structures
- 7.3 Stability
- 7.4 Running Gear
- 7.5 Motive Power Apparatuses
- 7.6 Brake Equipment
- 7.7 Car Body Structure
- 7.8 Structure to Mitigate Excessive Noise
- 7.9 Structure of Crew Section
- 7.10 Structure of Passenger Doorway
- 7.11 Structure of passenger Doorway and Gangway
- 7.12 Structure of a Passenger Car
- 7.13 Structure of Emergency Exit
- 7.14 Coupling Device
- 7.15 Structure of Rolling Stock for Transport of Special Cargo
- 7.16 Equipment of Driver Section
- 7.17 Automatic Door Control Device
- 7.18 Air Compressor and Accessories
- 7.19 On-Board Devices
- 7.20 Marking on Rolling Stock
- 7.21 Fire Prevention and Control Measures for Rolling Stock

7.22 Continued Functioning of Some Devices during Power Interruption.

Chapter 8 Maintenance of Facilities and Rolling Stock

8.1 Maintenance of Railway Facilities and Rolling Stock

8.2 Inspection and Trial Operation of New Facilities and Rolling Stock, etc.

8.3 Patrolling, etc. when there is threat of disaster

8.4 Regular Inspection, etc. of Railway Facilities and Rolling Stock

Chapter 9 Train Operation

9.1 Boundary of Station

9.2 Train Composition

9.3 Emergency Braking Distance, etc. of Trains

9.4 Train Operation

9.5 Shunting of Rolling Stock

9.6 Operation Speed

9.7 Safety between Trains

9.8 Railway Signals and Operation

9.9 Train Protection

9.10 Track Closure

9.11 Response to Natural Disaster

Chapter 10 Reporting of Railway Accidents

10.1 Objective

10.2 Scope of Application

10.3 Terminology

10.4 Stipulations Regarding Railway Operation Accidents, etc.

10.5 Responsible Accidents

10.6 Reporting of Railway Operation Accidents and Other Matters

3.4 Legislation and Responsible Organization of Railway Technical Standards

3.4.1 Legislation of Railway Technical Standards

- (1) Compulsory standards must be adhered to in each railway company. For this reason, it is necessary for these technical standards to be clearly prescribed in the legal system of the Philippine Government.

Confirmation of compliance with standards can either be carried out by the railway companies themselves, or by the public administration sector. As the basic philosophy, the weight applied to the self responsibility of railway companies shall be raised, the degree of freedom of companies including makers shall be expanded, and administrative involvement shall be held to a minimum.

- (2) In the Philippines, too, it is necessary for compulsory technical standards to be clearly prescribed in the legal system. Legislation relating to railways in the Philippines at the moment is as follows.

- Executive Order No. 125 January, 1987

Reorganizing the Ministry of Transportation and Communications defining its powers and functions and for other purposes

- Executive Order No. 125-A April, 1987

Amending Executive Order No. 125

- Executive Order No. 603 July, 1980

Creating a Light Rail Transit Authority, vesting the same with the Authority to construct and operate the Light Railway Transit (LRT) Project and providing funds therefore

- Presidential Decree No. 741 July, 1975

Amending an Act creating National Philippine Railways

The above legislation lays down prescriptions concerning the mandate, powers, functions, duties, organization and funds of DOTC, LRTA and PNR, but it does not directly state rules concerning railway business management, operating safety and technical standards.

However, in DOTC (E. O. No. 125) Section 5 (Powers and Functions), the following is stated: “Administer all laws, rules and regulations in the field of transportation and communications”, and since authority to establish railway-related standards is given, it is possible to establish Department Orders concerning railway technical standards.

For this reason, it is appropriate for technical standards to be established and advertised by DOTC Department Order.

In this connection, since the Interpretation Guidelines are reference standards, it is advisable to make the Guidelines sufficiently known to the personnel concerned as a notification by the Director of Transport Planning Service, Department of Transport and Communication.

Furthermore, in order to confirm that the contents of technical standards are satisfied during the construction and operation of railways, it is desirable to establish legislation concerning the business management and running of the railway utility and state prescriptions in that (for example, establishment of a rail transportation law).

Currently in the Philippines, since there is no comprehensive legislation concerning railway business management and operation (permission of railway operations, authorization of works, etc.), it is worth examining the establishment of a new law, however, this should be examined from a viewpoint that is separate from that of technical standards.

Also, from the viewpoint of minimizing administrative involvement, it is realistic to establish a system whereby railway companies themselves confirm compliance with technical standards.

3.4.2 Organization in Charge of Railway Technical Standards

- (1) Railway technical standards state regulations which are necessary for securing railway safety, maintaining networks, displaying railway characteristics, securing convenience for users, and taking environmental countermeasures; however, in order to newly

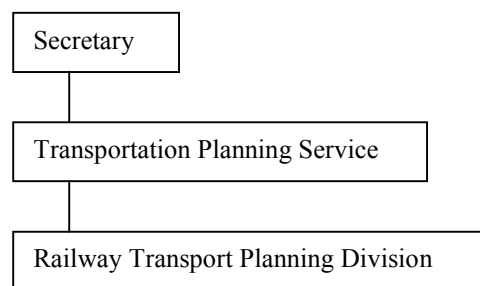
establish or revise standards, it is necessary to assign experts in technical standards who are well versed in railway work affairs.

Moreover, because technical standards are applied to all railway companies in the country, it is appropriate that the said experts belong to the administrative departments of national agencies or their equivalent bodies.

- (2) In the Philippines, too, it is necessary to establish a department in charge of railway technical standards.

Government agencies currently in charge of railways in the Philippines are as follows.

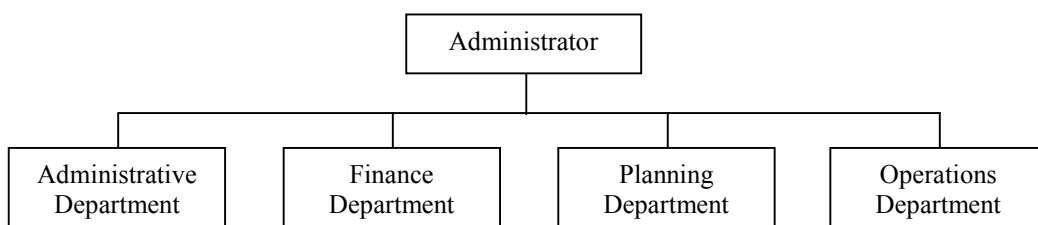
- 1) Department of Transportation and Communications (DOTC)



Within the DOTC there is a division responsible for railway transport planning, and around 10 personnel are assigned to this.

Moreover, within the ministry, EDSA MRT 3 Executive Office which is responsible for operation on Line 3 has been established.

- 2) Light Rail Transit Authority (LRTA)

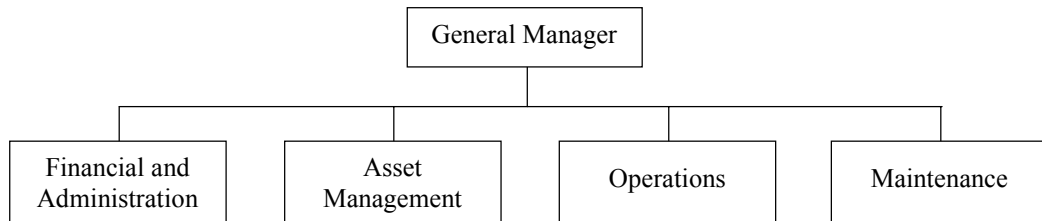


In terms of administrative machinery, LRTA is an independent authority under control of the DOTC. This authority manages and operates LRT, however, operation and maintenance of Line 1 is consigned to Metro Transit Organization, Inc.

(METRO). However, the contract on the entrustment has been void since August 2000.

The number of staff is around 50 in LRTA and 1,250 in METRO.

3) Philippine National Railways (PNR)



In terms of administrative machinery, PNR is a nationalized railway company under the management of the DOTC, and it manages, operates and maintains 446 km of line.

PNR has a work force of approximately 1,200 employees.

- (3) As was pointed out previously, it is appropriate for railway technical standards to be established by DOTC Department Order, so for this reason it is thought rational to establish a department within the DOTC responsible for establishing and revising technical standards. DOTC departments currently in charge of railways are the Railway Transport Planning Division (policy department) and the EDSA MRT3 Executive Office (implementing department).

The Railway Transport Planning Division belongs to the Planning Service Department and, similar to the Road Transport Division, Air Transport Division, and Water Transport Division it is jointly established with, it is responsible for planning and controlling projects. If possible it is desirable to expand the Railway Transport Planning Division so that it can also take charge of technical standards, however, it is thought that difficulty would arise in expanding just this division (also in terms of comparison with other sections).

Meanwhile, the EDSA MRT3 Executive Office is in charge of operation on Line 3, however, it is thought that establishment of such a field department within the DOTC is temporary, and anyway this is not a department for dealing with policy matters such as establishment of standards, etc.

For the organizations in charge of the railway technical standards, it is necessary to have a good administrative sense and also to be familiar with the railway technologies. Therefore, the following organizations are considered as recommendable organizations responsible for the establishment and revision of the railway technical standards in the Philippines.

- 1) Railway Transport Planning Division is recommended as the organization in charge of the establishment and revision of the railway technical standards.
- 2) However, the number of personnel in Railway Planning Division is small, and the Division is not sufficient as the organization for studying the details of the railway technical standards. Therefore, it is advisable to establish a "Council for Railway Technical Standards" within Railway Transport Planning Division as an organization which consists of government officials, railway personnel and so forth and is responsible for substantial deliberations for the establishment and revision of the railway technical standards (including the Implementation Guidelines). The members (draft plan) of the Council for Railway Technical Standards are as follows.

- DOTC (Railway Transport Planning Division)
- DOTC (EDSA MRT3 Executive Office)
- LRTA (Planning Department)
- LRTA (Operations Department)
- LRTA (Line 2 Project Office)
- PNR (Operations Department)
- PNR (Maintenance Department)
- MRTC (Metro Railway Transit Corporation)

CHAPTER 4

RAILWAY FARE AND PASSENGER SERVICE POLICY

4.1 Railway Fare

4.1.1 Railway Fare Setting Methods

Railway fare setting methods differ between countries. Japan uses the multiple costing method.

Total revenue (fare + other) = Total expenditure (labor costs, expenses, capital costs) in the
rail way division + Profit

However, since construction projects for subways and public railways in large cities are often partially subsidized by the government or other agencies, the user fare bearing capacity is rather considered in multiple consisting.

European countries are now separating railway construction and management in terms of accounting, organization, and institution and setting up an environment that permits open access only from qualified railway managing bodies. In this case, fares will probably be determined by adding railway rents to the running costs of railway managing bodies.

In large cities, however, transportation fares are often suppressed to some extent for the convenience of citizens and smooth transportation. To compensate for the fare suppressions, running costs are subsidized in various ways.

Generally speaking, urban railways are actually receiving subsidies for their constructions and operations. Therefore, fares are also determined with this in mind.

In the Manila metropolitan area, the existing railways are LRT 1 and 3 and PNR. In addition to these three lines, several lines are under construction or schedule.

LRT 1 (13.95 km with 18 stations) is owned and managed by LRTA (a special company 100% invested by the government) and operated by a private company (METRO 100% invested by LRTA, until June 2000) under a contract with LRTA. The fares for the line are flat (12 pesos for a token but 2 pesos between three end stations) but the introduction of magnetic cards is scheduled in December 2000 to adopt the travel-kilometer system (or travel distance system). Fares under the new fare system are yet to be determined.

LRT 3 was constructed by MRTC (a consortium invested by 7 companies) using the BLT method and operated by DOTC. After 25-year lease, this railway will be owned by the nation. When the railway was tentatively opened in December 1999 (12.9 km with 10 stations), the travel-kilometer fares from 17 to 34 pesos were set. Because of a small passenger population, however, the fares were reduced to 12 to 20 pesos by revision in February 2000. When the first planned section (16.9 km with 13 stations) was completed in July this year, the fares were reduced again to the six-month tentative fares of 9.5 to 15 pesos to increase the passenger population.

PNR, a national railway under DOTC supervision, uses the travel distance system for about 30 km in the urban commutation area. The fares are set lower than those of jeepneys.

For MRT 2 now under construction, the travel-kilometer system (or travel distance system) will be adopted with the same fare rates as LRT 1 because both LRT lines are under LRTA management.

LRT 6 under schedule for BOT construction will adopt a fare rate system similar to that of LRT 1 because the railway is to be constructed on an extension from LRT 1.

LRT 4 is saved for future discussion because neither the constructor nor the management body is known.

DOTC's basic policy about railway fares is based on the recognition that it is difficult to cover all costs with fares. According to this policy, the government should owe infrastructure costs and the fares should be determined with an emphasis on the following:

- Making the maximum use of transportation capacity
- Reducing the governmental subsidies
- Giving incentives to railway companies for keeping high service levels

4.1.2 Railway Fare Systems

Flat, travel-kilometer, travel distance, and distance fare systems

Railways in large cities may use the flat fare system for short lines. The flat fare system used to be promoted because turning ticket barriers can reduce necessary personnel for ticket punching. However, since the working kilometers of urban railways increased and the automatic ticket barriers suppressed personnel at ticket barriers, the travel distance fare system reflecting the travel distance is generally adopted.

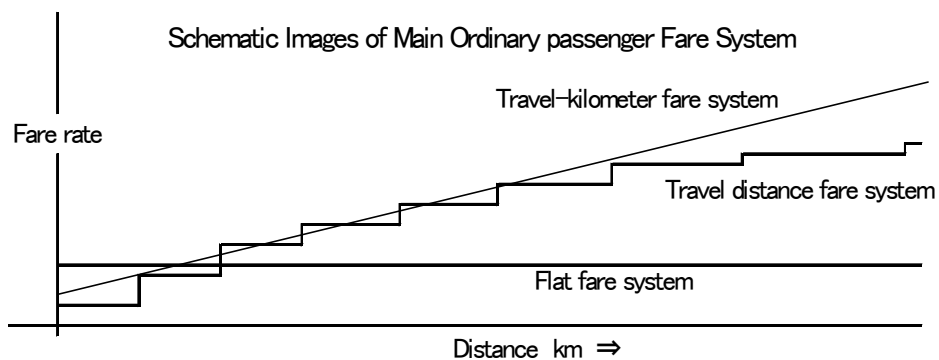


Fig. 4.1.1 Railway Fare Systems in Japan

For Manila, the travel distance fare system seems appropriate because LRT constructions will be promoted sequentially through mutual cooperation in future.

4.1.3 Railway Company Fare Levels

Fares may differ between railways companies depending on the service levels and past experiences. However, a fare system too complicated may not be preferable in Manila because the railway managing bodies tend to adopt the through-fare system.

Table 4.1.1 Transportation Service Conditions for Each Line

Item \ Line	LRT 1	LRT 3	MRT 2
Competitive transport	Mainly jeepney	Bus	Jeepney (Partially bus)
User characteristic	Many students	Many workers (55.6%) Room for students on the opposite way	Workers and students
Speed	Fast (26.3k/h)	Fast (35.8k/h)	Fast (26.0k/h estimated)
Air-conditioning	Partially cooled	Cooled	(Cooled)

4.1.4 Standard Fare Setting

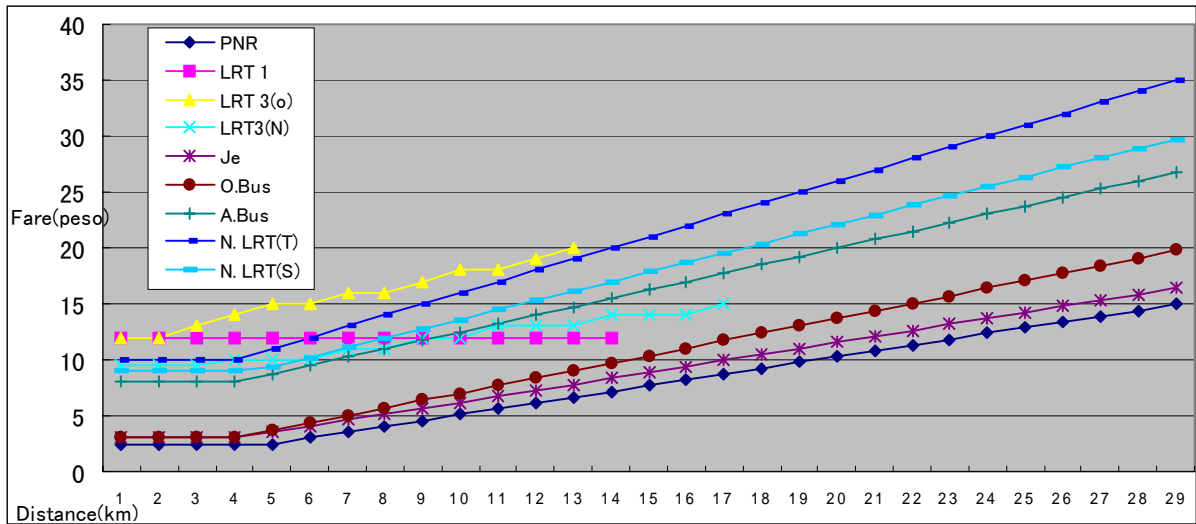
For railways in Manila, it is very difficult to determine optimum line fares. Since the government has three basic policies about fares as mentioned before, the LRT fares should not be set beyond the fare bearing capacity of general users but by considering competitions with other public transports.

In this survey, the traffic demand estimation model (STRADA) developed by JICA was used. In this case, fares were set slightly higher than those of air-conditioned buses comparatively close to the railway cars in transportation service conditions. The reference transportation capacity was calculated by adding the walk time, wait time, get-on/off time, travel time, and congestion to the tentative fares. Then, the fare where the passenger population and revenue become the greatest was calculated, by using fares as a key parameter. The results of the above analysis are as follows.

Table 4.1.2 Sensitivity Analysis on Tentative Reference Values

	Line	20%down	15%down	10%down	5%down	Base
Passengers/day	LRT 1	729,337(+35.8)	720,474(+34.1)	632,893(+17.8)	615,420(+14.6)	536,907(100)
	LRT 3	636,073(+67.1)	608,572(+59.9)	517,234(+35.9)	476,768(+25.3)	380,473(100)
	MRT 2	608,416(+24.4)	592,533(+21.1)	547,805(+12.0)	526,138(+7.6)	489,017(100)
Average fare (peso)	LRT 1	12.03 (-21.8)	12.66 (-17.7)	13.66 (-11.3)	14.42(-6.4)	15.39 (100)
	LRT 3	12.89 (-20.7)	13.62 (-16.2)	14.29 (-12.1)	15.23(-6.3)	16.24 (100)
	MRT 2	11.13 (-22.0)	11.87 (-16.8)	12.69 (-11.1)	13.48(-5.5)	14.26 (100)
Revenue (1000pesos)	LRT 1	8,774 (+ 6.1)	9,121 (+10.3)	8,645 (+4.6)	8,874(+7.4)	8,263 (100)
	LRT 3	8,199 (+32.7)	8,289 (+34.1)	7,391 (+19.6)	7,261(+17.5)	6,179 (100)
	MRT 2	6,772 (- 2.9)	7,033 (+ 0.8)	6,952 (-0.4)	7,092(+1.7)	6,973 (100)

Therefore, 15% down from the reference values may be the fare level for satisfactory revenue and passenger population where a fare reduction increases both the passenger population and the fare revenue.



- (Note) 1 Inter-company fare rate is assumed to be set on the conditions where through-fare system is applied to operation distance (km)
 2 N.LRT(T) shows Tentative Fare , N.LRT(S) shows Standard Fare.

Fig. 4.1.2 Transport Fares and LRT Fare Rates

4.1.5 Ticket Types and Discount Fares

(1) Ticket types

Ticket types differ between countries. In general, various tickets are issued to increase railway passengers. However, the types of tickets convenient for urban transportation are limited.

In Japan, ordinary single tickets, I.O. Card, coupon tickets, and commutation tickets are issued. In Manila, Single Journey Ticket (SJT) and Stored Value Ticket (SVT) are issued.

Table 4.1.3 Railway tickets for urban transportation
(Comparison between Japan and Manila)

Japan	Manila
Ordinary single ticket	Single Journey Ticket
Ordinary return ticket ••• Saving the trouble of buying a ticket for the way back from an event, sometimes with a slight discount	
I.O. Card ••• Allowing a ride from and to anywhere, with no discount (5000yen, 3000yen) Saving the trouble of buying a ticket for the way back	Stored Value Ticket (Discount rate: 7% max)
Coupon ticket ••• For riding a limited section at the fare indicated on the ticket with a 10% discount (10-ticket fare for 11 single tickets), saving an infrequent railway user from a congestion	
Commutation ticket ••• Used to go to office or school, sometimes with a 50% or greater discount (valid for 1, 3, or 6 months)	
One-day area ticket ••• One-day ticket for unlimited ride within an area at a fare about 5 times the minimum section fare for sightseeing, excursion, and business	

Commutation ticket is indispensable for a worker or student going daily to office or school by changing trains. I.O. Card is useful for using a railway for a short term or riding indefinite sections daily. Coupon ticket is useful for riding back and forth the same section in a short term. SVT in Manila has an intermediate characteristic between I.O. Card and coupon ticket, useful but not strong enough to increase railway users.

(2) Fare discount

About fare discounts, there is a great discrepancy between Manila and Japan. In Manila, From the viewpoint of sales, Stored Value Ticket (SVT) in Manila gives the last single premium as an equivalent of discount. The premium is 14 pesos at most for 200-peso SVT and the discount rate is $14/200=0.07\%$. This ticket may save the user from the trouble of buying a ticket each time at a station but is doubtful about the effect of inducing the user to select railway from various transports. In Japan, commutation ticket may be an equivalent of fare discount on urban railways. This enhances the commuter convenience, increases the commuter population, and serves greatly for settling railway users and reserving revenues.

Urban transportation in the Manila metropolitan area seems to require some railway user incentives like commutation ticket to promote the future development of railway and to enhance its role.

Urban railway users can be classified into commuters, general passengers, and tourists. As a rule, commuters use railways every day except on weekends, especially in limited morning and afternoon hours. General passengers use railways sometimes in the week, especially in daytime hours, and tourists mostly use railways on holidays.

Therefore, to general passengers and tourists, the said standard fares apply because they are infrequent railway users.

As to commuters accounting a great percentage among urban transport passengers, workers generally have one day off a week but workers at public organizations or large enterprises public servants and students have two days off. These commuters generally travel fixed sections once each in the morning and afternoon. Therefore, giving some incentives to this commutation will promote railway uses.

Basically speaking, passenger transportation is two-way while cargo transportation is one-way. About LRT passengers in Manila, the number of passengers getting on at each station differs greatly from that of passengers getting off.

Therefore, appropriate transportation facilities may be able to induce a population equivalent of this difference to use railways.

In addition, since LRT 1 is popular, entries into its stations are sometimes limited to ease congestions. LRT 3 is still not popular but the fare reduction at the opening of the first completed section has been increasing the passenger population gradually. Entries into LRT 3 stations are not limited but queues are seen at ticket windows. In addition, a plan is in progress for increasing the transportation capacity of LRT 1 in future. LRT 3 is now being prepared for full opening in 2003. Since MRT 2, LRT 6, 4 are also constructed to establish the railway transportation network, the passenger population of each line is expected to grow greatly. This will make it a great subject to ensure a smooth flow from ticket purchase at a ticket window to entry through a ticket barrier. Selling commutation tickets with certain terms of validity is very effective for solving this subject.

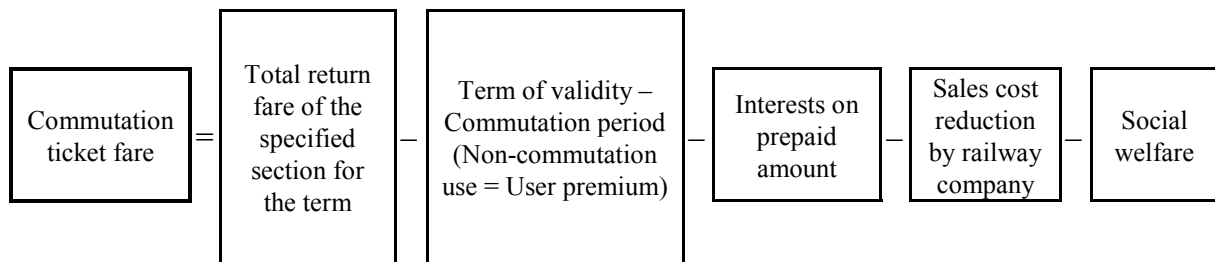
Therefore, not only LRT 1 and 3 but also MRT 2 should adopt commutation tickets to allow free ride to commuters at discount fares. Since the fares do not change however

often the users may ride trains, commutation tickets are helpful for inducing and securing railway users, reserving revenues, and also solving congestions at stations.

(3) Commutation ticket discount rates and terms of validity

Commutation tickets may be valid for one month, three months, or six months. However, since long-term commutation tickets seem impractical because users pay fares on their own in Manila, one-month or three-month commutation tickets may be appropriate. Even in that case, tentative payments by employers or installment payments should be studied about commutation tickets.

The discount rates should reflect interests on the prepaid fares, sales cost reductions by railway managing bodies, and user premiums and make users feel commutation tickets cost low.



As to the popularity of commutation tickets in the Tokyo metropolitan area, commutation ticket users account for 65% and ordinary ticket users account for 35% among the JR passengers. Among private railway passengers, commutation ticket users account for 64% and ordinary ticket users account for 36%. Among the passengers of the metropolitan loop line and subways, commutation ticket users account for 62% and ordinary ticket users account for 38%.

Table 4.1.4 Ratio of Commutation and Ordinarily Ticket Use in Tokyo Area

	JR	Private Lines (7)	Subway Lines (2)
Commutation Ticket	65%	64%	62%
Ordinary Ticket (SJT)	35%	36%	38%

In case of JR, the discount rates are about 50% for worker commutation tickets and 62 to 70% for student commutation tickets.

Table 4.1.5 Reduced Rate of JR Commutation Ticket of Japan
(prepared based on 16 - 20 km travel distance model)

Normal Rate	Reduced Rate Commutation Ticket			
	Type of Ticket	One-month	Three-month	Six-month
100	Commutation	50	52.5	55
100	University student	62.2	64.1	66
100	High school student	67	68.7	70.3

(Note) 1 Reduced rate of commutation ticket = $1 - \frac{\text{One - month regular fare}}{\text{Round trip normal fare of 30 days/month}}$

2 Three-month reduced rate is obtained from the one-month commutation ticket fare multiplied by 3 and reduced by 5%. Six-month reduced rate is obtained from the one-month commutation ticket fare multiplied by 6 and reduced by 10%.

As privately owned railways can establish the fare rate based on the balance of revenue and expenditure, the average rate of 14 major railways is set to 41.5% for one-month commutation ticket and 79.9% for student ticket, although there are some differences in different railways.

In this connection, Because of the sharp increase in the construction costs, the discount rate on the recently-opened subway Line 12 is about 36% for commuters.

The discount rates commutation tickets in Manila should be studied by considering the commuters' tendency for using railways. Roughly speaking, most workers have a day off a week and students have two days off a week. Therefore, the monthly rate of railway use is estimated to be about 85% for workers but 71% for students. If these values are considered with other factors mentioned before, discounts of 30 to 40% seem acceptable. Considering the discrepancy of fare bearing capacity between workers and students, the discount rates should be from 20 to 30% for workers and from 30 to 40% for students.

Table 4.1.6 Revenues and Fares at Different Discount Rates on 15-peso Single Fare

Ordinary monthly fare	Discount rate	Monthly revenue	Fare per ride (peso)						
900 pesos (15 pesos×2×30 days)	20%	720P(15P*30*2*0.8)	12	13.1	14.4	16	18	20.6	24
	25%	675P(15P*30*2*0.75)	11.25	12.27	13.5	15	16.87	19.28	22.5
	30%	630P(15P*30*2*0.7)	10.5	11.44	12.6	14	15.75	18	21
	35%	585P(15P*30*2*0.65)	9.75	10.63	11.7	13	14.62	16.7	19.5
	40%	540P(15P*30*2*0.6)	9	9.8	10.8	12	13.5	15.4	18
	45%	495P(15P*30*2*0.55)	8.25	9	9.9	11	12.37	14.14	16.5
	50%	450P(15P*30*2*0.5)	7.5	8.18	9	10	11.25	12.86	15
	Monthly use rate			60	55	50	45	40	35

Average number of use by worker = 6/7 (one day off) = 85.7%.

$$85.7\% \times 60 \text{ (full monthly use)} = \underline{51.42} \quad \mathbf{51 \text{ times}}$$

Therefore, the discount rate should be determined to make the fare lower. If the premium is also considered, discounts from 20 to 30% may be appropriate.

Average number of use by student = 5/7 (two days off) = 71.4%

$$71.4\% \times 60 \text{ (full monthly use)} = \underline{42.84} \quad \mathbf{43 \text{ times}}$$

Therefore, the discount rate should be determined to make the fare lower. If the premium is also considered, discounts from 30 to 40% may be appropriate.

4.2 Strengthening Linkage between Railway Companies

4.2.1 Inter-railway Transit Tickets and Fares

(1) Common transit ticket

In Japan, the traditional way of railway transfer is to use a transit ticket that tells all railways to use and the total fare. Between private companies in Tokyo and Osaka, magnetic cards are getting introduced recently as magnetic cards but the fares are not common yet.

DOTC, LRTA, and other related organizations agreed on about common tickets for railways in the Manila metropolitan area. At present, however, making tickets common is a difficult subject to solve even between LRT 1 and 3 because it costs high to integrate and unify systems installed individually at railway managing bodies.

(2) Inter-railway transfer fare

To determine an inter-railway transfer fare, fares charged by railway managing bodies are aggregated (aggregate-fare system) or working kilometers covered by railway managing bodies are totaled (through-fare system).

In Metro Manila areas, the existing railway are LRT 1 and 3, and PNR. In additions, MRT 2 is under-construction and others are in the planning stage. In general, however, it is very difficult to total working kilometers covered by different railway managing bodies because:

In an urban transport , base fares (minimum fares) account for a great percentage of the revenue. Therefore, if the through-fare system is applied to railways managed by different companies, the revenue of each railway managing body will decrease.

Since railway management is supported by fare revenues, the through-fare system cannot be introduced readily for voluntary management.

However, introducing the through-fare system may be effective for ensuring the convenience of railways in large cities and for positively extending future railway uses. This introduction can be expected to reduce the profit from each transit passenger but to increase passengers.

As to urban railways in European countries, the through-fare system is already adopted between different railway managing bodies in many areas or between railways and buses for the convenience of users. In many cases, the national or regional government pay the arising costs.

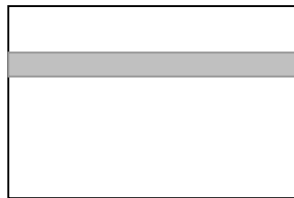
In Japan, the six member companies of the JR Group are using the through-fare system.

The railways in the Manila metropolitan area (PNR, LRT 1, LRT 3, and MRT 2) are managed by public or semi-public corporations but may permit uniform management in future. Therefore, the consensus on the through-fare system between companies seemed to have paved the way to the system. For the convenience of users, the implementation of the system is expected.

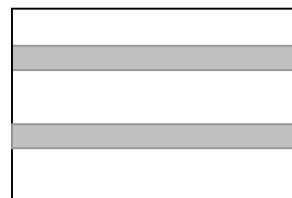
4.2.2 Automatic Fare Collection System and Common Card

(1) Current status of the AFC system in Manila

Ticket information is read and written magnetically in the present AFC system. The information is recorded in the magnetic stripe arranged on the ticket. LRT 1(the LRT line operated by LRTA) ticket has only one magnetic stripe. There is a gap in its center, and it memorizes fixed information in its first half and variable information in its last half. LRT 3(the LRT line operated by MRTC) ticket has two magnetic stripes and also memorizes fixed and variable information in one stripe, and keeps the second stripe as a reserve stripe.



Magnetic stripe of LRT 1 ticket



Magnetic stripe of LRT 3 ticket

Fig. 4.2.1 Magnetic Stripe on Ticket

The system configuration of AFC system of LRT 3 is shown below. Except for the fact that LRT 1 can only exchange data between CCS(Central Computer System) and SCS(Station Computer System) by a floppy disk and it has no TIM, LRT 1 has almost the same system configuration as LRT 3.

Automatic Gate	Ticket examination and collection
Analyzer/Dispenser	Issuing SJT and SVT
Ticket Issuing Machine	Issuing SJT(only LRT 3)
Station Computer System	Equipment control of AFC system
Encoder/Sorter	Encoding and sorting of magnetic card for reuse
Central Computer System	Control of the whole AFC system

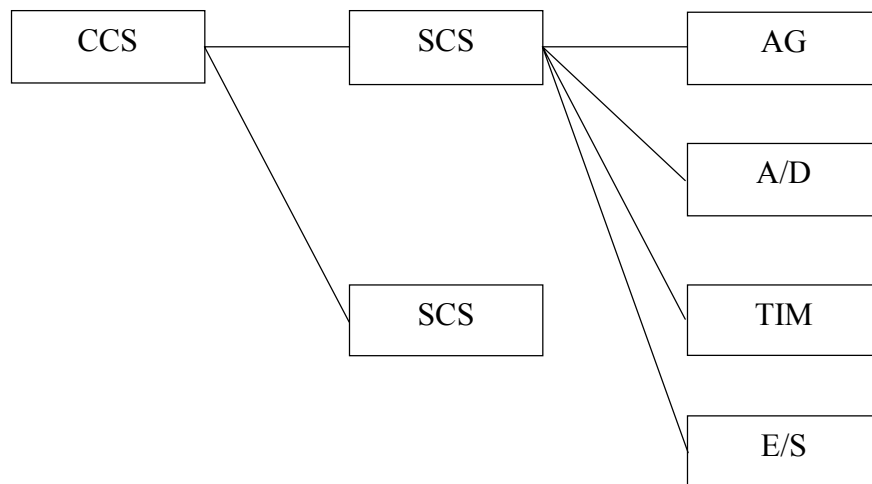


Fig. 4.2.2 System Configuration of AFC

Further investigation revealed that in Manila, the integration of the ticket specification has been discussed after each manufacturer started the designing of the equipment. OMRON(AFC vendor for LRT 3) modified its encoding format to match the proposed common specification, but CGA(AFC vendor for LRT 1) did not modify its encoding format since it was not included in the initial contract.

(2) Obstacles to the ticket integration

Because the magnetic card tickets of LRT 1 and LRT 3 have different encoding format, the automatic gate of LRT 1 (LRT 3) cannot read the magnetic card of LRT 3 (LRT 1). As a result, passengers who want to transfer to the other line are forced to buy another ticket at the connecting station.

The lack of coordination in deciding the required specification for both LRT 1 and LRT 3 seems the cause of this problem in ticket integration and it should be taken for granted that a considerable amount of cost is resulting from this miss-coordination

Although both LRT 1 and LRT 3 have strong demands for ticket integration, they have not concluded on the final decision about ticket integration. This is because there is no budget for this project, and so a low cost solution is the key factor to the decision making.

(3) Consideration of ticket integration

If ticket integration was included in the requirements of LRT 1 and LRT 3 in the beginning, it could have been easily realized. Unfortunately, however, because LRT 1

and LRT 3 have required AFC systems of different specifications, the ticket integration cannot materialize without system modification in some degree.

1) Integration achieved by magnetic tickets

One of the key issues in ticket integration is the modification cost of the existing AFC systems. If there is no cost restriction, we could modify the system in any desirable way without technical difficulty. Accordingly, it is essential to examine the cost and benefit of integration scheme. In this study for integration achieved by magnetic cards, the following two ticket integration schemes are considered

- Total ticket integration by using magnetic card

All tickets of LRT 1 is available to all AFC equipment in LRT 3 and vice versa.

- Partial ticket integration by using magnetic card

Some tickets of LRT 1 is available to all AFC equipment of LRT 1 and some AFC equipment of LRT 3, however, no ticket of LRT 3 is available to any AFC equipment of LRT 1 and vice versa.

The outline of total ticket integration

The condition of making LRT 1 ticket compatible with LRT 3 ticket is that they have a common encoding format. Their encoding formats are different. Accordingly, it is necessary to modify the existing AFC system by introducing a common encoding format. The major obstacle to this modification is the cost issue.

Total ticket integration will be realized by choosing one of the alternatives below.

- Adopting LRT 1 encoding format as the common one, the AFC equipment in LRT 3 should be modified accordingly.
- Adopting LRT 3 encoding format as the common one, the AFC equipment in LRT 1 should be modified accordingly.

Before choosing one alternative, it is necessary to evaluate the cost and benefit of each alternative. Modification to AFC equipment may be as follows.

1. Hardware modification of AFC equipment

2. Software modification of AFC equipment
3. Software modification to SCS
4. Software modification to CCS

Total ticket integration is an ideal solution for the passengers. It is difficult, however, to give an incentive to the manufacturers for this job, since in this case manufacturer X who does not get the job would enjoy the business advantage, while manufacturer Y who takes the job has no business advantage, so it is unlikely for the manufacturers to become positive about this job.

The outline of partial ticket integration

A ratio of passengers who take both LRT 1 and LRT 3 may suggest the amount of commuters who would take advantage of the ticket integration. The number of passengers who take both lines is not exactly estimated. Partial integration is proposed on the assumption that the amount of the passengers who take both lines is relatively small.

We can choose either one of the alternatives below as the common ticket for LRT 1 and LRT 3. Common ticket is SVT and we should exclude SJT. SVT can be issued in advance, and would not require a large amount of additional equipment, so it is proposed that the ticket type for a common ticket shall only be SVT.

- The common ticket should be SVT of LRT 1.
- The common ticket should be SVT of LRT 3.

Also here, a conclusive factor for decision is that which alternative is less expensive. An additional installation of the equipment of one in the other, or replacement of the equipment could be considered as a solution. The amounts of space for an extension of AFC equipment may be considered. In place of the extension of equipment in one line, a part of its equipment may be exchanged with the equipment of the other line. Modification to AFC equipment may be as follows.

- i) Hardware modification to AFC equipment
- ii) Software modification to AFC equipment
- iii) Software modification to SCS
- iv) Software modification to CCS

Partial ticket integration is a compromised solution, and may not be so convenient for some passengers. However, the convenience in railway transportation will be no doubt improved because passengers would have a choice to take both LRT 1 and LRT 3 with one ticket. This plan would only be beneficial if the number of passengers who are transferring to the other line is small, and this plan is not beneficial if there is a large number of passengers using both lines.

2) Integration achieved by smart card tickets

It seems a trend that transport operators in the world adopt AFC system using smart cards instead of magnetic cards. There is a possibility of achieving the ticket integration of LRT 1 and LRT 3 by using smart cards, as well as magnetic cards. A study of the integration achieved by magnetic tickets, and a study of integration achieved by smart card shall be made. However, the following reasons would not allow us give LRTA and MRTC a support in ticket integration by smart card.

- The high cost of the card media
- Unfinished depreciation of the existing magnetic AFC equipment
- Economical difficulty in realizing smart card SJT

Many cities in the world studies about the introduction of smart card ticket to their public transport. It is doubtful, however, to rely on smart card immediately to resolve the present situation.

(4) Conclusions

In Metro Manila, various measures have been taken to alleviate urban traffic congestion. Of these measures, the introduction of common tickets and related automatic ticket examination systems is considered indispensable for expanding the role of railways and enhancing their functions. DOTC, LRTA, and other organizations concerned have also the same opinion.

Therefore, it is necessary to make all-out efforts to realize the unification of tickets for LRT Lines No.1 and No.3 which have already been opened.

As described before, the complete unification system is rather expensive. On the other hand, although the partial unification system is inexpensive, its effect is limited. Therefore, in view of additional investment, the partial unification system is considered acceptable for the time being. In this case, considering such factors as the situation of

AFC software maintenance, and space for additional introduction of AFC equipment, and also in view of the fact that AFC equipment on LRT 3 is already in operation, it is practical to adjust the specifications of AFC equipment for LRT 1 with those of equipment for LRT 3 and to limit the common tickets to SVT.

In order to proceed in making the decision, the following steps should be taken;

Step 1: Compare the following costs.

1. The modification cost to adjust LRT 1 equipment to LRT3 equipment.
2. The modification cost to adjust LRT 3 equipment to LRT 3 equipment..
3. The cost of additional installation or replacement of LRT 3 equipment to use Line 1 SVT as a common ticket.
4. The cost of additional installation of replacement of LRT equipment to use LRT 3 SVT as a common ticket.

Step 2: Select a plan based on the comparison of the above costs.

Step 3: Discuss and analyses the technical superiority of the plan.

Step 4: Attain a budget to realize the plan.

However, it is necessary to design uniform software valid for all railways and systematically promote measures for wide utilization of the software, because MRT 2 is scheduled to open in the future, and the construction of new railway routes such as Lines No.4 and No.6 is also planned at present.

4.2.3 Methods of Inter-company Settlement of Accounts

(1) General rules for settlement of accounts

In accordance with the execution of through-fare system in addition to the introduction of common tickets and computerized ticket punching and collection system, inter-company accounts must be settled to clear off all inter-company sales revenues and expenditures. Basic rules of this settlement services are that proper settlement can be achieved only when settlement of accounts is made not only by individual railway companies but accurate information is furnished each other. Based on this prerequisite, the following settlement of accounts is carried out.

At first, it is necessary for all railway companies to arrive at the "Agreement on inter-company settlement of sales accounts" and the "Agreement on handling of accounting

books and slips of sales accounts." The following procedures should be taken upon the above agreement.

Obtain the sales revenue covering that of individual companies based on travel kilometers to determine the sales revenue to be received by each company.

When tickets related to other companies are sold, obtain the amount of sales commission to be received by the company sold the tickets.

Determine the amount of inter-company sales revenue and sales commission to be returned.

Prepare inter-company settlement of account slips describing sales revenue and sales commission.

Send all settlement of account slips to counterparts .

Companies received the above slips shall make payment .

(2) Organization executing settlement of accounts

Settlement of accounts is carried out by connection transport settlement department of individual companies but a "connection transport settlement service company" can be established to commission all settlement procedures to the company established where there are many related companies.

The Central Clearance Headquarters (CCH) has been established in Manila with the LRTA as a core. It is presumed that the role of this organization can become more important as common card ticket system and settlement of account system are introduced in the future.

4.3 Passenger Services

Passenger services should be discussed roughly from the viewpoints of station arrangements and functions to transportation services and in detail from the viewpoints of passenger guidance and other face-to-face services. However, since specialists make proposals about terminal planning and transportation planning, proposals are made only about the following:

4.3.1 Passenger Services at Stations

(1) Optimizing the station arrangements

In urban railways, station arrangements greatly affect the trends of railway users. Manila and other populous cities in urban areas require optimum station arrangements based on the migrations of people. This is different from railways that transport long-distance commuters from suburban areas to urban areas as fast as possible by stopping only at limited stations.

In Manila, the average station intervals are 0.8 km for LRT Line 1, 1.4 km for LRT Line 3, and 1.3 km for LRT Line 2. These intervals seem comparatively long in Southeast Asia where walking distances are said to be short, and some of them look away from a center of traffic or a center where migrating people gather and part. This should be in mind when planning a new scheme in future.

LRT Line 3 has station intervals of about 2 km at four sections: Kamuning - Cubao (1.93km), Santolan - Ortigas Ave. (2.3km), and Guadalupe - Buendia (1.9km), Magallanes - Taft (1.9km). Depending on the local development statuses, it may become necessary in future to construct new stations in these sections by considering the railway conditions (gradient and curve).

(2) Ensuring the convenience of users at stations

The main advantages of railway transportation are speed, frequency, punctuality, comfortableness, and low fare. As to a railway station used many passengers every day, the evaluation factors are access to the station, the sales system for passengers, the concourse or waiting space, toilets, announcement and guides, and facilities for physically handicapped passengers.

1) Access to the station

The stations of LRT 1 and 3 in Manila are overhead. Therefore, passengers must ascend about 7 to 9 meters from the ground to get on a train at a station of LRT 1 and 7 to 13 meters at a station of LRT 3. The ascend and descend give a great burden on passengers. The stations of LRT 3 have elevators, but the elevators are intended for physically handicapped passengers and cannot handle many passengers. Even in the city, escalator can be seen at buildings and underground passages where many people gather and part. Therefore, escalator should also be installed at stations

for access to roads. They say that escalators are planned for LRT 3. The immediate installation of escalators is expected.

2) Strengthening the ticket windows

The ticket barriers are automated both at LRT 1 and 3 but tickets are sold manually at ticket windows. LRT1 has comparatively many ticket windows at each station, but LRT 3 has only a few ticket windows. Therefore, long queues are formed in rush hours these days. Although SVT is expected to solve this problem, the diffusion index of SVT is still below 20%.

In the future, it may be necessary to increase ticket windows, consign sales, strengthen advance ticket sales, and apply automatic vending machines.

3) Other

Since the stations are overhead, their names are difficult to see from the ground. To make a station location clear, it is necessary to put up a logo combined from a line name and a station name. "Station name," "open hours," "fare table," and "standard train timetable" are essential for a transport and should be put up at each station according to the same standards. Executing the put-up contents with responsibility may be effective for gaining confidence on railway.

Some toilets were found difficult to use. Unlike the conventional toilets, it is recommended to upgrade the toilets by charging.

(3) Perfecting the inter-railway liaison transportation function

To ensure smooth passenger transfer between railways, through train runs are preferable. When constructing a new railway line, through train runs should be permitted between lines where a sufficient passenger flow can be expected.

However, this system is often difficult to realize on railway lines already open because railway standards or structures differ between the lines and additional investments are necessary. For smooth transfer between lines, at least the followings should be noted:

1) Integrated maintenance and management of transfer stations on different lines

In addition to the PNR Line and LRT 1 and 3 in service and MRT 2 under construction, new lines are now under study for future construction. To make railway play an important role among transports in the Manila metropolitan area,

however, the first priority should be given to the establishment of a strong transportation network on the railway lines.

To do so, stations near an intersection of railway lines should be positioned as close to each other as possible for integrated management, and due considerations should be given in future railway projects.

The stations already open or under construction may require the following improvements:

EDSA Station on LRT Line 1 and TAFT Station on LRT 3 are expected to be a joint station under integrated management. The stations will be linked through a moving walkway for smooth communications, the tickets and automatic ticket barriers will be made common, and the through-fare system will be introduced. Therefore, the ticket barriers are also expected to have common latches or to be latch-free.

D. Jose Stations on LRT 1, 4, and MRT 2 may be about 200 to 300 m away from each other. In this area, PEA is proceeding with a local development project including bus and jeepney terminals. About the railway section, it is necessary to make a proposal to PEA so that the three stations can be established and managed as one general station to ensure easy transfers between the lines. The railway managing bodies should also consider the layout to allow the shortest transfers between the three stations and make studies to simplify ticket punching and collection and to construct moving walkways linking the stations.

Cubao Station on LRT 3 and MRT 2 under construction are about 400 m away from each other. A development project is going on in this area, including the two stations. An overhead bridge and a moving walkway should preferably be established in this project so that passengers can transfer without going down to the ground.

PNR intersects LRT 1 at Burmentitto Station, MRT 2 at St Mesa Station, and LRT 3 at Magallanes Station. However, since the PNR station is on the ground level and there is a great discrepancy in the transportation services, the stations can now not be established or managed in an integrated form. Their integration

should be discussed again when the facilities are improved and transportation is enhanced in future.

Monumento Station to be connected to LRT 1 in the second project of LRT 3 and Quezon Ave. Station to cross LRT 4 are also expected to be established and managed as an integrated joint station.

2) Passenger guide signs related to transfers

To make railways convenient and easy for anybody to change trains, guide signs easy to understand are necessary, "passenger guide," "transfer information," and "transfer timetable" should always be put up or announced.



Fig. 4.3.1 Train Information at a Passageway

4.3.2 Promoting related businesses

(1) Significance of related businesses

The railway business, national or private, generally establishes the foundation of national or local life. Since the fare revenue is limited, it is said difficult to make both ends meet only by the railway transportation business alone. Seeking for stronger managerial foundations, Japanese railway management bodies often develop housing complexes and leisure facilities along railways before or with railway constructions to recover development profits and promote development uses. In addition, they introduce such businesses as shops, restaurants, and car parks into the existing station terminals to strengthen the station functions and to stabilize station management by future revenues. In the information-oriented era, advertisements using spaces at stations and on trains are also good sources of revenues.

By purposes, these related businesses can be categorized as follows:

Businesses directly related to the railway business and sharing or compensating for part of the work

Ticket sales and car servicing

Businesses to provide railway users with various high-quality services for enhancing conveniences, eventually increasing the transportation and related businesses

Shops, restaurants, and car parks

Businesses to make effective uses of lands and spaces belonging to the railways for ensuring revenues from related businesses

Advertisements, leasing spaces under railway bridges, and developing and leasing unused sites

(2) Prerequisites for developing a related business

- Site reservation A business led by a railway management body require a station or adjacent sites for large-scale development. For medium-scale development, unpopular sites or spaces above the station or railway may be sufficient. For small-scale development, dead spaces in station premises may be enough if used effectively.

- Customer population Another prerequisite for development is that the station has a user population large enough.

- Fund raising The other prerequisite is to raise funds for implementing the project. In general, about 20% of the necessary fund is on hand and the rest is from a bank or other. With this capital, the intended building is constructed and tenants are collected simultaneously. The tenants are supposed to pay the allotted amounts (key money and deposit).

A railway management body make necessary preparations for this kind of business but should establish a management body (ex. ABC Station Building Co., Ltd.) immediately for management. In this case, the railway management body is expected to take the lead in the invested business with over 50% of the company stocks.

(3) Current status and outlook of railway-related businesses in Manila

Railway-related businesses are now almost none in Manila but their preparations are in progress. LRT 1 has only small shops at several stations because the station spaces are not very large. The advertisement business is suspended temporarily for some contract-related reasons.

As to LRT 3, Show Blvd Station is now preparing spaces for related businesses. Related businesses are also planned at the stations of Ayala, Magallanes, and Guadalupe.

(4) Railway-related business in Japan

The typical railway-related business in Japan is station buildings. As to the Yamanote Line with 29 stations in the Tokyo metropolitan area. Among the stations, Tokyo Station and Shinjuku Station for departures and arrivals of long-distance trains and Ikebukuro Station connected to other JR and private railway lines are now being established as terminal buildings for railway-related businesses of large scales.

The stations of Akihabara, Ueno, Shibuya, Ebisu, Meguro, and Shinagawa have medium-scale businesses using spaces above the stations or under the ground because there are no adequate areas. At other stations, small-scale stores are being developed using slight spaces in their premises.



Fig. 4.3.2 Shops Utilizing Idle Space in a Station Yard

4.3.3 PNR Service Improvement Measures

Many parties are attempting various measures to ease traffic congestion in the Manila metropolitan area, and there are now several railway construction projects. However, leaving the PNR deteriorated and corrupted at the center of the metropolis may be a social loss. The delay of the vitalization of the PNR route may be attributable to the following five reasons.

One, PNR is intended for long-distance and medium-distance railways. This railway is not able to or improved to handle or control a great many short-distance commuters born from the population quickly growing in the Manila metropolitan area.

Two, PNR has level intersections between the railway and roads piercing through the city. In the center of the metropolitan area, PNR intersects roads at about 40 places. In some densely populated area, PNR has more than 10 crossings at 200 m intervals. To prevent accidents, staff is positioned at crossings of great traffic and blocks the road traffic when a train passes. However, this is far from normal because the train must slow down.

Three, people live illegally along the line. Illegal residents construct buildings very close to the railway, even beyond legal limits, and enter the railway tracks not only to disturb train runs but also to cast stones.

Four, the government PNR authorities seem not very aggressive because the problem is too difficult to solve.

Five, PNR has been surveyed several times. Some people say no more surveys are necessary but all the past surveys are only partial and not aimed at activating PNR because they do not discuss the current statuses in detail.

Under these circumstances, a new PNR activation project should be initiated with an immediate survey to clarify the ideal image of PNR in the metropolitan area and measures for its promotion with the followings in mind:

PNR is a promising urban line anticipated to increase users greatly if drastically improved.

If the current level crossings with roads are left, improvements cannot be expected even when illegal residents are eliminated.

This makes it necessary to discuss a partially or totally overhead or underground railway for the metropolitan section of about 10 km.

To promote this project, a specialist familiar with this kind of case should make a feasibility study at the earliest timing.



Fig. 4.3.3 PNR Line in an Inner Area

4.3.4 Linkage between Railway and Other Transports

In addition to the conventional LRT 1 and LRT 3 just opened, MRT 2, LRT 6, and 4 will be established sequentially in several years to ease traffic congestions in the Manila metropolitan area.

Mutual service competitions about fare, speed, and comfortableness improve used benefits in the end.

However, these competitions must be based on efficient and orderly urban transportation. A certain guideline is necessary about fares, and transportation routes should be set to bring out the best from each transport.

From this point of view, the policy should be discussed about the following :

The EDSA Street used to be core of urban transportation. At the construction of LRT 3, however, about 20% to 30% of the street was given to the railway. Therefore, the new traffic policy should make the services better and more efficient.

Railway can fulfill its duty only by offering transportation services easy for anybody to use at fares acceptable to anybody.

An efficient route network should also be organized for bus that used to play the main role in road traffic. It may be important to establish a system that allows railway and bus to exhibit comprehensive power for improving urban transportation by working in concert. This way of thinking can be applied in the construction of the MRT 2 and planning of the LRT 4 in the future as well.

To promote the railway use, new jeepneys routes are also necessary around railway stations.

It may also be necessary to give some incentives to the operators, for example, about the handling of their licenses.

The introduction of tickets and fares which allow transfer between the railway and other means of transport (bus and jeepneys) may now be difficult because there are many minor bus and jeepneys operators having very different managerial foundations and service levels, unlike railway management bodies having a common managerial foundation. This subject will be discussed in future when railway becomes ready to fulfill its duty and can be linked mutually with bus or jeepneys.

CHAPTER 5 THROUGH OPERATION POLICY

5.1 Through Operation Plan

5.1.1 Advantages of Through Operation

Through operation will bring advantages to both railway users and railway enterprises.

- 1) The advantages for railway users are the alleviation of congestion at terminal stations; and the reduction of transport time by eliminating the necessity of changing trains.
- 2) The advantages for railway enterprises are the reduction of construction cost and rolling stock cost : and the enhancement of competitive power against other means of transport.

5.1.2 Draft of a Through Operations Plan

We will study the possibility of through operations, including the track sections for which construction is already being planned, for the transportation authority responsible for railways for the Manila metropolitan area. A route map of these track sections is shown in Fig. 5.1.1.

Of the track sections illustrated, we will study the following tracks, including LRT Line 1 and LRT Line3 that are already in operation, as well as planned tracks. No planning will be carried out for MRT Line 2 and LRT Line 4 because the through operations in the study results will be very complicated.

(1) Plan proposal

1) Through operations on LRT Line 1 and LRT Line 3

Through operations at the Monumento Station in the north

Through operations in the vicinity of the EDSA Station in the south

Furthermore, LRT Line 6 now being planned is included in LRT Line 1.

2) Improvements and through operations for North Rail Line and MCX Line

Through operations based on elevation of the track between Tayuman and Vitocruz (use existing track bed)

Through operations based on placing the track between Tayuman and Vitocruz underground (shorten by using a separate line)

(2) Prerequisites for the comparative study

- 1) Date for start of through operations will be 2015.
- 2) The transportation demand estimates for the improvement plans for each track section are shown in Table 5.1.1 as Case 1 through Case 4.
- 3) A comparative study in conjunction with the through operations will be conducted for the following cases.

LRT Line 1 and LRT Line 3 will be studied by comparing Case 1 and Case 3, including LRT Line 6.

North Rail Line and MCX Line will be studied by comparing Case 3 and Case 4.

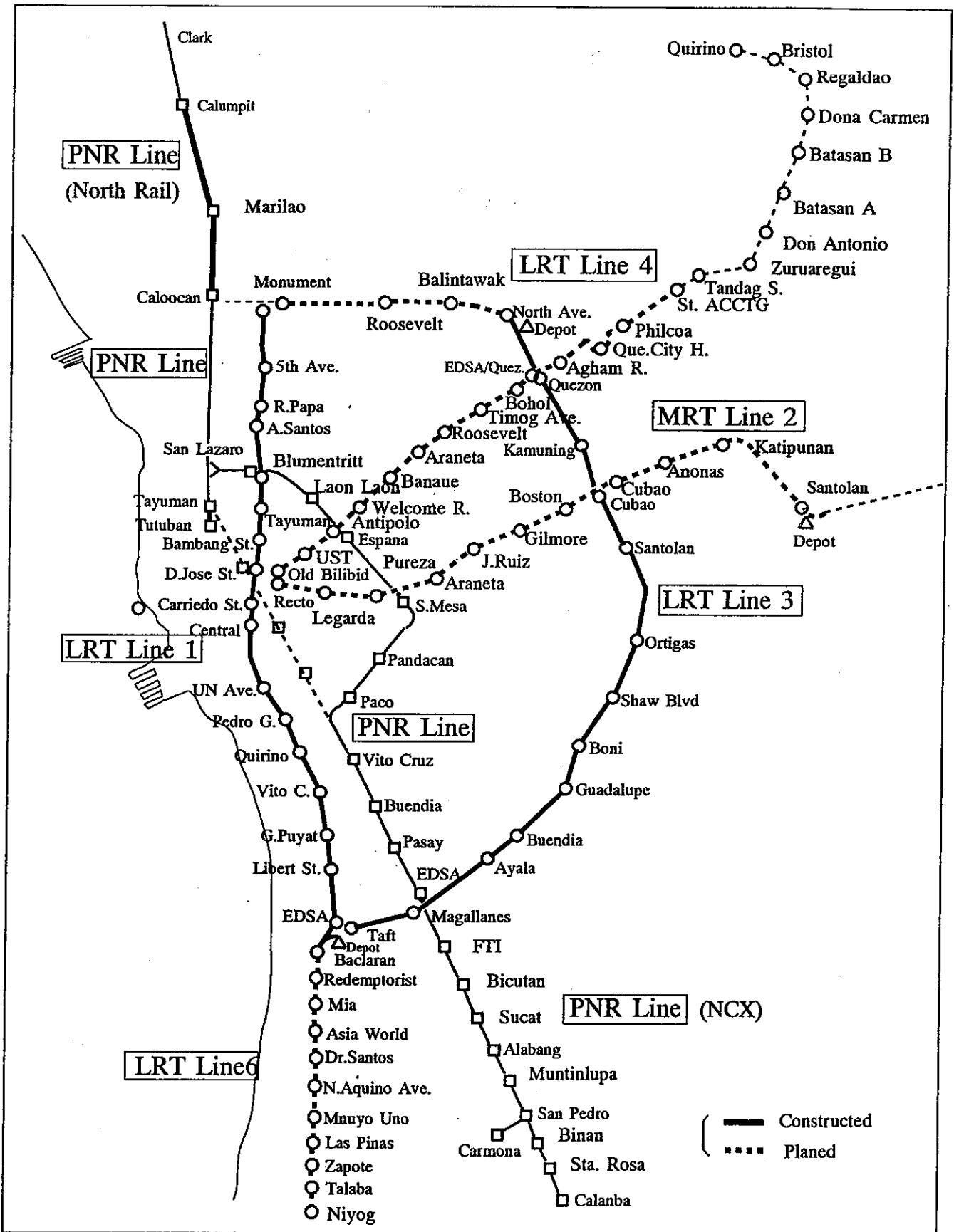


Fig. 5.1.1 Metro Manila Railways

Table 5.1.1 Through Train Operation Plan

Separate operation on Line 1 and line 3	
Conventional track improvement on PNR North-South Line	Shortcut PNR underground route construction connecting with North-South Line
Case 1	Case 2
Through operation on Line 1 and line 3 via Monumento station	
Conventional track improvement on PNR North-South Line	Shortcut PNR underground route construction connecting with North-South Line
Case 3	Case 4

5.2 Plan for Through Operations on LRT Line 1 and Line 3 and LRT Line 6

Plan for through operations at Monumento station

This through operations planning proposal can be executed and should be executed. Line 1 and 3 form an important route grid for metropolitan area transportation as loop lines. Transforming Monumento Station into a junction station will be extremely complicated and difficult as a railway route. Therefore, this transformation should not be made, and another plan such as the utilization of a separate line (PNR line, etc.) should be studied, for the transport from suburbs to the city center.

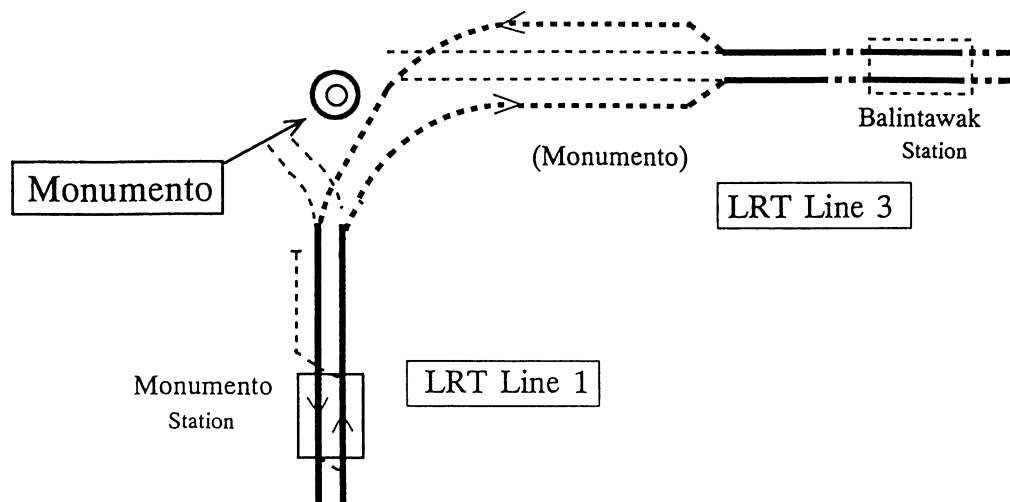


Fig. 5.2.1 Through Operation Plan for LRT Line 1 and 3 near Monumento Station

(1) Study of facilities and other needs for through operations

The present status of transportation facilities on LRT Line 1 and 3 and the plan for facilities that will accompany through operations is shown in Table 5.2.1.

(2) Primary investigations and items for improvement during the implementation stage

- 1) Detailed investigation of train through operations
- 2) Improvement of train protection systems
- 3) Investigate yard track layout at terminal stations
- 4) Agreements with businesses (companies) for through operations

Table 5.2.1 Investigation of Through Operation Plan

		LRT Line 1	LRT Line 3	Through operation
Track etc.	Rolling stock & structures	14km	22km	36km
	Axle load & stress	Can handle trains from LRT Line 3 at present (Requires study)	LRT Line 1 rolling stock will require investigation	Will require investigation
	Platform length	105m	130m	Sufficient study will be required for through operation of Line 1 rolling stock (Study will be required for extending Line 1 in the future)
	Platform height	690mm	920mm	ditto
	Curve radius	R170	R370	-
Rolling stock	Dimension	26.35L*2.59W*3.32H	31.72L*2.5W*3.65H	Rolling stock dimensions must be standardized
	Axle load	10.7ton	8.8ton	Introduction of lighter weight cars will be needed. Study is necessary on distance between bogie
	Normal deceleration	1.3m/s/s	1.01m/s/s	Normal deceleration must be standardized
Rolling stock depot	Car storage capacity	30 train set	40 train set	Study will be required for construction of new depot in the future
	Safety equipment	Manual switching device	ditto	(Introduction of relay system will be needed)
Train	Curve radius	R25	R25	(Layout of rolling stock depots must be improved)
	Formation	3~4 cars	3 unit	4 cars
	Maximum speed	60km/h	65km/h	-
	Minimum headway	2 min.	2.5 min.	(2minutes or less improvement is needed)
	Passenger capacity	912 persons/train	702 persons/train	(900 persons/train or more)
Operating safety devices	Blocking	Automatic block system	Automatic block system	(Automatic block or speed control system)
	Signalling	Wayside signal	Wayside signal	(Wayside signal or Cab signal)
	ATS, etc.	ATS	ATS	(High-performance ATS or ATC)
Various types of cooperation		-	-	Train operation, Management, Fare adjustment, Accident investigation, etc
	Traffic management	-	CTC	(Introduction and/or improvement of CTC and PRC)

Note: Matters in parentheses must be implemented even in the case where the through operation is not planned.

(3) Transport demand for each Case

1) Comparison of Transport Volume

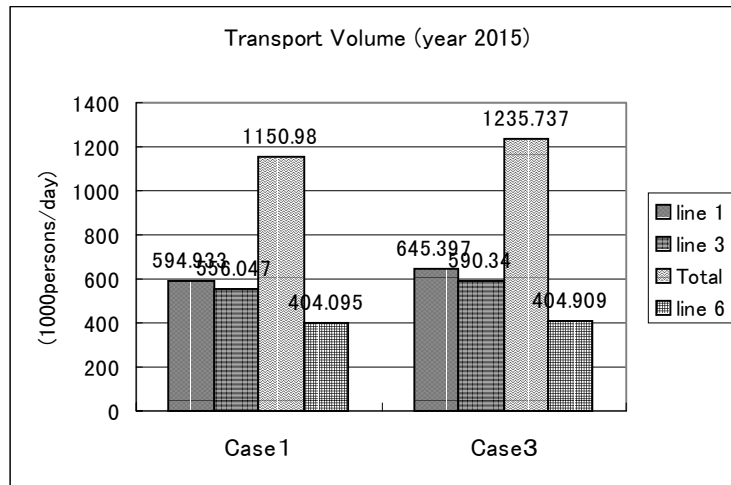


Fig. 5.2.2 Comparison of Transport Volume

2) Comparison of Sectional Transport Volume (Case 1 and Case 3)

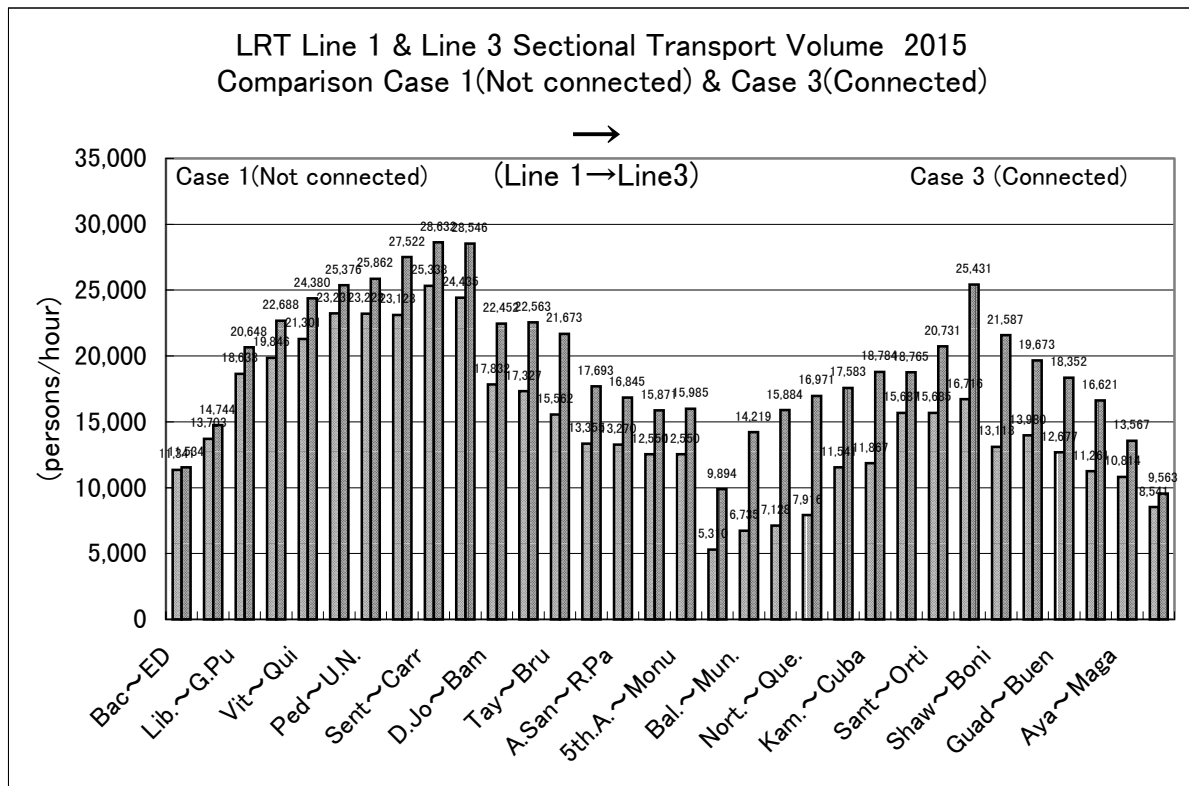


Fig. 5.2.3 Comparison of Sectional Transport Volume (Case 1& Case 3)

(4) Train operation plan

1) Train operation time

LRT Line 1 : Baclaran ~ Monumento = 32 minutes

LRT Line 3 : Monumento ~ Taft = 38minutes

2) Minimum train headway

The required headway is 1minute 30 seconds ~ 2 minutes.

3) Number of train operations

Table 5.2.2 Train Operation Plan (2015)

Line	Case 1		Case3	
	No.of Train	Max.Bord.ef.	No.of Train	Max.Bord.ef.
	Trains/hour	%	Trains/hour	%
Line 1	24	120	26	121
Line 3	22	121	24	116
Line 6	12	123	12	121

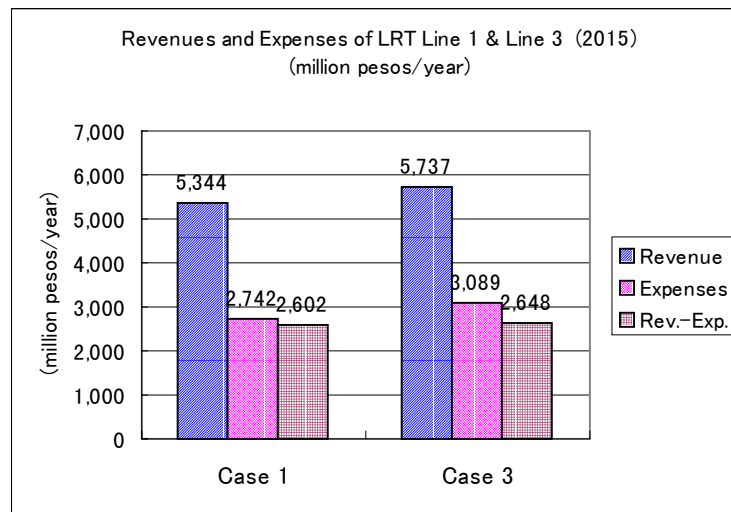
4) Required train formations

Table 5.2.3 Number of Required Train Formations (2015)

Line	Case 1	Case 3
Line 1	30 formation (120 unit)	64 formation (256 unit)
Line 3	34 formation (102 unit)	
Total	64 formation (222 unit)	

Note: The 64 is included 4 stand by formations.

5) Passenger revenue and operation expenses



Note: Operation expenses do not include depreciation cost, etc.

Fig. 5.2.4 Passenger Revenue and Operation Expenses

(5) Summary of investigation results

Summary of investigation results show the Table5.2.4.

Table 5.2.4 Summary of Investigation Results

	LRT Line 1		LRT Line 3		Through operation	
	Case 1		Case 3		Case 3	
Pros & con	△ Complexity	△ Complexity	△ Complexity		○ Reduces complexity	
① Passenger service	△ Transfers (lost time:20')	△ Transfers (lost time:20')	△ Transfers (lost time:20')		○ Eliminates lost time	
② Delivery, etc.	□ 595 (1000pers./day)	□ 556 (1000pers./day)	□ 556 (1000pers./day)		○ 1,236 (1000pers./day) (+85,000pers.)	
③ Transported Volume	□ 2,762 mil. Pesos/year	□ 2,582 mil. Pesos/year	□ 2,582 mil. Pesos/year		○ 5,737 mil. Pesos/year (+393 mil. pes.)	
④ Revenue	△ Separate use	△ Separate use	△ Separate use		○ Increase operating efficiency	
⑤ Rolling stock use	△ Difficult	× Extremely difficult	× Extremely difficult		○ Consolidate & expand depot	
⑥ Expansion of depot	△ Individual inspections	△ Individual inspections	△ Individual inspections		○ Comprehensive inspection	
⑦ Inspection, etc.		□ New Monument station	□ New Monument station		○ Enhancement of Monument st.	
⑧ Investment					△ Construction of tracks, etc.	
⑨ Facilities enhancement					△ Necessary to improvement	
⑩ Car improvements	○ Using ATC	□ Supplement ATS	□ Supplement ATS			
⑪ Operating expenses	□ 1,358 mil. Pesos/year	□ 1,384 mil. Pesos/year	□ 1,384 mil. Pesos/year		○ 3,089 mil. Pesos/year (+347 mil. pes.)	

Note. ○ : advantageous items, □ : fair items, △ : somewhat disadvantageous items and × : disadvantageous items.

5.3 Plan for North Rail Line and MCX Line Improvements and Through Operations

In order to complement LRT Line 1 (including Line 6) where transport will be strained, and to fulfill its critical mission in the future as the principal trunk line for the Philippines, improvement and connection of the north track and south track is the topic of greatest urgency.

(1) Plan proposal

Two proposals have been developed as a countermeasure, as shown in Fig. 5.3.1.

1) Proposal 1

Elevate the line currently in operation over a distance of roughly 10km .

2) Proposal 2

Using Tayuman as the starting point, link to the south line in the vicinity Vitocruz as an underground rail and implement through service. (about 7km of underground)

(2) Comparison and Study of improvement alternatives on North Rail and MCX Line

1) Track equipment

2) Necessity of through operations in the metropolitan core

3) Management nucleus and organization

4) Operation control system

5) Construction cost, etc.

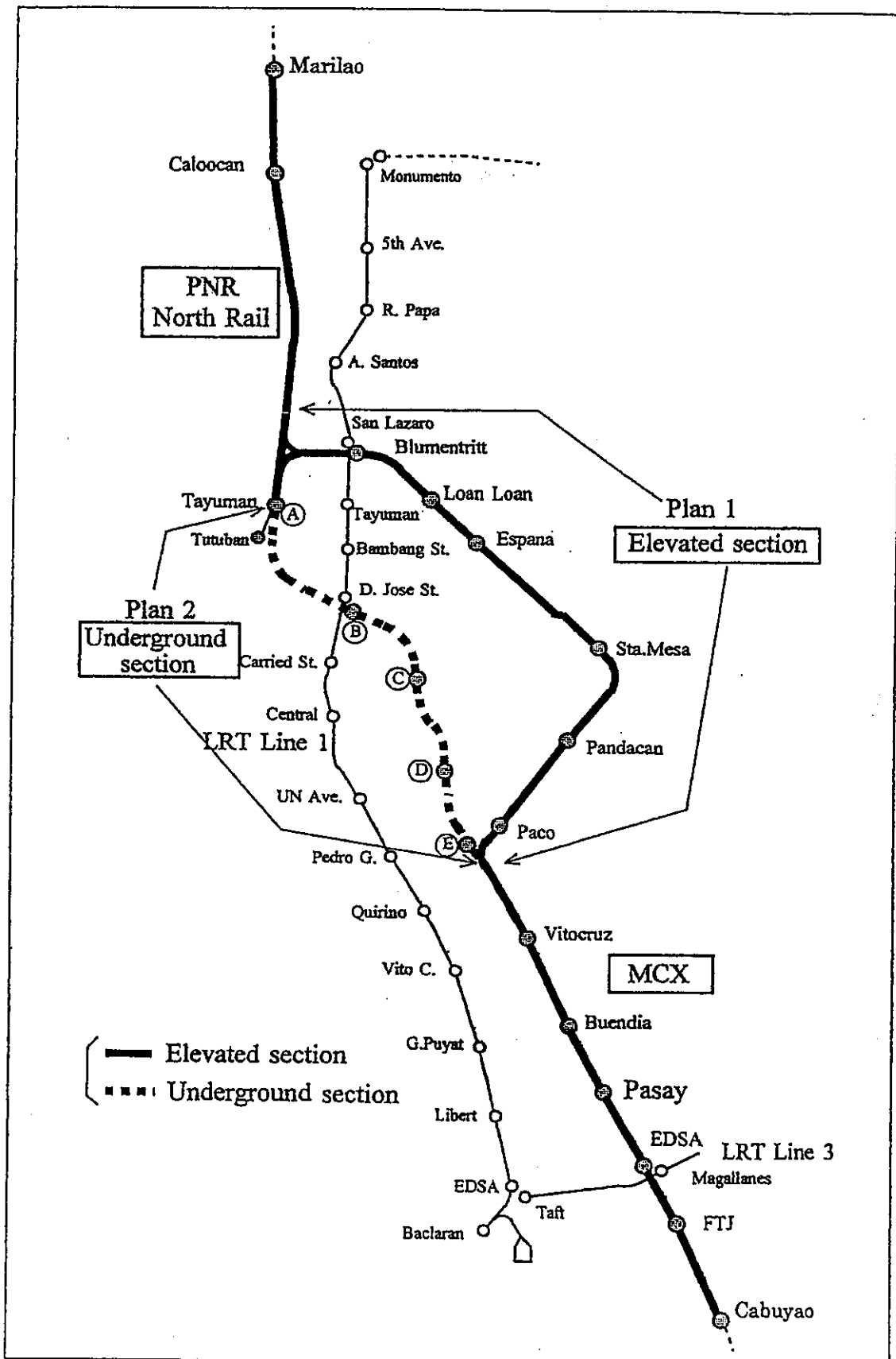


Fig. 5.3.1 Improvement Plan of North Rail and MCX Line

Table 5.3.1 Investigation of Improvement on North Rail Line and MCX Line

		Case 3	Case 4
North Rail and MCX Line (Section km)		Elevated railway 63.2 km	Underground railway 60.2 km
Track, etc.	Elevated	Tayuman~Vitocruz:approx.10km	-
	Underground	-	Tayuman~Vitocruz:approx.7km
	ditto	Vitocruz~FTJ:approx.6km	
Train operation	Track gauge	1,067mm	
	Power	Electric operations	
	Operation system	Add ATS as a multi-track automatic block sistem	
	Minimum headway	2.5 minutes	
	Maximum speed	100km/h	
Administration	Formation	EC : 10 cars	
	Operating unit	Public institutions will own and manage the infrastructure, and private companies will manage operations.	
Construction expense	Elevated or underground	15 billion pesos (approx.)	26 billion pesos (approx.)
		(Double track construction is not included)	
Operating expenses	Total expenses	4.1 billion pesos/year (approx.)	4.2 billion pesos/year (approx.)

(3) Comparison of Transport Volume and Transport Plan

1) Comparison of Transport Volume, etc.

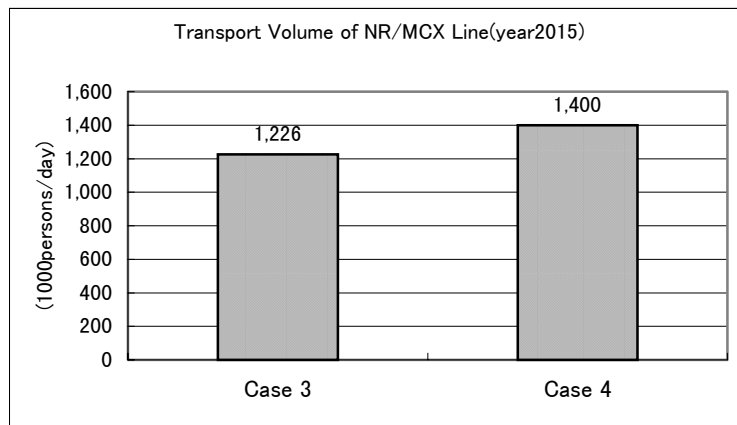


Fig. 5.3.2 Comparison of Transport Volume of North Rail/MCX(2015)

2) Necessity of through operation in the metropolitan core

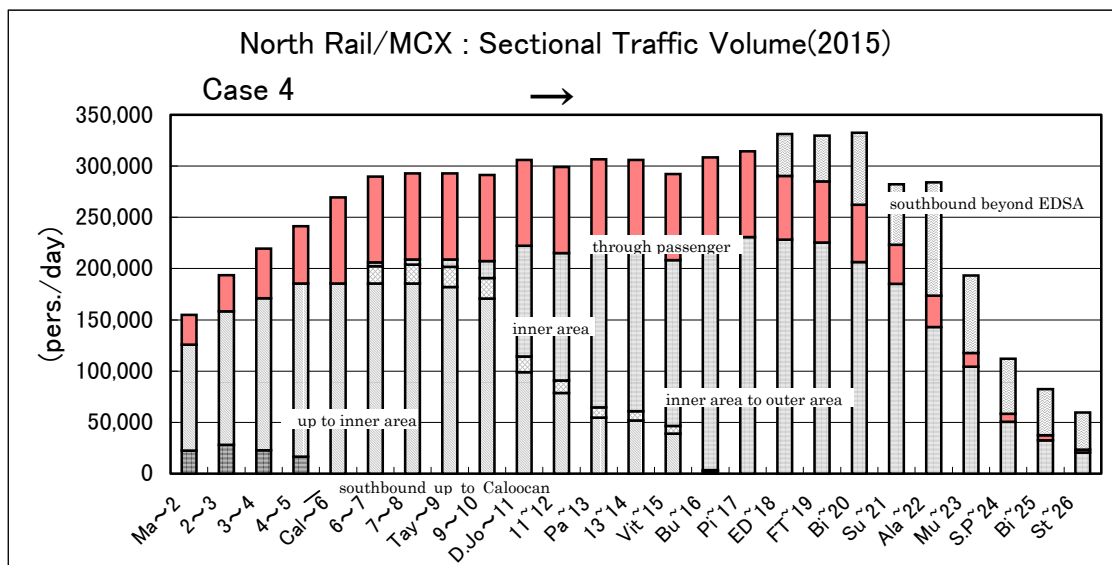


Fig. 5.3.3 Analysis of Sectional Transport Volume

(4) Train Operation Plan

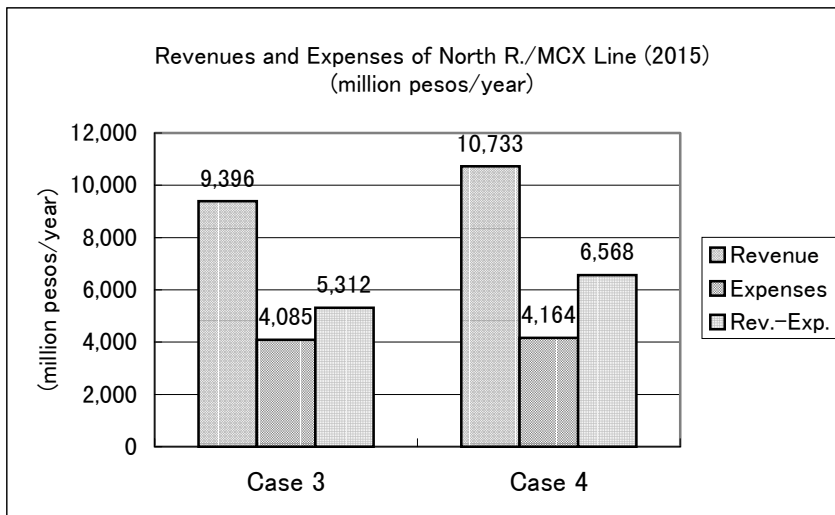
- 1) Type of coaches : Electric railcar(JR East 209-Series , 4M6T, DC 1,500V)
- 2) Maximum speed : 100km/h
- 3) Train operation time : Case 3 : Elevated = 88 minutes
Case 4 : Underground = 81 minutes

- 4) Operation control sys. : Automatic block system (Wayside signal + ATS)
- 5) Number of trains and required formations

Table 5.3.2 Number of Trains and Required Formations (2015)

Item		Case 3	Case 4
No. of Trai	Marilao ~ Tayuman	9 Trains/hour	12 Trains/hour
	Tayuman ~ San Pedro	17 ditto	18 ditto
	San Pedro ~ Cabuyao	8 ditto	9 ditto
Required Trains	Marila ~ Cabuyao	43 formations	43 formations
		(430 cars)	(430 cars)

- 6) Passenger revenue and operation expenses



Note: Operation expenses do not include depreciation cost, etc.

Fig. 5.3.4 Passenger Revenue and Operation Expenses

- (5) Summary of Investigation Results (NR/MCX)

It shows Table 5.3.3.

Table 5.3.3 Summary of Investigation Results (NR/MCX)

		Case 3 Elevated railway	Case 4 Underground railway
Pros & con	① Squatters	○ Countermeasures	○ Countermeasures
	② Transported volume	△ 1,226 (1000pers./day)	○ 1,400 (1000pers./day) (+174,000pers./day)
	③ Revenue	△ 9,396 million pesos/year (approx.)	○ 10,733 million pesos/year (+1,337mil.pesos/year)
	④ Equipment	△ Inconvenient access	○ (Track length shortened by about 3km)
	⑤ Train operation	△ Change of driver's cabin is necessary, increase in dwell time.	○ Change of driver's cabin is unnecessary
	⑥ Land utilization	□ Possible to utilize the area 10km long beneath elevated track.	○ Possible to utilize 10km of land along the old track route.
	⑦ Investment	○ Possible to utilize approxi. 6km between Vitacruz~FTJ.(ground surface above the metoro)	
		□ Smaller than the amount in Case 4. 15 billion pesos	△ Investment larger than the amount in Case 3. 26 billion pesos (+11 billion pesos)
	⑧ Operating expenses	□ Relatively higher than under Case 4. 4,085 million pesos/year	○ Relatively lower than the amount in Case 3. 4,164 million pesos/year (+79million pesos/year)
⑨ Evaluation	It is recommended to go ahead with Case 4 -the shorter, underground railway proposal.		

Note. ○ : advantageous items, □ : fair items, △ : somewhat disadvantageous items and × : disadvantageous items.

CHAPTER 6

STATION AND STATION PLAZA DESIGN STANDARDS

6.1 Necessity of Manual of Station and Station Plaza Planning

In the Study, in order to provide safety, comfortable and convenient railway services, guidelines are established for standardization of station facilities and station plaza.

6.2 Manual of Station and Station Plaza Planning

(1) Rationale for Station Standards

For maximum benefits from investments in railway transport, it must be integrated with other railway lines as well between the railway and other transport modes. Stations and station plazas provide the desired integrating elements.

Because the existing intersection and connecting stations of current operating lines, constructed lines and planned lines are inconvenient for transfers, planning shall be carried out with consideration given to the following in order to ensure smooth transfer between rail transport.

Through operations

Construction of stations in same place

Construction of adjoining stations

Furthermore, to ensure that rail transportation is easy to use, effort shall be made to plan stations close to areas of concentrated business, commercial and residential functions and bus and jeepney terminals, etc., and to improve the level of services by providing facilities which can be used by passengers in safety and comfort.

(2) Manual of Station Planning

1) Basic consideration for station planning

Basic consideration

As for the basic thinking to adopt when planning stations, plans shall be compiled based on the following eight clauses for station facilities with consideration given to simplicity, flexibility, and attention to the needs of disabled persons, etc.

Nine Articles for Station Facilities

Chapter I Overall Layout

Article 1 Secure easy to understand passenger flow

- Adopt simple traffic lines
- Secure visibility.

Article 2 Free corridors shall be provided not to cause division of the area along the line.

Article 3 Adopt a flexible layout which considers space for future expansion and addition of facilities.

- Adopt facilities which respond to increased numbers of users and business expansion, etc.
- Secure maximum width for ticket inspection.

Article 4 Adopt facilities which consider labor saving.

- Seek to integrate ticket inspection.
- Seek to integrate duties.
- Introduce automatic ticket inspection.

Article 5 Install escalators, elevators, slopes and passenger toilets (including toilets for physically challenged persons), etc. with a view to catering to physically challenged persons and promoting rail use.

- Install escalators and elevators both inside and outside station compounds.
- Install Braille information and Braille blocks for persons with impaired vision.
- Install continuous and smooth handrails.

Article 6 Install passenger toilets in inconspicuous but easy to find places.

- Remove height differences at entrances and also consider automatic washing.

Chapter II Platform level

Article 7 Do not install anything in addition to the minimum necessary facilities.

Chapter III Station offices, etc.

Article 8 Place offices on one floor.

Chapter IV Guide and information displays

Article 9 Make information displays easy to understand.

2) Computation of scale of facilities in the station facilities plan

Procedure for compilation of facilities plan

Station size is determined according to the number of using passengers, etc., and the procedure for compiling station equipment plans is indicated in the following flow diagram.

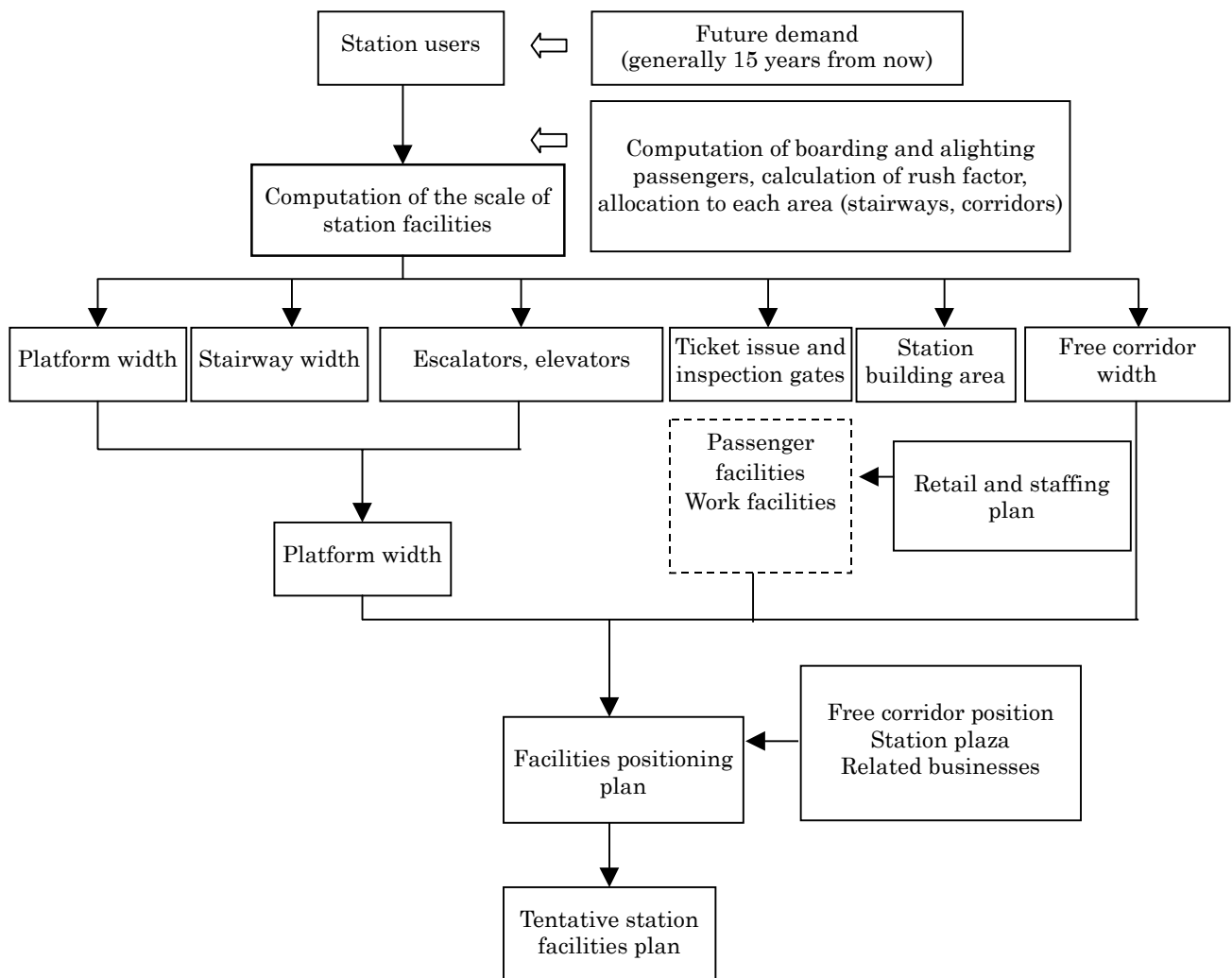


Fig. 6.2.1 Flow of Facilities Plan Compilation

Procedure of facilities planning

Composition of station facilities is classified into four such as flow facilities, passenger facilities, passenger handling facilities and station work facilities. Consideration of the facilities planning and compilation of scale of facilities are indicated for the station facilities plan.

a) Flow facilities

- i) Planning of free corridors, concourses, and passenger corridors, etc.(Refer to item 6.2.4(2)2 a) of the main text.)

Station corridors shall be placed so as not to be concentrated around main roads and station plazas.

Concourses shall be divided into interior and exterior facilities. The concourse is the center of passenger flow in the main station building; other facilities are placed around it; and it is often connected to free corridors.

Specific calculation methods shall be used in planning the size of free corridors ,concourse and so forth.

- ii) Planning of ticket issue and inspection barriers, and calculation of concourse area.(Refer to item 6.2.4(2)2 b) of the main text.)

The required area of concourses (outside inner station) is obtained from the following expression by totaling the area before ticket issue and the flow area.

The area before ticket issue is the space required for passengers to purchase boarding tickets, etc. It is retention area for waiting for purchase.

- iii) Stairway plan(Refer to item 6.2.4(2)2 c) of the main text.)

Base on standard of the calculation methods and reference maps, dimension of the width, landing and gradient are considered.

- iv) Escalators and Elevators, etc.(Refer to item 6.2.4(2)2 d) of the main text.)

Planning of elevator and escalator are designed based on characteristics of stations (new station and station to be renovated), installation place and structure of station.

1. Installation place of Escalators

In new stations or stations undergoing major renovation, escalators are installed as basic station facilities on graded passages between

walkways and free corridors, between free corridors and platforms, and between platforms, etc., in order to assist users with impaired mobility and to promote use of railways.

2. Installation place of elevator

In new stations or stations undergoing major renovation, where height differences cannot be overcome by means of slopes, at least one elevator each shall be installed between walkways and free corridors, between free corridors and platforms, and between platforms.

v) Platform Planning(Refer to item 6.2.4(2)2 e) of the main text.)

Since it is necessary for large numbers of passengers to safely and rapidly board and alight trains during limited train stop time, straight lines are desirable and designated height, width and length are required.

1. Platform dimensions

The effective length of platforms shall be calculated by using a specified formula, giving due consideration to the reference map the platform width shall be obtained by using a formula for size calculation.

In the calculation, the maximum width of facilities on the platform shall also be considered, paying due attention to the reference map.

b) Passenger Facilities(Refer to item 6.2.4(2)2 of the main text.)

Facilities of passenger waiting rooms and toilets are planned based on important notices of the facilities.

c) Passenger handling facilities

i) Required number of ticket barriers(Refer to item 6.2.4(2)2 a) of the main text.)

Since ticket barriers often create bottlenecks in the flow of passengers in stations, the number of ticket barriers shall be determined so as not to hinder passenger flow.

The required number of ticket barriers is calculated based on the number of boarding and alighting passengers at congested times and speed of passage.

d) Ticket Issue Facilities(Refer to item 6.2.4(2)2 b) of the main text.)

Ticket issue facilities are divided into ticket windows and automatic ticket vending machines. It is desirable that boarding tickets for short distance sections (inexpensive tickets) be sold through vending machines.

Required number of ticket barriers shall be calculated based on the formulas of automatic ticket barriers and automatic vending machines.

e) People Friendly Station Building

Since stations are constructed over multiple levels, height differences with outside footpaths are large, and vertical movement can be a burden, boarding and alighting passengers including those with impaired mobility are discouraged from using railways. Therefore, it is becoming more and more important to provide station areas that are safe and pleasant for all station users to utilize.

1. Facilities for aiding persons with impaired mobility (see Appendix7)

Facilities for aiding various kinds of persons with impaired mobility are as follows.

Facilities for persons with impaired sight

- Guide and warning blocks
- Braille tape
- Guide chimes
- Fall prevention fences

Facilities for persons with impaired hearing

- Station information signs as fixed information
- LED displays which enable variable information (effective at times of accident or emergency) to be provided
- Train approach indicators, etc.

Facilities for wheelchair users

- Wheelchair toilets
- Handrails, etc.
- Slopes (1/12 or less indoors)

- Escalators (for wheelchairs) and elevators
- Securing of corridor width (ticket barriers 900 mm)
- Non-slip finishing
- Height of counters, etc.

Elderly persons and children

- Hand rails, etc.

ii) Thinking behind station sign systems

Since passengers using stations for the first time experience difficulties, a sign system, which includes pictographs, shall be proposed (refer to Appendix7).

(3) Manual of Station Plaza Planning

1) Basic Principles of Station Plaza Planning

Station plazas serve two roles: first of all they are transportation zones for allowing changeover with road traffic such as buses and jeepneys, etc., and secondly they are environmental zones for supporting activities and exchange of shoppers and waiting passengers and contributing to the urban landscape, etc. In addition to laying out facilities for fulfilling these roles in a manner which enables them to function organically, it is necessary to secure a scale that can be used smoothly and in comfort when planning station plazas.

Planning procedure of station plaza development

Planning procedure of station plaza development is shown in Fig. 6.2.2.

Standardization of station plaza development

Facilities, which should be introduced to station plazas, are roughly divided into transportation facilities, landscape enhancing facilities, and convenience facilities. As station plaza functions, the necessity of each facility in cases where stations are classified as inner in CBD stations, outside CBD stations, multi-function stations, and ordinary stations are as shown in the following table.

Table 6.2.1 Necessity of Station Plaza Facilities in terms of Station Character

Zoning and Facilities		Station pattern	In CBD Multi-function station	In CBD Ordinary station	Outside CBD Multi-function station	Outside CBD Ordinary station
Transfer zone and Transportation facilities	Footpaths					
	Roadways					
	Boarding and alighting areas	Bus		-		-
		Jeepney, taxi, tricycle				
		Private vehicle				
	Parking areas	Bus		-		-
		Jeepney, taxi, tricycle				
		Private vehicle				
	Various signs					
	Traffic directing islands, etc.					
Bus stop shelter			-		-	
Environment zone	Landscape enhancing facilities	Flower beds, planters				
		Monuments				
		Street lights				
	Convenience facilities	Telephone boxes				
		Benches, stools				
		Post boxes				
		Information boards				

: Indispensable : Generally necessary items : Install where necessary

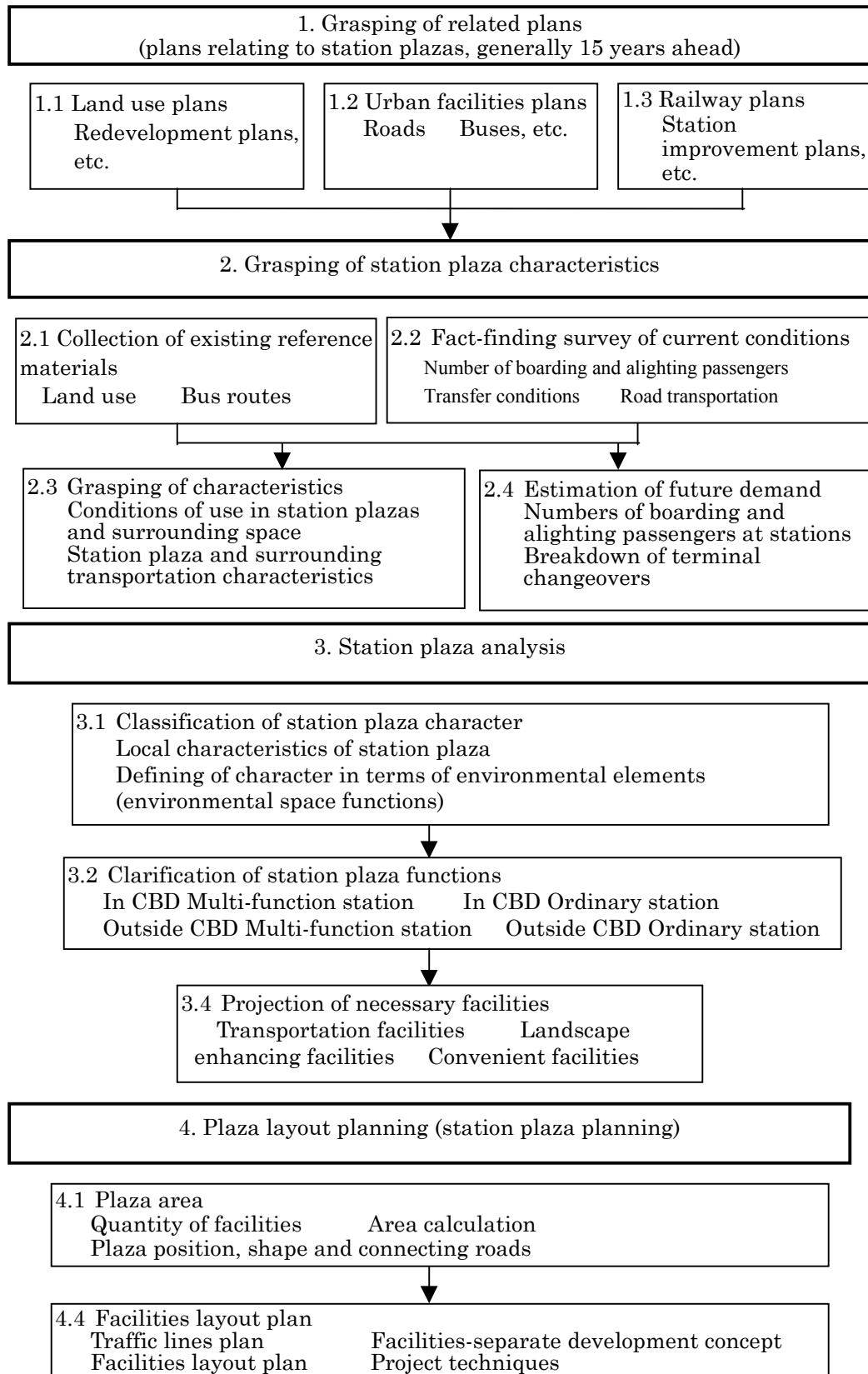


Fig. 6.2.2 Planning Procedure of Station Plaza Development

Determination of scale of station plaza

Transportation facilities are basic facilities necessary for station plazas. Based on the peak demands for each transportation facility to be introduced to the corresponding station plaza, calculate the quantity and area of each transportation facility.

a) Environmental facilities

The station plaza will have potential to create new urban core and should include the transportation facilities, landscape enhancing facilities, service facilities and disaster prevention facilities. These facilities should not be the same for each station plaza, but indispensable facilities should be determined for each station plaza considering the features of the corresponding station and urban structure.

b) Total area required

For each station pattern and number of berths, determine the total area necessary for the station plaza as shown in the following table. Note that these values are reference values.

Table 6.2.2 Total Area Necessary for Station Plaza for Each Station Pattern and Number of Facilities
(If all the facilities should be gathered into the station plaza)

Station pattern	Number of station plaza users (persons/day)	Number of bus berths	Number of Jeepney berths	Number of taxi berths	Number of tricycle berths	Approximate area (m ²)	Remarks
Multi-function station In CBD	375,000	2	10	2	(None)	11,000	The area of the transfer deck should be separately estimated.
Ordinary station in CBD	75,000	(None)	6	(None)	(None)	1,400	
Multi-function station Outside CBD	180,000	2	5	7	(None)	7,000	The area of the transfer deck should be separately estimated.
Ordinary station outside CBD	55,000	(None)	4	(None)	(None)	1,000	

Note:

- Considering the future use, the peak rate shown in the research result was used.
- The rate of passengers getting on trains to getting off trains at the peak was determined while referring to the reference values in Japan.
- The service time of each facility at the peak was determined as follows while referring to the reference values in Japan and current conditions in Manila:
 Bus: Getting on = Every 3 minutes (20 buses/hr for each berth) / Getting off = 2 sec/person
 Jeepney : Getting on = Every 1.5 minutes (40 Jeepneys/hr for each berth) / Getting off = 1.5 sec/person
 Taxi: Getting on = Every 1 minute (40 taxis/hr for each berth) / Getting off = Every 1 minute (40 taxis/hr for each berth)
 Berth area: Bus = 70 m²/berth / Jeepney = 30 m²/berth / Taxi = 20 m²/berth
 Passengers' waiting area: 1 m²/person
- Environment space rate: Determined to 20 to 30% while referring to the example in Japan (included in the total area)

Draft of Design Standard

Draft of Design Standard by type of station plaza is as follows.

a) Layout

As a traffic nodal point, the layout of the station plaza should be carefully determined. Since people and various vehicles, such as buses, gather at the station plaza, the traffic circulation lines should be simplified and smooth traffic should be ensured at the station plaza. In addition, to ensure safety and convenience of the aged people or physically handicapped people, traffic on the street should be improved and the plaza should command a fine view.

b) Multifunction station

i) Scheme for urban multifunction station plaza

Since an urban multifunction station is a main station in the business area at the center of the city and connected to the other railroad lines, a large number of people use the station.

For the railroad users and nearby business facility users, ensure safe and comfortable walking at the station plaza, and be sure to secure a gathering space and pedestrian space to ensure smooth flow.

If two or more stations gather at the same place, many people will walk between the stations to change the lines. In addition, many people will walk between the stations and nearby buildings. In this case, construct multi-level passages (consisting of an overpass and underpass) to ensure smooth flow for the pedestrians.

At such a station, many people use Jeepneys and buses. For this reason, many berths are necessary for these terminal transportations. To ensure smooth getting on and off for the passengers, properly locate the berths considering the destinations, etc. Construct sidewalks between the station and the roadways to ensure pedestrian safety. Also construct roadways having enough number of lanes to ensure smooth flow of vehicles. In addition, install signals to ensure safety and smooth flow.

If there are many pedestrians around the station, install escalators, etc. to ensure smooth flow and to relieve the congestion. Also install guide plates and nameplates so that people can easily go to the desired facilities or roads

ii) Scheme for suburban multifunction station plaza

Since a suburban multifunction station is a main station in the outskirts or suburb of the city and connected to the other railroad line, a large number of people use the station.

If there is a station near this station, many people will walk between the stations to change the lines. In this case, secure a gathering space and pedestrian space to ensure smooth flow of people.

If the stations are separated from each other, construct a multi-level passage between the stations in addition to the multi-level passage between the station and nearby area.

At such a station, many people use buses, taxis, and Jeepneys. For this reason, properly locate the berths considering the destinations, etc. so that people can easily use these transportations.

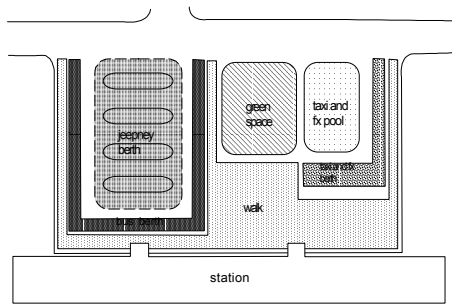
Since many people walk between the station and the berths for terminal transportations, install escalators, etc. to ensure smooth flow.

c) Ordinary station

An ordinary station in the city area or suburban area does not have many passengers, and does not have many facilities around the station. For this reason, a small number of people use the station plaza..

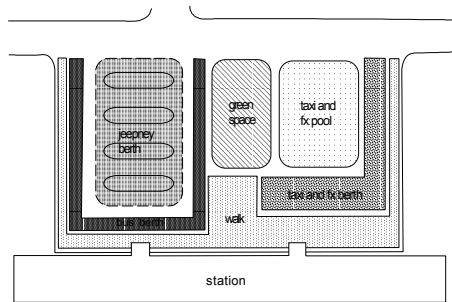
Jeepneys are the most popular vehicles, but they are small. For this reason, construct a Jeepney berth that can be used for both purposes; getting on and off. If the road is narrow, partially widen the road to construct the berths so that smooth flow of vehicles can be ensured.

For the pedestrians, install escalators or elevators to ensure easy walking.



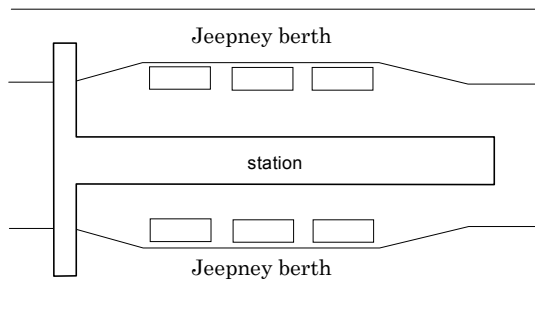
Urban multifunction station

■ Multi function station's plaza inside of CBD



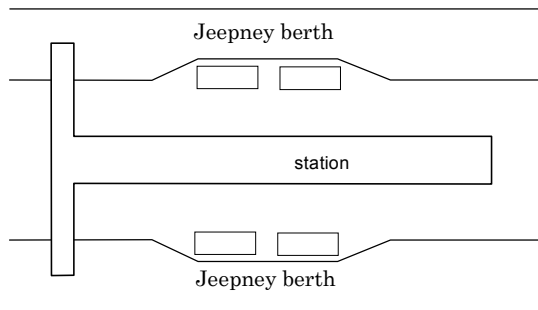
Suburban multifunction station

Fig. 6.2.3 Standard Design for Multifunction Station Plaza
(In CBD and outside CBD)



(Urban ordinary station)

● Ordinary station's plaza inside CBD



(Suburban ordinary station)

○ Ordinary station's plaza outside CBD

Fig. 6.2.4 Standard Design for Ordinary Station Plaza

CHAPTER 7

STATION PLAZA DEVELOPMENT

(1) Merit of Station Plaza Development / Station Facilities Improvement

The stations stimulate intensive land utilization in and around the area. The station plaza development will make the locality more conducive to business and residents, and indirectly raises the income of the LGUs through the tax collection.

To property owners, station plazas present opportunities for private gains. The concentration of commuters and pedestrians creates a critical mass of potential customers. Hence, it introduces commercial, business, and other enterprises. At a sufficient scale, it may revitalize economic and social activities.

(2) Proponents and Undertakings

The undertakings referred to station facilities improvement, station plaza and the surrounding area developments will involve acquisition of land and renovation of existing facilities. Land lots have to be prepared for transport facilities. Other lots for public use are also necessary.

The public sector's involvement is inevitable. Active involvement by public sector is much better. It does not necessarily mean budget appropriations. It includes guidance, coordination, management, regulation and deregulation. It is aimed at lowering hurdles for entering business by contributing to the enhancement of profitability and financial viability. Incentive leverage is mobilized to the end of realizing public interest.

(3) Priority Area Development

The scheme comprises the following components:

1) Designation of a specific area as the priority development area

2) Incentives

This includes preparing better business environments and providing financial incentives pertaining to taxes, guarantees, insurance, etc.

3) Legal capacity for the implementing station area development

The country has a legal capacity for implementing this scheme: The Urban Development and Housing Act 1992, the Comprehensive Zoning Ordinance for NCR 1981, the Local Government Code 1991 etc. The Urban Development and Housing Act identifies a “priority development area” and its “designations.” “TRU (Transportation and utility) area” shall be identified in zoning and land use plan under the Comprehensive Zoning Ordinance for NCR issued by MMDA. In this regard each locality shall comply with this Ordinance, unless amended by a corresponding locality. The Urban Development and Housing Act and Local Government Code stipulate that LGUs are authorized to formulate land use plan and zoning.

(4) Incentive Measures

A diversified program shall be developed and be put into one package, neither fragmental nor piecemeal. And prior notice to the public has to be made so that the private sector could make an evaluation of undertakings in as reasonable a manner as possible in terms of maintaining profitability and financial viability. The responsible agency in the private sector has to formulate incentive packages through consultation with concerned agencies such as DOF.

The incentive package is divided into two categories: one is preparing better business environments and the other is providing financial incentives.

The second category is related to financial incentives ranging from tax to capital and financial markets.

(5) Procedure and Organizations

A stepwise procedure to guide the private sector in applying for participation in undertakings is provided below:

Step1 Related parties establish an enterprise on their own initiatives.

Step2 An enterprise formulates a development plan and presents its proposal to a public entity to get its approval and ask for a preferential status.

Step3 A public entity evaluates a development plan and designates an undertaking and a location as prioritized.

Step4 A public entity provides incentive measures for an enterprise.

Evaluation of development plan, designation of a specific area as a prioritized development area and formulation of incentive measures provision should be carried out by either by a single organization or by a group made up of organizations that have joined up with each other. Candidates for the organization are as follows: DOTC, MMDA, HLURB, HUDCC, municipality or city. Which is the most suitable for the undertaking is subject to deliberation.

A joint- venture agreement can be signed between the two parties. It may entail the formation of a joint venture company.

Invariably, the private investors would prefer to incorporate a separate special-purpose company (SPC). Lot owners in the vicinity of the proposed development could be brought into the SPC through stock swap, i.e., land in exchange for shares of stock.

(6) Procuring Fund

Aside from equity and commercial loans, the SPC could raise capital by issuing bonds (based on assets). This securitization of assets would be a promising candidate. In the near term, the country will have a bond market where bonds are tradable. Under this condition, SPC—the investor—could make the best use of the invested money, properly responding to capital and financial market performance as follows: on the one hand, investors are free to sell bonds and get cash money in exchange and on the other hand, investors do not have to pay back for bonds.

On a long-term basis, it is conceivable that an “ Urban Development Fund ” can be established in order to enlarge the number of station plazas coming into fruition. The stable and sound financial resources are designed to be available to cope with any undertakings of that sort.

CHAPTER 8

PRELIMINARY DESIGN OF STATIONS AND STATION PLAZAS

8.1 Selection of Candidate Stations for Case Study

8.1.1 Selection Criteria of Candidate Stations for Case Study

The main criteria is whether the five station areas accord with the basic concept of the multi-modal station area development in related to the Standardization for Integrated Railway Network of Metro Manila (SIRNMM); what extent they will contribute to the attainment of the SIRNMM objectives; where are they in line strategy, and particularly whether they are accordance with the development concept presented in the development scenario in Chapter 2.

The evaluation criteria are established to select two stations from five candidate station areas shown as follows:

- Viability in terms of Land Acquisition
- Development Benefit
- Transport Development Policy Oriented

8.1.2 Selection of Priority Stations

Selection of the priority station is based on three ranks for each of the criteria mentioned in the above and score of 0, 1 or 3 is given for each rank based on the qualitative reasoning. The prioritization is classified as high priority area more than 14 of the total score, medium one with 10 – 13 score and low one less than 10 score. Evaluation results are shown in Table 8.1.1.

Table 8.1.1 Evaluation Result for Priority Areas for Multi-modal Station Development

Name of Station	Selection Criteria				Total Score	Priority Assessment
	A	B	C	D		
a) C. M Recto (LRT 1.2 & 4, PNR)	*****	*****	****	****	18	A rank
b) EDSA (LRT1 & LRT3)	**	****	****	***	13	B rank
c) Monumento (LRT1 & LRT3)	***	****	****	****	15	A rank
d) Cubao (MRT3 & MRT2)	-	*	*	*	3	C rank
e) Magallanes (MRT3 & MCX)	****	****	****	***	15	A rank

C. M. Recto, Monumento and Magallanes are selected to evaluate for the case study with high rank.

C. M. Recto has relatively high potential of multi-modal station area redevelopment utilizing the site of Manila city jail to be demolished and existing bus terminal as a base land. However the area has being developed by Philippine Estate Authority. Therefore the area is excluded from our study.

8.2 Preliminary Design of Station Facilities

(1) Outline of Preliminary Design

1) Choice from Station

Preliminary design of station facilities is conducted for the following two stations.

Station name: Monumento (LRT Line 1)
Magallanes (NR/MCX), Magallanes (LRT Line 3)

2) Preconditions

Number of the users in future is projected based on the assumption for Case 4, underground through operation of NR/MCX, and through operation of Line 1 and Line 3 at Monumento as target year of 2015.

3) Outline of examination

At Monumento (LRT Line 1) and Magallanes (LRT Line 3) stations, since the plan is to carry out improvements at existing station facilities which include separate platforms, only separate platforms shall be examined as the platform type.

Since Magallanes (NR/MCX) is planned as a new station, island platforms and separate platforms shall be examined as alternative platform types.

4) A summary of the station facilities plans

A summary of the station facilities plans is shown in next page.

Table 8.2.1 Summary for Station Facilities Plans

Facility Station Name	Monumento Station	Magallanes Station (NR/MCX)	Magallanes Station (LRT Line 3)
Station structure	Elevated station	Ground, underground station	[Elevated station]
Platform type	Separate	Island (examination of separate type finished)	[Separate]
Platform width and length	7.0m [4.6m] 116m [102m]	7.5m 210m	2.4m [4.0m - 5.7m] 116m [127m]
Platform canopy	Totally covered 116 m [102 m]	Totally covered 210 m	[Totally covered] 116 m [127 m]
Ticket issue facilities	23 automatic ticket machines	18 automatic ticket machines	Inner circle line: 1 ticket window [3 windows] Outer circle line: 14 automatic ticket machines, 8 ticket windows [3 windows]
Ticket inspection facilities	17 automatic ticket barriers 1 ticket barrier and guard window	8 automatic ticket barriers 1 ticket barrier and guard window	Inner circle line: 5 automatic ticket barriers [3 units] Outer circle line: 5 automatic ticket barriers [3 units]
Escalators	Pavement 1F - free corridor 3F, for 2 people (general use), 24 units Concourse 3F - platform 2F, for 2 people (general use), 4 units Total: for 2 people, 28 units	Concourse 1F - platform B1, for 2 people, 2 units	Pavement 1F - free corridor 3F, for 1 person, 16 units
Elevators	Pavement 1F - free corridor 3F, also for wheelchair users, 2 units Concourse 3F - platform 2F, also for wheelchair users, 2 units Total: also for wheelchair users, 4 units	Concourse 1F - platform B1, also for wheelchair users, 1 unit	[Pavement 1F - ticket window/barriers and platform 2F - free corridor 3F: also for wheelchair users, 2 units]
Stairs	Pavement 1F - free corridor 3F: 5.6 m Concourse 3F - platform 2F: 2.4 m	Concourse 1F - platform B1: 2.6 m	[Pavement 1F - free corridor 3F]
Width of free corridor	15.0m (3F)	7.0m (1F)	3.4m [5.0m (3F)]
Work conditions	Line 1 single track (single platform) operation	PNR single track (single platform) operation	–
User of station area in 2015	314,000 persons/day 40,800persons/hour	133,700 persons/day 17,400persons/hour	131,900 persons/day 17,100persons/hour

Note) Explanations in [] parentheses indicate quantities and structure, etc.

Outline of Facilities Improvement at Monumento Station

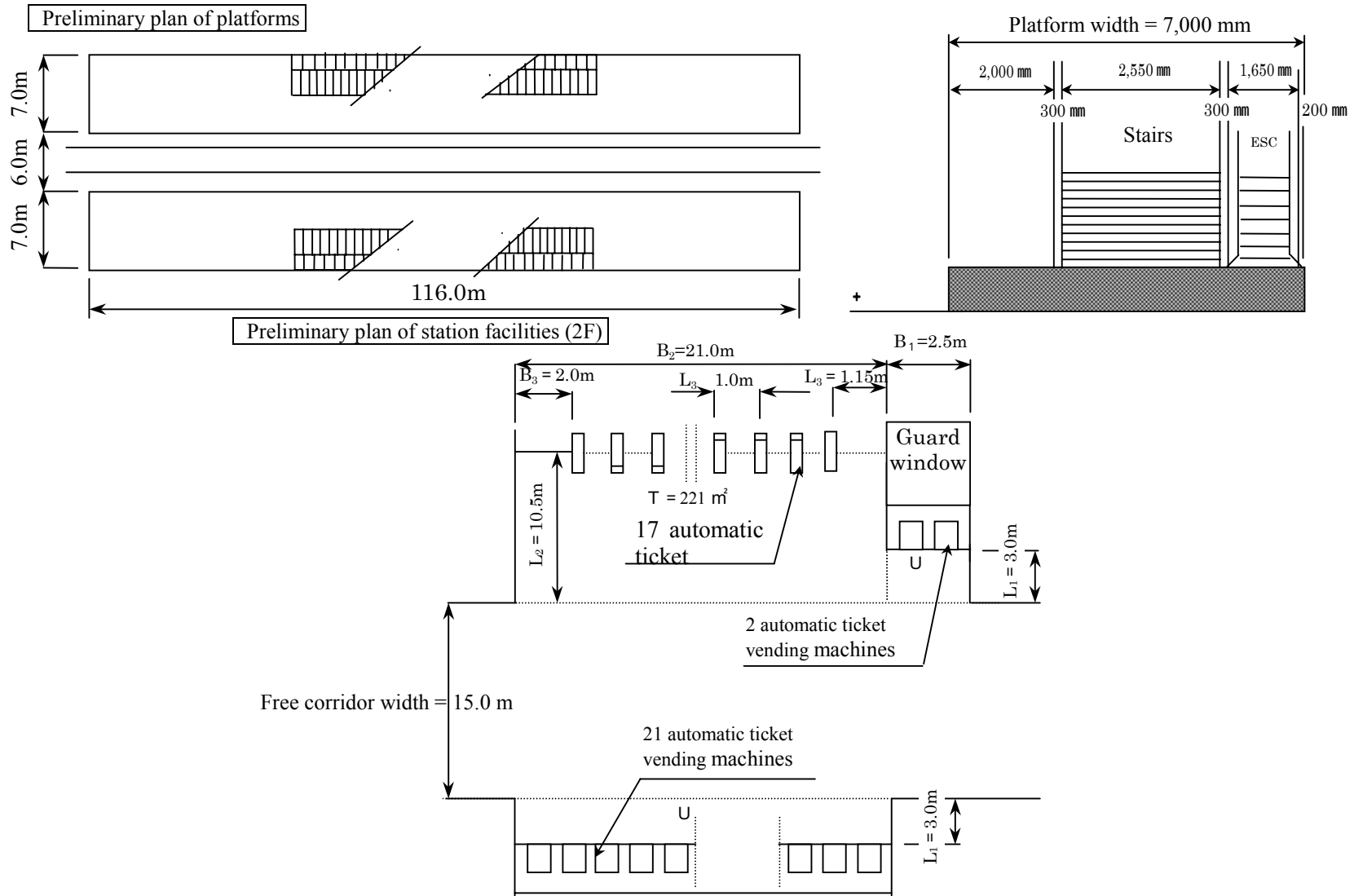


Fig.8.2.1 Outline of Facilities Improvement at Monumento Station

Outline of Facilities Improvement at Magallanes Station (NR/MCX)

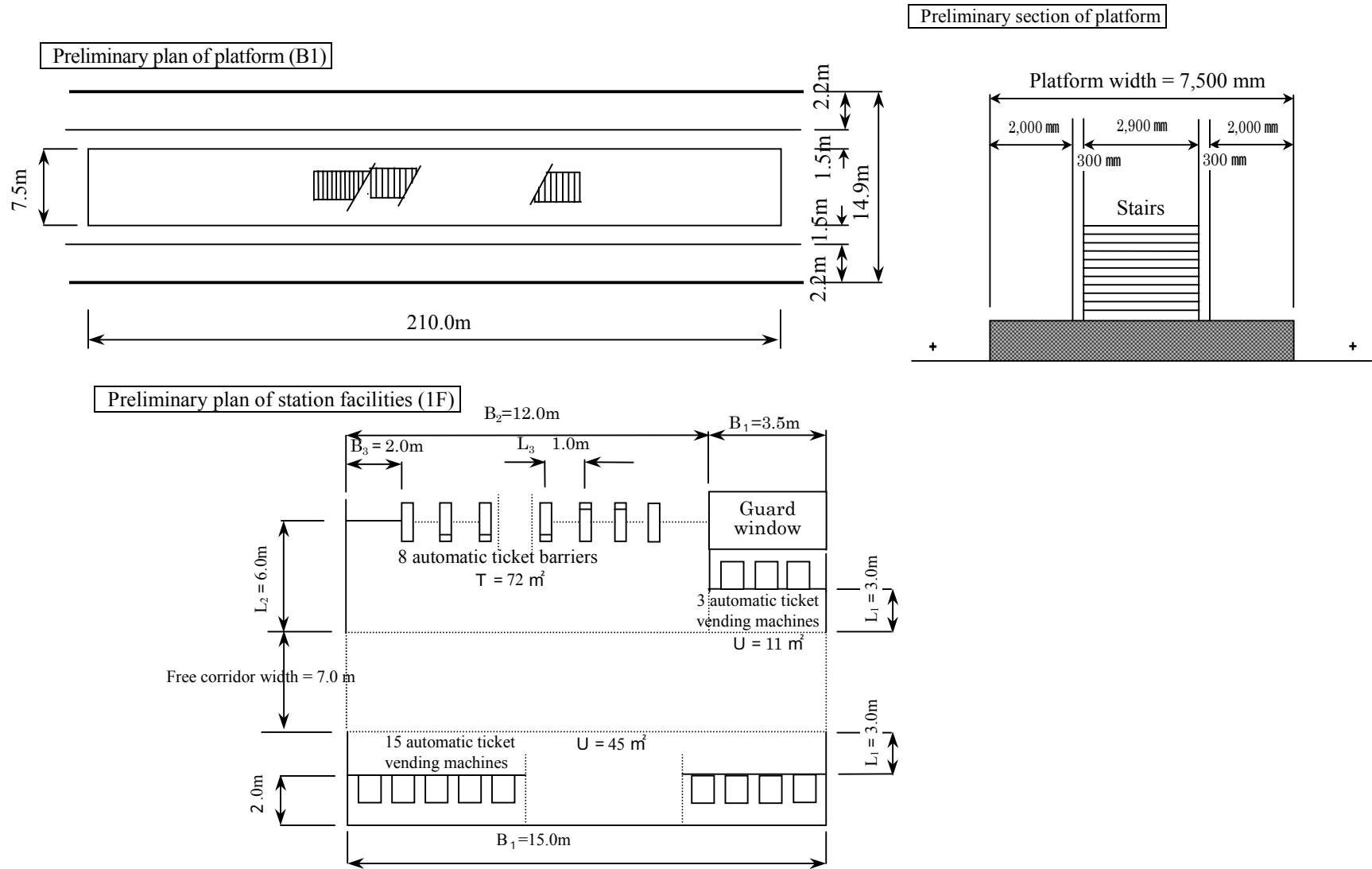
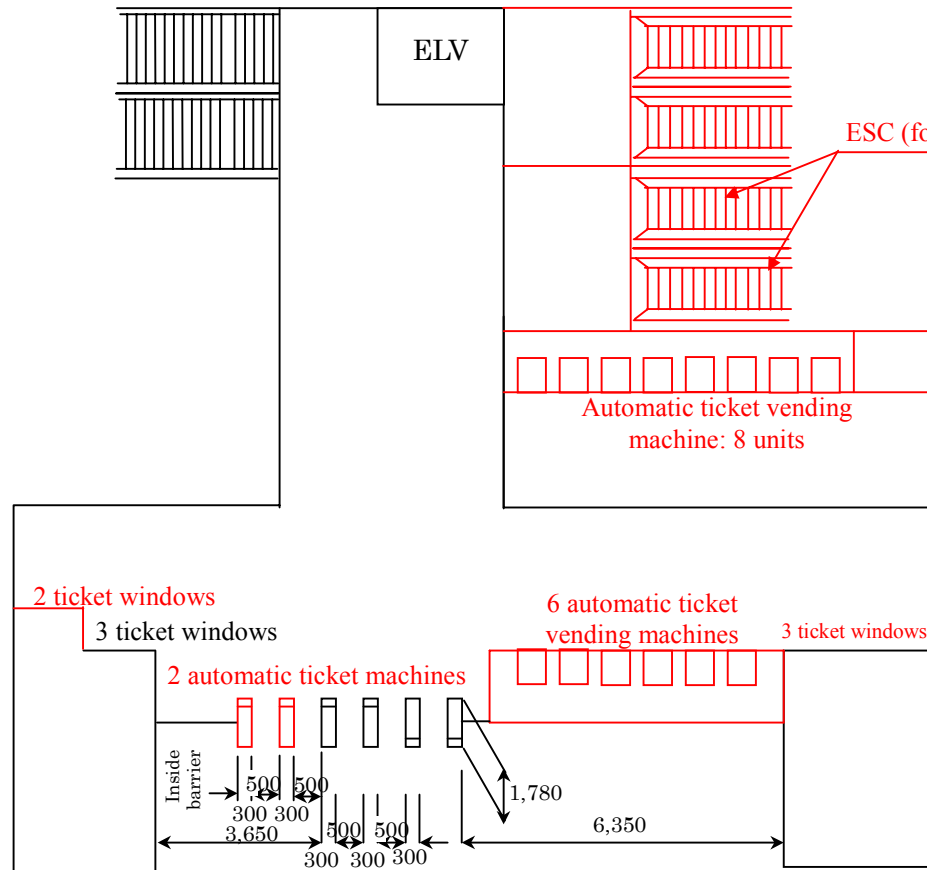


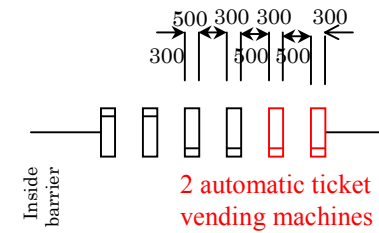
Fig.8.2.2 Outline of Facilities Improvement at Magallanes Station (NR/MCX)

Preliminary plan of improvement to outer circle line ticket issue facilities, automatic barrier and escalator facilities



Preliminary plan of inner circle line automatic barrier

(Based on existing facilities dimensions)



Note) Concerning new elevators for the inner circle line, see the preliminary drawing of the outer circle line.

Fig.8.2.3 Preliminary Plan of Improvement to Outer Circle Line Ticket Issue Facilities, Automatic Barrier and Escalator Facilities, etc

8.3 Preliminary Design of Station Plaza

8.3.1 Consideration of Proposed Alternative Station Plazas Development

Monumento and Magallanes Stations are proposed for case study of preliminary design. Lots and layout plans of alternative station plaza are considered for two stations.

Both case study stations are expected to have more passengers in the future, and will have heavier road traffic including jeepneys, etc. Accordingly, to relieve the congestion on the roads around the station, a new station plaza should be constructed separately from the roadways.

In order to construct berths and space for the transfer of passengers in a station plaza, a lot that is considerably wide is necessary. However, if the lot around the station would already be crowded with various urban facilities and it would be difficult to obtain a large unused land, adopt a multi-level crossing system for the station plaza. In addition, select several considerably large lots with low buildings, and propose these lots as the alternative station plaza lots.

Compare the proposed alternative lots from the viewpoint of the reconstruction policy, scale, facility layout, reconstruction cost, convenience, effect of reconstruction (from the viewpoint of transportation and city facilities), maintenance cost, etc., an alternative station plaza layout plans are proposed as showcase of station plaza development in Philippines.

8.3.2 Drawings of Preliminary Design for Station Plaza

(1) Monumento station plaza

Monumento Station is the northern gateway of this city, and is the terminal station of LRT Line 1. This station therefore has the largest number of passengers, and functions of transportation node as connection point, and center of urban activities. The vicinity areas will get more urban activities and will secure sophisticate condition in near future.

The station plaza lot is about 1.3 ha including the unused lands. On this lot, a multi-level complex building including function of transport terminal, office space and residence should be constructed. For the plaza, therefore, environmental spaces should be secured, and a passageway that connects the plaza to the station should be constructed, and the multi-level crossing system should be adopted for the nearby crossings.

Regarding the transportation facilities, in addition to the existing bus terminal, will construct enough berths for each mode used by transfer passengers so that they can meet the future demands.

Regarding the landscape-enhancing facilities, enough area for the environmental zone, and install historic monuments shall be secured. In addition, necessary facilities, such as service facilities and design of convenient and easy-to-understand vehicular and pedestrian circulation shall be introduced in the environmental zone.

By the way, a pedestrian exclusive zone that connects the station to the station plaza is needed. To ensure a smooth flow of people in the pedestrian zone, a wider promenade by reconstructing the existing passageway, among other things shall be developed.

Around the station, various shops, offices, or houses will be realized to develop by phased development. To ensure a smooth access from the vicinity areas to the station, the access roads plan of the vicinity area shall be considered.

(2) Magallanes station plaza

Magallanes Station is the eastern gateway of this city, and the MRT Line 3 and the PNR Line are connected to this station. Since there is a large-scale development plan for the southern area, this station will have a larger number of passengers in the future. After implementation of the station area development, this area will get more convenient and comfortable urban circumstance and revitalization of the vicinity area

On the spacious lot under the elevated roads, construct the station plaza, and be sure to secure an environmental zone in the plaza. In addition, construction of a passageway for the pedestrians that connects the plaza to the both stations, and also construct a multi-level crossing system at the nearby crossing shall be developed for the user of the station plaza including the vicinity area between the plaza and the nearby business and housing areas.

There are two lots (eastern and western lots) for the station plaza under the elevated road, for the separate type station plaza.

Since the eastern lot is near the MRT and PNR line stations, main facilities shall be constructed on this lot. Other hand, the western lot is small, therefore minimum facilities such as jeepney terminal etc. shall be constructed on this lot.

For the concentration type station plaza, the eastern lot only will be used for the development. In this context, crossing traffic volume may increase on trunk roads like South Superhighway extension and EDSA.

Drawings of Station Plazas for Monumento area and Magallanes area are shown in Fig. 8.3.1 to 8.3.4.

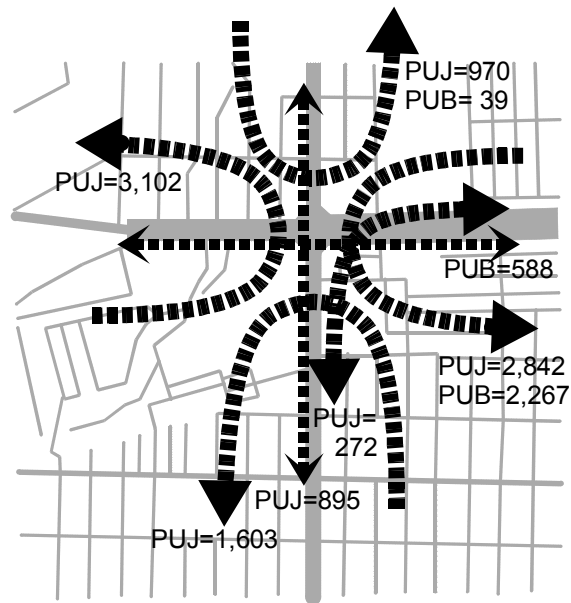


Fig. 8.3.1 Current Transportation Services around Monumento Station

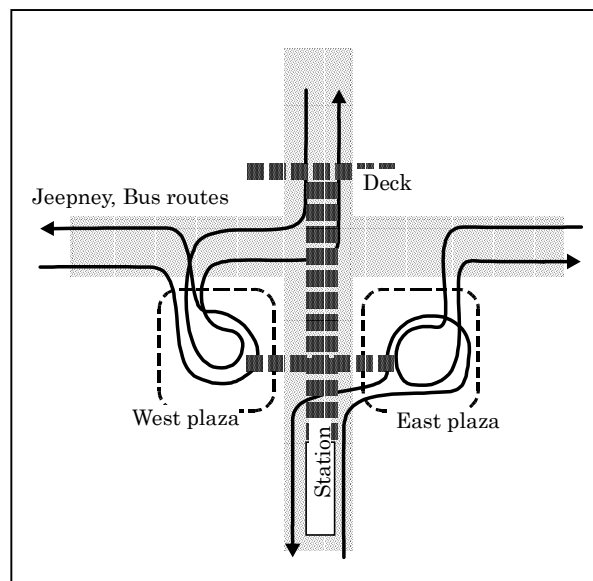


Fig. 8.3.2 East and West Plazas

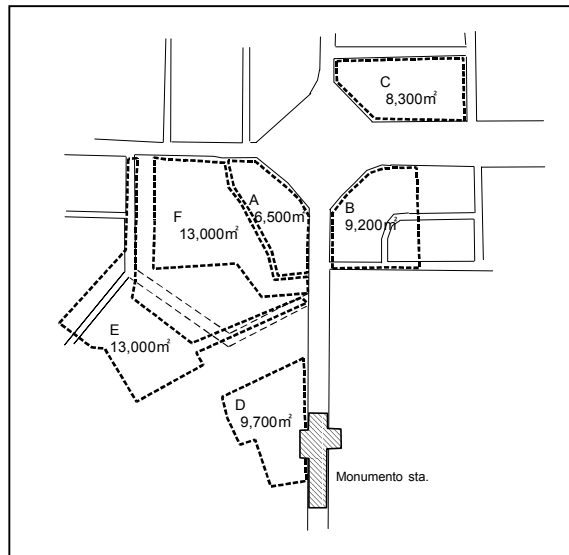


Fig. 8.3.3 Alternative Lots Proposed for Monumento Station Plaza

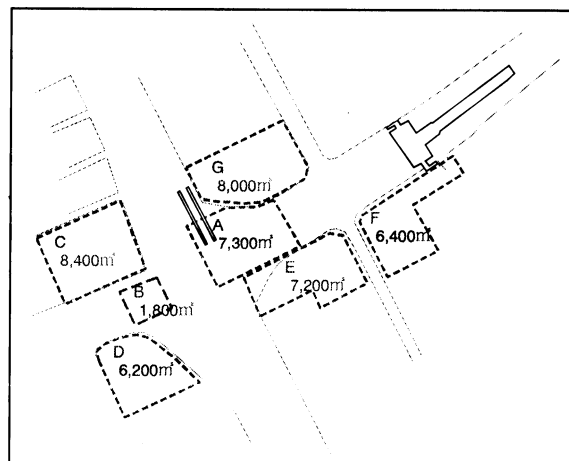


Fig. 8.3.4 Alternative Lots Proposed for Magallanes Station Plaza

8.4 Economic and Financial Analysis

8.4.1 Economic Analysis

(1) Objective and Method of Economic Analysis

1) Objectives

In order to evaluate effectiveness of the project from the standpoint of the national economy, comparative analysis of economic cost and benefit both in the cases of

implementation of this project (with the Project) and un-implementation (Without the Project) is carried out.

2) Estimated Method

The estimate of the benefits is limited to passenger time saving of the project and the reduction on operating costs of the diverted passengers in the project. The magnitude of the benefits on public road transport can be measured in terms of vehicle-kilometers with or without the project. On the other hand, the magnitude of the railway passenger time saving can be estimated by comparing railway travel speed with vehicle travel speed.

3) Project for Analysis

Case 1: Conventional track improvement on PNR North-South lines, Separate operation on LRT line 1 and line 3

Case 2: Shortcut underground route connecting with North-South lines, Separate operation of LRT line 1 and line 3

Case 3: Conventional track improvement on PNR North-South lines, Through operation on LRT line 1 and line 3

Case 4: Shortcut underground route connecting with North-South lines, Through operation of LRT line 1 and line 3

Case 4 is adopted for evaluation of economic analysis in this study.

(2) Result of Benefit and Cost Analysis

The calculated EIRRs are 14.4% and 31.0% for Monumento and Magallanes respectively. Monumento Station Plaza project including station facilities improvement is not economically feasible, with an EIRR below the threshold set by NEDA (15%) because of the expensive land acquisition and elevator facility. However, considering the fact of sensitivity analysis, implementation of the proposed Monumento Station Plaza project is feasible under the condition of private sector's participation and the Magallanes project is feasible economically and can be justified for implementation.

Table 8.4.1 Sensitivity Analysis

		Cost					
		Monumento			Magallanes		
		-20%	same	+20%	-20%	same	+20%
Demand	-20%	14.4%	12.0%	10.1%	31.0%	26.9%	24.0%
	Same	17.0%	14.4%	12.4%	35.5%	31.0%	27.7%
	+20%	19.3%	16.5%	14.4%	39.5%	34.6%	31.0%

8.4.2 Financial Analysis

(1) Project for Analysis

Case (A) Financial Analysis of development of Monument station and the station plaza.

Case (B) Financial Analysis of development of Magallanes (LRT Line 3 and PNR/MCX) station and the station plaza.

(2) Net Cash Flow

(Unit: 1000 Peso)

	2006	2015	2029
Case (A)	-25,380	26,052	185,491
Case (B)	66,383	136,486	272,457

In the case of Case (A) , net cash flow becomes positive from 2014 and the cumulative deficit turns positive in 2020.

In the case of Case(B) , net cash flow becomes positive from the first year after the construction period.

(3) FIRR and Evaluation

	FIRR
Case (A)	7.02%
Case (B)	28.64%

The reason why FIRR of Case (B) is high level, is that investment cost is small and revenue gets both from LRT 3 and PNR. As to the land in the station plaza, it is owned by government and there is no need to pay money.

On the other hand, FIRR of Case (A) is low level comparatively, because investment cost is so big, especially land acquisition and escalators.

If the construction of Case (A) and (B) starts at same time and FIRR calculates totally, FIRR becomes 15.26% which is higher than 15% of domestic interest..

(4) WACC (Weighted Average Cost of Capital)

Case (A) 7.43%

Case (B) 7.33%

Both cases are similar and comparatively low.

(5) Sensitivity analysis

Table 8.4.2

(Unit: FIRR)

		Cost					
		Monument Case (A)			Magallanes Case(B)		
		-20%	Unchanged	+ 20%	-20%	Unchanged	+ 20%
Revenue	-20%	7.02%	4.70%	2.88%	28.64%	24.54%	21.37%
	Unchanged	9.47%	7.02% (Base Case)	5.11%	33.02%	28.64% (Base Case)	25.27%
	+ 20%	11.59%	9.01%	7.02%	36.81%	32.20%	28.64%

In the case of Case (A) ,it is very severe as it is below 15 % of domestic interest even when FIRR is the most favorable condition of cost reduction 20% and revenue increase 20%.

In the case of Case (B) , it has high feasibility because FIRR is 21.37% on the condition of the worst case of cost increase 20% and revenue reduction 20%.

8.5 Environmental Consideration and Scenic Views

(1) Objectives of the Study and Present Environmental Condition

The survey was carried out around the Monumento and Magallanes stations, as there are potential impacts not only within the project area itself but also in the areas surrounding it. Impacts for the short, medium, and long-term range including the construction period were considered. Social condition survey included items on relocation of houses, land prices, vicinity population, scenic conditions and related items.

The study has been carried out in line with the Environmental Guidelines for the Infrastructure Projects-IV Railway prepared by JICA together with consideration of the environmental laws and rules roles in the Philippines and the Philippine Environmental Impact Statement (EIS) System. The work is based on site visits to the project locations and related areas, results of meetings and discussions with representatives of related sectors, and review of documents, regulation and data concerning the project.

Fig. 8.5.1 and Fig. 8.5.4 show the project area at Monumento and Magallanes, and urban built-up areas.

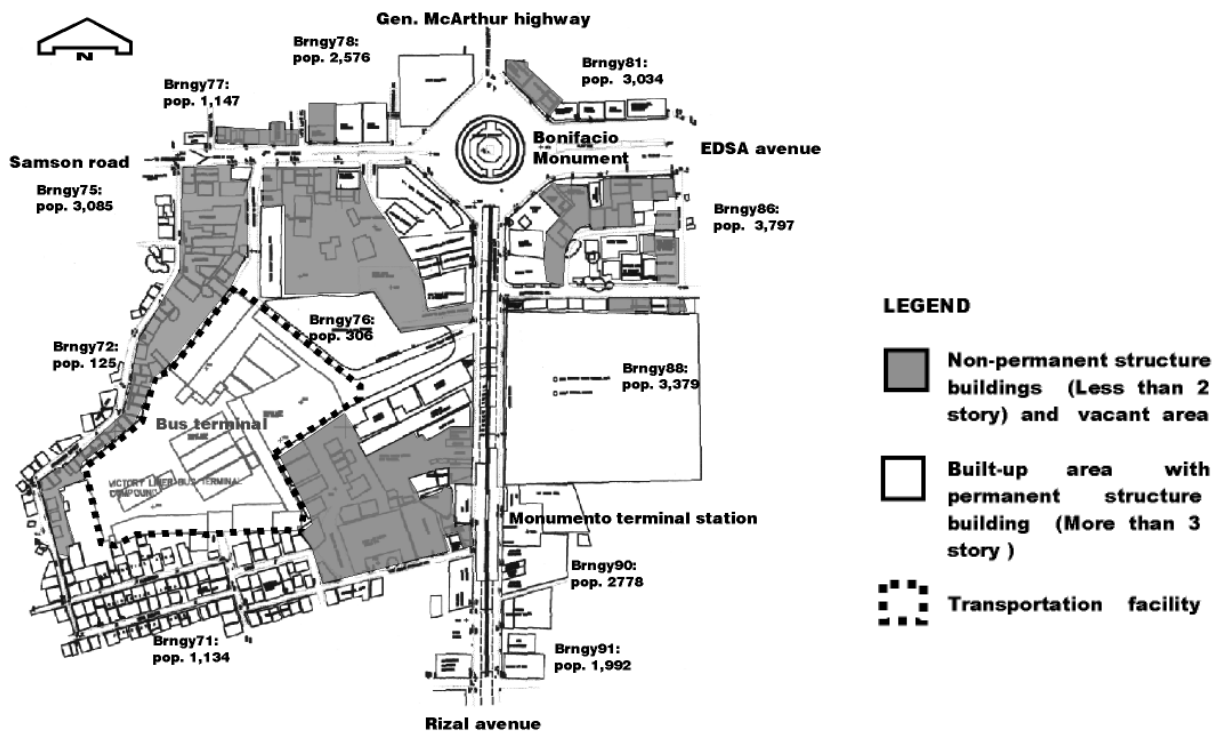


Fig.8.5.1 Project Area at Monumento and Urban Built-up Area

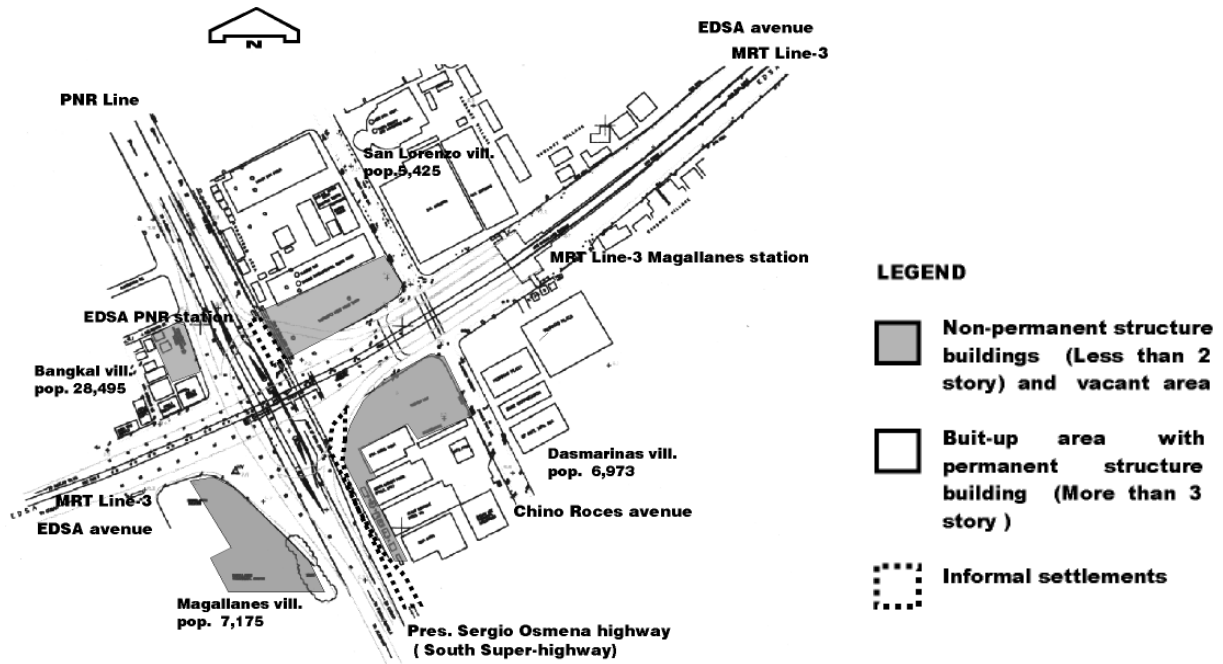


Fig. 8.5.2 Project Area at Magallanes and Urban Built-up Area

(2) Initial Environmental Examination

Initial environmental examination (IEE) has been conducted for the selected objective Monumento and Magallanes stations and their plazas and summarized as follows.

Context of work is Innovation of the station and development of station plaza of 1.3 ha area, and fulfillment of station equipments, transportation terminal such as for bus, jeepny, taxi, and also plaza spaces for transition function. Station and station facility are LRT-line1 Magallanes, PNR-EDSA station and MRT-line3 Monumento station and their fulfillment of the station equipment.

Characteristics of the Site Description for Monumento and Magallanes areas are as follows.

Monumento: Location: LRT-line1 Monumento station area in Kaloocan city,
Benefiting population: Approx. 250,000 persons.
Demand: Approx. 930,000,000 persons/year in 2015.

Magallanes: Location: MRT-line3 Magallanes and PNR-EDSA station area in Makati city,
Benefiting population: Approx. 300,000 persons.
Demand: Approx. 116,000,000 persons/year in 2015.

Scoping of the project for Monument and Magallanes area are summarized as following Table 8.5.1. Natural environmental component would be negligible.

Table 8.5.1 Scoping of the Project

Items of environment		Evaluation	Authority
1. Social Environment			
1	Transfer of (Monumento) Dwellers (Magallanes)	A	There are 14 units of residential houses and their families for removal.
		A	There are 70 units of informal settlers families inhabited and their families are to be removed.
2	Economic activities	C	Economic will be much vitalized with the station and station square development.
3	Transportation and living facilities	C	Existing congested transportation condition and system also pedestrian flow will be much conveniently enhanced.
4	Breakage of communities	C	No specific community breakage may occurred.
5	Ruins, cultural assets	A	Bonifacio Monument situates at the circle. (Monumento area)
		C	No specific effects (Magallanes area)
6	Water, fishing and forest right	C	There is no water body and forest, so that there is no effects on these items.
7	Health	C	No deterioration on health and sanitation, but vicinity environment will become more hygienic in status.
8	Refuse	B	Construction wastes may be generated, but there are in temporally situation during construction period.
2. Public Hazard			
1	Air pollution	C	There will be no air pollution since the size of the transportation will not be increased drastically.
2	Water contamination	C	There will not be work that may bring water pollution
3	Soil contamination	C	There will be no enhancement of soil erosion with the work, no occurrence of noxious substances.
4	Noise, vibration	B	During construction period there will be temporary noise occurred, but there will be no increase of noises and vibration after the work.
5	Sinking of land altitude	C	No use of underground water.
6	Offensive odor	C	No offensive odor will generate.

Note: The classification of evaluation

A: The subject E.I is unquestionably induced by the Project

B: The subject E.I is likely to be induced by the Project

C: There is no possibility of the subject E.I being induced by the Project (It isn't made the target of EIA)

(3) Environmental Positive Impact of the Project

Environmental impacts in positive side in over all components at Monumento and Magallanes area as assumed as follows.

- 1) Contribution to solve urban transportation and traffic congestion problems
- 2) Enhancement of Convenient and smooth vehicle transferring function to the station

- 3) Establishment of pedestrians through the sufficient walking spaces from a transportation mode to railway or other mode's
- 4) Generating time and energy saving effects for citizen's diversified daily activities
- 5) Establishing the station surrounding area to be up- graded in townscape and Business opportunity
- 6) Generating new economic activities and high intensive land use
- 7) Contribution to a reduction of the mortar vehicle emission and noise level

(4) Further Study Guideline for Environmental Impact Assessment

For the further study of environmental impact assessment (EIA), clear examinations on potential positive and negative factors of EIA and social impact assessment (SIA) for further feasibility study and detailed design study stage. Major EIA subjects would be as follows.

Screening of the Projects, major items of specific attention are summarized as follows.

- 1) Transfer of dwellers : Transfer upon acquisition if lands acquired. (dwelling right, transfer of landownership)
- 2) Ruins, cultural assets: Loss and /or deterioration of temples, shrines and hidden cultural assets for Monumento

CHAPTER 9

COMPREHENSIVE RECOMMENDATION

9.1 Development of the Railway Network

9.1.1 Realization of Planned Lines

The objective of the Study is to make railways in Metro Manila more comfortable and convenient for users and in turn to increase the number of people using railways. The most important and effective means of ensuring that citizens use railways is the construction of a railway network. In the Study, it is not intended to propose the planning and construction of new specific rail routes, however, it is hoped that construction of those routes currently being planned is realized at an early stage.

Future plans for rail network construction in Metro Manila have already been demonstrated in the following programs:

- (1) JICA development study “Metro Manila Urban Transportation Integrated Study” (MMUTIS) implemented from 1997 through 1999
- (2) Medium-Term Philippine Development Plan (MTPDP) established by the Philippine Government and having 1999-2004 as the target year

The most important thing in order to increase the number of rail users in Metro Manila is to achieve the earliest possible realization of these already proposed rail network plans. In addition to the already operating Line 1, Line 3 and PNR, if construction of Line 2 (currently being built) and the planned Line 3 extension, Line 4, Line 6, North Rail and MCX is realized, dramatic increase in the number of rail users can be anticipated.

In advancing construction of the railway network, it will be necessary to promote cooperation between related Departments and Agencies such as the DOTC, NEDA, MMDA and DPWH, etc. under the guidance of the President, to hear the views of local government representatives, railway operators, urban transportation experts and transportation users, and to seek the understanding of citizens by presenting specific railway construction plans, cost benefit and sources of construction funds, etc. before the public.

9.1.2 Important Points in Construction of the Railway Network

As was mentioned above, carrying out the planned construction of the rail network in Metro Manila is important, however, it will be necessary to pay attention to the following points when doing this.

(1) Rail System

The specifications of new wayside facilities and rolling stock must be such that appropriate transportation capacity can be secured based on the demand forecast for the lines in question.

Concerning Metro Manila Line 1, because LRT was adopted this based on an estimate of transport demand which was lower than actual demand at the time of construction, it was later necessary following the start of commercial operation to carry out major works for boosting transport capacity. Conversely, if a railway system is constructed with excess capacity based on a demand forecast larger than the actual demand, this leads to higher investment cost and adversely affects business standing.

Concerning demand forecast for each railway line in Metro Manila, figures having 2015 as the target year are indicated in MMUTIS. According to this forecast, concerning new railway lines in Metro Manila, it is necessary to introduce a train system which has the capacity for high density operation and large volume transportation. In carrying out the construction of new lines, it is rational to conduct detailed demand forecasts and to add to the rolling stock fleet in line with demand increases following the opening of lines, however, it is vitally important to establish basic specifications which ensure that no major improvement works of facilities are required.

(2) Government Involvement

As a public mode of transport, railways support urban functions in major cities and are an essential requirement in order for citizens to enjoy full and comfortable lifestyles. Moreover, as a means of making cities more attractive and vitalizing urban centers, the importance of railways is increasing all the time.

However, since railway construction requires massive funding and take a very long time to attain service profitability, rail construction led by private sector companies is limited. In other words, private companies are attracted to railway construction in cases where development progresses along wayside areas and benefits of development can be enjoyed as a result of increases in the value of owned real estate, etc. In urban areas where

wayside areas have already been developed, it is hard to realize internalization of development profits resulting from railway construction and it is difficult to expect much private-led railway construction. In this case, railway construction must be tackled within the framework of urban policy and urban transport policy of the central government and local governments.

Meanwhile, the Philippine Government and local governments are confronted with extremely harsh financial conditions, and it is not appropriate to pass the burden for excessive fiscal expenditure onto future generations. For this reason, concerning the construction of railways in Metro Manila, in addition to providing institutional and financial incentives to private companies in order to obtain maximum private sector funding, while at the same time seeking an appropriate burden from users (fares), it is necessary to seek new sources of railway construction funds through the establishment of environmental tax, etc.

As the worldwide trend concerning the construction and operation of railways in major urban centers, it is increasingly common for central and local governments to carry out infrastructure development and for private companies to implement efficient operation, i.e. the so-called separation of infrastructure development • ownership and operation.

Moreover, even in cases where permission for railway construction and operation is granted to private companies, it is necessary for public authorities to take an involvement in ensuring through operation between lines (seamless operation), improving connections with other modes of transport via development of station plazas, and improving service and safety levels through installing escalators and removing barriers, etc.

(3) Connection with Urban Development

Railways play an important role in supporting everyday life, however, they also make an important contribution to urban functions through mitigating road congestion, reducing transport pollution, extending the commuter radius and vitalizing city centers. Moreover, construction of station plazas, station area development, construction of multi-level intersections, improvement of level crossings, and countermeasures against squatters, etc., which are all intended to improve the comfort and convenience of railways, are also linked to urban projects and road construction. Therefore, in carrying out development of the railway network, it is effective for railway officials to work closely with road and city officials in promoting projects that ensure the integrated development of railways and urban functions.

In order to improve urban transport in general, raise urban functions and realize an attractive and high quality urban lifestyle, it is necessary to further strengthen cooperation between railway development and urban development with respect to the overall improvement of stations and areas around stations.

(4) Importance of PNR Line

PNR stretches north to south from Tutuban through the center of Metro Manila, and at its peak it consisted of 1,300 km of line. Since then, the abolition and closure of railway lines has been made inevitable by the advance of motorization, deterioration of railway facilities and occurrence of natural disasters, and the line extension currently stands at 446 km. Furthermore, the railway is unable to fully function because train speeds and frequency of services are reduced due to deterioration of railway facilities and squatters around the line; and moreover, reduction of revenue due to low fares and numerous free riding puts pressure on business operation. However, since PNR connects the center of Metro Manila to districts with growth potential in the north and south, it is an attractive route as a commuter main line.

According to the railway demand forecast for 2015 as given in MMUTIS, high levels of passenger usage are anticipated on the PNR north line and south line in future. Moreover, the section between Caloocan-Tayuman-Sucat (approximately 28 km) is double track line. Upon constructing the railway network in Metro Manila, an effective means of realizing network effect would be to vitalize this PNR line and make it into a pillar of passenger movement. Projects have already been formulated for the north line (North Rail Line) and south line (MCX Line), however, policy has not yet been determined with respect to the section in the center of Metro Manila (Tayuman-Buendia). It is important to develop PNR as a key route of the rail network in Metro Manila through improving the north and south lines and carrying out drastic revision of the central section. Accordingly, in the Study, it is proposed that improvement of services through raising speeds, free rider countermeasures and squatter countermeasures be sought by turning the central section which links the north and south lines into an underground line.

9.2 Railway Technical Standards

9.2.1 Establishment of Railway Technical Standards

In order for railways to operate safely, speedily, accurately and efficiently, it is necessary to have set rules and standards. Concerning the method adopted in major rail nations, safety

standards, etc. for fulfilling socially required levels are defined by the government, and railway operators secure safety by adhering to these standards.

Railway technical standards are divided into compulsory standards which prescribe for safety and voluntary standards aimed at improving production efficiency and removing trade impediments, etc. In the Study, examination was carried out on compulsory standards. Concerning voluntary standards, international standards such as the ISO Standard should be introduced to the Philippines. Compulsory standards prescribe necessary performance items for securing required safety levels, maintaining networks, displaying railway characteristics, securing convenience of users, and adopting environmental countermeasures. It is not advisable to incorporate specific figures into compulsory standards because specifications differ according to each railway and line, introduction of new technology may be hindered, and this may lead to increased costs. The Study proposes the minimum required standard items for constructing and operating railways and the performance conditions required in those items, and it is hoped that the Philippine government takes these proposals into account in establishing and promulgating its own railway technical standards. Moreover, interpretation guidelines which give a commentary on the thinking behind railway technical standards have been stated in the Study. It should be pointed out that these are a preliminary guide intended to aid the understanding of railway operators and officials in charge of establishing railway technical standards.

9.2.2 Legislation and Responsible Organization for Railway Technical Standards

Compulsory technical standards must be clearly stated in legislation of the Philippine Government and widely informed to railway operators.

The legislative system of the Philippine Government consists of Acts, Executive Orders, Presidential Orders and Department Orders, etc.. Since maritime safety rules are prescribed in Department Orders, it is appropriate that railway technical standards also be prescribed in this manner. Also, it is necessary to establish a responsible organization for establishing technical standards and carrying out revisions according to technical progress, etc. Organizations responsible for railways within the Philippine Government are the DOTC, LRTA and PNR, however, officials in charge of technical standards need to possess administrative sense in addition to a deep understanding of railway technology. Taking these two aspects into consideration, the Railway Transport Planning Division within the DOTC is considered to be appropriate as the responsible department. Moreover, in order to handle opinions in the practical running of the railway, it is proposed that a Council for Railway Technical Standard

composed of railway experts from the DOTC, LRTA, PNR and MRTC, etc. be set up within the Railway Transport Planning Division, and that a system be established for deliberating the contents of standards.

9.2.3 Problems of Unification of Specifications

There is a school of thought which thinks that by prescribing concrete figures for the basic specifications of railways in railway technical standards and seeking to standardize railways as a result, this will lead to greater efficiency of railways. For example, the following values are established: gauge 1,435 mm, overhead voltage 1,500 VDC, minimum curve radius 160 m, steepest gradient 35/1000, track center interval 3,200 mm, car floor height 920 mm, and so on. However, by standardizing the specifications of railways throughout a country or in one city, there is a risk of ignoring the topographical features of each line, hindering technical progress and preventing reduction of construction costs.

However, when carrying out through operation on two or more lines, it is necessary to standardize basic specifications on the sections in question. Basic specifications refer to gauge, track clearance, car clearance, design load, minimum curve radius, steepest gradient, train length, platform height, electric system, power collection system, signal safety system, major dimensions of rolling stock, and so on. Therefore, when planning the railway network, it is necessary to plan in advance those sections where through operation will be carried out. As for those sections where through operation is not intended, providing that the performance conditions of railway technical standards are satisfied, it is more efficient in terms of construction and operation to freely select specifications.

Furthermore, since standardizing rolling stock and electric equipment parts standards contributes to cost reduction, standardization is being advanced according to ISO, etc. It will be important to adopt international voluntary standards that will lead to cost reduction in the Philippines too.

9.2.4 Preparation of Railway Inspection and Maintenance Standards

Following the start of commercial operations on railways, it is necessary to establish inspection and maintenance standards with respect to civil engineering, track, electrical and operating safety facilities and rolling stock, in order to keep railway facilities in sound condition and to ensure the safe running of rolling stock. Concerning these inspection and maintenance standards, each railway company establishes specific detailed rules based on its own line and rolling stock conditions for the maintenance of operating safety. It is

recommended that each railway company informs personnel of these inspection and maintenance standards and implements inspections at set intervals to monitor compliance with them. (See Appendix 5.2)

9.3 Railway Fare and Passenger Service Policy

9.3.1 Railway Fare

(1) Standard Fare

It is necessary to set the basic fare for railways upon giving careful consideration to the ability to pay of general users and competition with other public modes of transport. Accordingly, in this Study, a fare roughly 25% higher than that for air cooling buses, which offer almost the same service conditions as railways, was set as a provisional standard, and parameters such as speed of each mode of transport, arrival time, changeover time, waiting time and comfort, etc. were used to compute the fare where optimum transport volume and revenue are realized. As a result, it was found that optimum transport volume and fare revenue were achieved in the case of reducing the above provisional standard fare by 15%.

(2) Introduction of Commuter Passes

An effective way to promote railway use and realize labor saving within railway companies is to issue various types of discount ticket.

Looking at the daily numbers of boarding and alighting passengers at each station on Line 1, there are many stations where the number of boarding passengers differs greatly from the number of alighting passengers. This means that passengers do not use the Line 1 on the outward or inward journey. In order to encourage rail use on both outward and inward journeys, introduction of commuter passes is effective.

One month or three month commuter tickets are appropriate for introduction to urban railways in Manila, and discount rates of 20%-30% for work commuting and 30-40% for school commuting are appropriate judging from the number of users and fare revenue.

9.3.2 Strengthening of Linkage between Railway Companies

(1) Inter-railway Transit Tickets and Through-fare System

In Metro Manila, in addition to the currently operating Line 1, Line 3 and PNR, lines planned for new construction or upgrading are Line 2, Line 4, Line 6, North Rail and MCX. In the event where multiple railway companies conduct services on a number of line sections, there will be frequent cases of passengers riding over sections operated by different companies. In this event, in order to promote passenger convenience and make fares seem less expensive, it is recommended that inter-railway transit tickets be issued and that a through-fare system be introduced.

Concerning the introduction of a through-fare system, in the case of urban transport where short distance trips are the main, there is concern that the revenue of each railway company will fall compared to the case of separate fare systems. However, since introduction of the through-fare system can be expected to increase the number of rail users, this is something which should be realized while paying attention to the fare structure and discount rate, etc. of each railway company when introducing the system.

(2) Standardization of Automatic Fare Collection System and Boarding Tickets

The automatic fare collection (AFC) systems on Line 1 and Line 3 are incompatible because they use different magnetic card encoding formats. In order to make it possible for passengers to ride on both lines using one boarding ticket, it is necessary to carry out remodeling of the AFC equipment and reworking of software on both lines.

In order to carry out complete standard handling which will enable Line 1 and Line 3 boarding tickets to be used at all automatic gates on both lines, it would be necessary to totally rework the hardware and software of all automatic gates on both lines, but this is not feasible because it would incur cost equivalent to no small ratio of the initial investment.

One cost-effective means of carrying out the standard handling of some boarding tickets is to target just stored value tickets (SVT) and add Line 1 automatic gates to Line 3 stations or Line 3 automatic gates to Line 1 stations for handling only stored value tickets (SVT). Even in this case, however, cost would be incurred in installing Line 1 automatic gates in each Line 3 station, and it would be necessary to issue a ticket issuing machine in Taft Avenue Station, install a new station computer system, and carry out upgrading of software for the automatic ticket gates and central computer system.

A drastic solution would be to adopt standard boarding tickets which utilize non-contact IC cards. However, it is not realistic at the current point to introduce an IC card system because magnetic card automatic ticket gates have only just been purchased on Lines 1 and 3 and the depreciation period is not yet complete and the cost of IC cards is high.

Therefore, there is not currently any cheap and effective improvement method for carrying out the standard handling of differing AFC on Line 1 and Line 3. However, the introduction of AFC which allows standard boarding tickets to be used carries major benefits for users. For this reason, looking ahead to the future, it is necessary to establish unified AFC software which enables AFC to be utilized on all lines, and to steadily promote such software until it is used on all lines.

(3) Fare Settlement System Between Companies

If transit common boarding tickets or common boarding cards, etc. are introduced, it will be necessary to carry out settlement of fare revenue between companies.

This settlement work requires each company to provide information according to a basic agreement established between the companies and to distribute fares according to procedure. If there are numerous related companies, it is more efficient to set up a coordinating and transport settlement company to undertake all settlement work.

9.3.3 Passenger Services

(1) Passenger Services at Stations

(Shortening of distances between stations)

The arrangement of stations on urban railways is greatly affected by railway user trends, however, in the case of major cities in Japan and Europe, the average distance between stations is around 1.0-1.2 km. The average distance between stations on Line 2 and Line 3 is 1.3-1.4 km, but there is room to consider the construction of new stations while paying attention to future development conditions.

(Installation of escalators)

Movement from ground level to platforms is a major burden for rail users. On both Line 1 and Line 3, it is necessary to carry out the planned installation of escalators.

(Bolstering of ticket windows)

In order to mitigate congestion at ticket windows, it is necessary to make use of automatic ticket vending machines and to promote the sale of advance tickets (stored value tickets, etc.).

(Display of station names, etc.)

It is recommended that line names, station names, operating times, fares tables and standard train timetables be displayed in each station.

(Enhancement of communication and transport functions between railways)

In order to make transfers between different railways go smoothly, stations located at intersections between different lines should be positioned as close together as possible in the planning stage. As for stations which have already been completed or which are under construction, it is necessary to examine the optimum layout between stations and to adopt pedestrian decks, moving walkways, common latches or no latches, etc.

(Passenger guiding signs)

At stations where passengers transfer between different lines, it is necessary to install easy to understand transit signs. It is desirable for guide displays to adopt international pictographs as a unified sign system.

(2) Promotion of Related Businesses

It is common practice in Japan and other countries for railway companies to implement incidental related businesses to rail transportation in order to stabilize running of the railway business. Related businesses range from small-scale activities such as retailing and food and beverage selling within station compounds, to large-scale concerns such as utilization of whole station buildings as department stores or specialist outlets. The fundamental premise of these activities lies in making use of stations or company-owned property. Since many passengers concentrate in and around stations, it is important to make maximum use of them. In order to carry out related enterprises on a medium or large scale, the railway company concerned needs to raise around 20% of the required capital from its own funds. In cases of constructing station buildings for use by shops, etc., money (premium, guarantee money) is sometimes collected from scheduled tenants and used to cover part of the initial capital outlay. It is also important to separate the related businesses from the railway company and make them into independent subsidiaries, in order to enhance unique expertise, speed up decision making and clarify business management responsibility.

Related businesses on the railway system in Metro Manila currently consist of small-scale operations only, however, on Line 3, MRTC has plans to develop related businesses at its stations. Since LRT stations are subject to space limitations, it is recommended that related business development starts from stores, coffee shops, eating establishments and convenience stores, etc. which will improve the convenience of users.

(3) Links Between Railways and Other Transport Modes

Securing links between railways and other modes of transport (buses, jeepneys, tricycles, etc.) is essential for improving the convenience of users. Methods for realizing this are coordinating operating lines, coordinating fares and improving connections in stations.

Coordination of fares is difficult in the current situation because the business operating base of each company is so different. Concerning operating lines, it is necessary to secure a division which enables the characteristics possessed by each mode of transport to be utilized to the full. It is necessary to carry out the reorganization of bus and jeepney routes in line with the opening of railway lines, and to adopt jeepney lines based around railway stations.

9.4 Through Operation Policy

9.4.1 Necessity of Through Operation

Implementation of through operation, whereby trains travel between differing line sections, improves convenience for passengers and also has merits for the railway companies. Therefore, through operation is something which should definitely be implemented on sections where it is possible.

Seen from the viewpoint of passengers, the merits of through operation are as follows: transfer between lines at junction stations is no longer necessary and thus congestion is relieved at terminal stations; and arrival times are shortened because transfer time and train waiting time at connecting stations is removed.

Meanwhile, seen from the viewpoint of railway companies, the following advantages can be obtained: more users are attracted due to the greater convenience, and this leads to greater transportation volume and increased revenue; since only one connecting station is required for through operation, construction cost of one station can be economized on; since shuttling time at connecting stations can be omitted, the number of train formations can be

reduced; and since consolidation and closure of train depots is possible, depots can be transferred from the city center and consolidated in outlying areas.

Problems with through operation are that costs may be incurred in carrying out improvement works to standardize basic specifications between line sections, and construction costs are incurred in securing connections between lines.

Accordingly, it is desirable that sections where through operation is to be implemented be decided in the railway network planning stage.

9.4.2 Through Operation Implementation Sections

Railways which are already operating or are in the planning stage in Metro Manila are Line 1, Line 3, PNR, Line 2, Line 4, North Rail and MCX . Of these, through operation is possible on the following lines:

- (1) Line 1 and Line 3 (since station facilities and line for connections near ESDA Station on Line 1 and Taft Station on Line 3 are complete and large-scale improvements are required, through operation is not a realistic proposition at the current time).
- (2) Line 1 and Line 6
- (3) North Rail and MCX

Through operation from Line 2 and Line 4 to other lines is not possible due to different alignment, etc. However, concerning D. Jose Station on Line 1 and the areas around Recto Station and Old Bilbid Station where the Line 2 and Line 4 terminal stations are planned, it is necessary to construct facilities such as station connecting corridors which enable transfers to be carried out smoothly.

9.4.3 Implementation of Through Operation between Line 1 and Line 3

Line 3 is currently operating between North Ave. and Taft, and there are plans to extend it from North Ave. towards Monumento on Line 1 in future. The Study proposes that when carrying out extension of Line 3, facilities at Monumento should be adopted which enable through operation between Line 3 and Line 1.

Although the specifications of rolling stock differ between Line 1 and Line 3, through operation under set conditions is possible in terms of operation handling and equipment. It is

easiest for Line 3 rolling stock to enter into Line 1, but there is also room to consider entry of Line 1 rolling stock into Line 3.

In the Study, transportation volume, transport plan, investment cost and operating cost, etc. were roughly calculated for the case where through operation is carried out between Line 1 and Line 3 at Monumento.

According to this, transfer time will be cut by 20 minutes, passengers will increase by 31 million per year (2015), and revenue will increase by 393 million peso per year. In addition, costs will be saved because construction of Line 3 Monumento Station will no longer be necessary, the number of train formations will be cut (excluding additional rolling stock accompanying the increase in transportation volume), and administration expenses will be reduced. Meanwhile, it is estimated that the increase in works costs accompanying through operation will be 2.6 billion peso.

In other words, implementation of through operation on Line 1 and Line 3 will have benefits for both passengers and the railway operators.

9.4.4 Implementation of Through Operation between Line 1 and Line 6

Construction of Line 6 is planned from near Baclaran, the southern terminal of Line 1, towards Cavite in the south.

In the Study, it is proposed that when constructing Line 6, facilities be constructed at Baclaran which connect and enable through operation to be conducted between both lines.

The implementation plan and specifications for Line 6 are not clear as yet, however, facilities and rolling stock which make through operation possible should be adopted. If Line 3 is connected to Line 1 via Monumento and this is then linked to Line 6 from Baclaran, not only will this improve convenience for passengers, but from the viewpoint of railway operators, transportation volume will increase and it will be possible to move the rolling stock depot from the current inconvenient site in the city to land alongside Line 6.

9.4.5 Implementation of Through Operation between North Rail and MCX

It is planned for North Rail to run from Caloocan in Metro Manila to Clark International Airport and for the PNR line which currently lies idle to be utilized. MCX, which entails the rehabilitation and upgrading of the existing PNR Metro Manila commuter line, will run from

Sta. Mesa to Calamba (south line). North Rail and MCX plan to vitalize and make use of PNR lines, but the section between Caloocan and Sta. Mesa will be discarded.

However, through directly linking North Rail and MCX, PNR will become a promising route for arterial transportation in Metro Manila.

In consideration of this, it is proposed that approximately 60 km of line between Manrilao on the North Line and Cabayao on MCX be upgraded to a double track electrified line so that through operation can be conducted and it can be used as a main line in Metro Manila.

In this case, on the section between Tayuman and Vitocruz, facilities are deteriorated, there are numerous crossings, and there is a problem with squatters. For this reason, the options of constructing elevated line or underground line on this section were explored

Concerning the elevated line plan, since road and railway line which are already elevated or planned for elevation exist on this section, problems would exist in terms of structure and operation if railway line were to be constructed above these structures.

In the Study, it is proposed to carry out through operation between PNR North Line and South Line by constructing underground line on the section of approximately 6 km between Tayuman and Vitocruz and semi-underground line between Vitocruz and FTJ.

According to this plan, as a result of implementing the partial underground construction of PNR line, it is estimated that travel time between Marilao and Cabuyao (60 km) will be 81 minutes and that the annual number of users will be 509 million (2015). Meanwhile, 43 trains (430 cars) and 1,358 personnel will be required, and costs will be incurred in the execution of electrification works, double tracking works and underground construction works.

Concerning the plan to carry out through operation between North Rail and MCX by converting part of the PNR line to underground line, it will be necessary to carry out a separate F/S and detailed examination, however, preliminary survey of the merits and demerits found the plan to be attractive.

9.5 Design Standards for Stations and Station Plazas

9.5.1 Necessity of Design Standards (Manual) for Stations and Station Plazas

In order for stations and station plazas to provide services which are safe, comfortable and convenient, it is necessary to design appropriate scale and functions and plan an effective arrangement of facilities.

Railway lines in Metro Manila have hardly any station plazas, and station facilities also vary a lot between lines. Therefore, it cannot be said that stations satisfy the functions that are required of them.

For this reason, it is effective to establish the standard scale, equipment, functions and layout of stations and station plazas according to the local characteristics, number of users and type of each station, and to develop stations and station plazas based on this standard. In the Study, station and station plaza design standards (manual) which are based on experience in Japan are proposed.

Planning of specific stations and station plazas does not always match with the design standards (manual) from the viewpoint of topography and layout, etc., but it is important to advance plans using the manual as a starting point.

9.5.2 Important Points in the Use of Station and Station Plaza Design Standards (Manual)

(Station facilities planning)

The size of stations is generally set based on the estimated number of users 15 years in the future. Concerning width of platforms, width of staircases, installation points of escalators and elevators, number of ticket barriers, area of station building, area of concourse and width of free corridors, etc., it is important to carry out computation based on standard figures.

(User-friendly station development)

Since vertical movement is a burden for physically challenged persons such as the elderly and disabled, it is necessary to install escalators and elevators. Since installation following the start of commercial operation is difficult, escalators and elevators should be introduced from the planning stage.

In order to make boarding and alighting and transfer of trains easier, it is necessary to adopt a sign system and introduce pictographs based on ISO international standards.

It is necessary to install toilets (including toilets for wheelchair users), platform waiting rooms, and facilities for physically challenged persons (guide and warning blocks, etc.).

(Station plaza facilities planning)

In addition to traffic handling functions, since station plazas possess exchange functions, landscape functions, service functions and disaster prevention functions, it is necessary to secure the necessary facilities and area.

However, since station plazas are strongly connected to land use plans and urban facilities plans in addition to railway plans, it is important to coordinate with local governments and other related agencies.

Concerning the required facilities and area of station plazas, standard scale and figures based on the number of station plaza users are proposed, and it is necessary to secure site land based on these data.

9.6 Institutional and Financial Methods for Station Plaza Development

Station plazas not only provide sites for changing between railways and other modes of transport, they are an integral part of urban facilities around stations. For this reason, since station plaza development is development of common social infrastructure and can only be implemented by the private sector (railway companies, etc.) to a certain extent, public sector involvement is necessary.

However, it would be financially difficult for the Philippine public sector to develop station plazas using its own funds; rather, public sector involvement should center around preparation of the business environment and provision of tax and financial incentives.

A possible means of realizing this is to utilize the Urban Development and Housing Act, Comprehensive Zoning Ordinance, and Local Government Code, etc., designate station plazas and surrounding areas, and establish a Priority Area Development System by which incentives are provided to businesses in such areas.

It is also effective to enhance the business environment through implementing deregulation, and to offer tax deduction and financial incentives on securities, etc.

Concerning the raising of funds, private capital should be utilized to the full: a promising alternative would be to receive investment from Philippine citizens at home and abroad through establishing an SPC (special purpose company) and issuing bonds.

Moreover, rather than raising funds separately for individual projects, it is better to set up a long-term stable fund (Urban Development Fund) and examine introduction of urban development tax, etc. as a new source of funds.

9.7 Preliminary Design of Stations and Station Plazas

9.7.1 Preliminary Design of Station Facilities

(1) Basic Specifications of Station Facilities

Concerning the two stations targeted for preliminary design, i.e. Monumento and Magallanes (NR/MCX) and Magallanes (LRT3), based on the station design standards (manual), the basic specifications of station facilities (length and width of platforms, number of ticket machines, width of stairs, number of escalators, etc.) were computed with consideration given to the number of users in 2015.

In order to simplify station facilities, it is important to reduce the proportion of tickets sold on the day by promoting commuter passes and coupon tickets (stored value ticket), and to adopt measures such as the even spreading of passengers during rush hour.

Moreover, concerning the question of whether to consolidate station personnel by introducing automatic ticket vending machines, etc. or whether to place emphasis on recruitment upon maintaining ticket windows, it is necessary to examine this from the viewpoint of social policy.

(2) Preliminary Design of Station Facilities

Facilities layouts, section drawings and improvement work procedure drawings were prepared for Monumento Station and Magallanes Station (PNR, Line 3). Also, economic and financial analysis and initial environmental examination in the case of station improvement and station plaza development was carried out.

Concerning Monumento Station, it is assumed that through operation will be carried out between Line 1 and Line 3. As for Magallanes Station (PNR), upon examining two options for the platform type, i.e. island platform and separate platforms, priority was given to the island platform alternative.

9.7.2 Preliminary Design of Station Plazas

(1) Basic Specifications of Station Plazas

Concerning the plazas of the two stations targeted in the preliminary design (Monumento, Magallanes), based on the station plaza design standards (manual), rough estimation was carried out on the required number of bus, taxi and jeepney berths and the necessary station plaza area. However, since areas around the stations consist of commercial and residential land, it will not be easy to secure site land for station plazas as planned.

For this reason, it is necessary to secure station plaza sites by utilizing the institutional and financial methods as described in Chapter 7 and to design realistic station plazas which are compatible with that land.

(2) Preliminary Design of Station Plazas

Evaluation was carried out on six alternatives for station plaza sites in the case of Monumento Station and seven alternatives in the case of Magallanes Station. Out of these, the optimum sites were selected and preliminary design was carried out on the station plazas and corridors linking them to the stations.

Also, economic and financial analysis and initial environmental examination were carried out for the case of station plaza construction at both stations. The results of this, as is described in Chapter 8, were favorable, however, the issues which face station plaza development concern whether or not existing residential land, etc. can be secured for station plazas, what kind of operating body should implement the development, and how the necessary funds should be secured.

Therefore, it is necessary to compile an action plan of the type indicated in section 9-8 and to execute this in planned stages.

9.8 Implementation Plan and Schedule

A preliminary evaluation of the identified projects was carried out by a qualitative comparison of their relative merits in terms of project priority. The purpose of this exercise is to screen the projects proposed in the Study for their efficient implementation.

(1) Proposed Projects and Programs

The proposed projects are shown as follows:

1. Multi-modal Station Area Development
 - Bus & Jeepney Terminal Development
 - Pedestrian Deck Installation Project
 - Access Road Improvement Project
2. Station Facilities Improvement Project
 - Escalator, elevator, free pedestrian way etc.
3. Through-Operation Project (LRT Line 1 & Line 3)
4. Bus & Jeepney Rerouting Project focused on Stations
5. Establishment of Taskforce Team for Materializing an Integrated Transport Policy and Planning
6. Urban Development Fund Raising Program
7. Human Resource Development for Railway Sector
8. New Residential Area Development with Railway Transport
 - LRT Line No.4 Extension & Expansion Project

(2) Evaluation of Projects/ Programs

A preliminary evaluation was achieved by assigning a maximum value for each category. The general value of a project was based on its (1) Necessity and (2) Viability, each being worth a total value of 50 points. Categories (1) and (2) are then disaggregated into constitution issues with the assigned number of maximum points.

(3) Implementation Schedule Towards the Year 2015

Taking into consideration the results of the preliminary evaluation above, an implementation schedule is proposed for the medium-term development and towards the year 2015, shown in Table 9.8.1.

Under the dawn of the Railway Age in the Philippines, in order to develop a sound railway sector, coupled with human resource development for the railway sector, the following should be executed in the medium-term period: (a) establishment of an integrated transport policy etc., (b) strengthen administration institutions of the existing railway lines as a means of increasing passengers through improved railway facilities, and (c) construction of station plazas for improving accessibility to the stations.

Taking the viewpoint that traffic congestion could not be resolved without the railway development in Metro Manila, the role of the railway and road sectors shall be clarified under the integrated transport development policy. Appropriate development measure of the existing proposed railway lines should be considered under the above condition.

From the long-term viewpoint, dominant population concentration to Metro Manila of approximately 10 million people until 2015 is anticipated to cause even more serious traffic congestion and deterioration of residential conditions. In order to alleviate these problems, integration with residential area and railway developments (new town project) shall be executed in the northern part of the Greater Manila Metropolitan Area. Otherwise residential developments in the southern part are proceeding along the corridor of MCX.

Table 9.8.1 Implementation Schedule (Tentative)

Project Name	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	-2015
Multi-modal Station Area Development	■										
Station Facilities Improvement Project	■										
Through Operation Project (LRT Line 1 & Line 3)		■									
Bus & Jeepney Rerouting Project focused on Stations		■									
Establishment of Taskforce Team for Materializing Integrated Transport Policy and Planning	■										
Urban Development Fund Raising Program	■										
Human Resource Development for Railway Sector		■									
New Residential Area Development with Railway Transport			■								