

Socialist Republic of Vietnam  
Hanoi People's Committee (HPC)  
Hanoi Metropolitan Railway Management Board (MRB)

Special Assistance for Project  
Implementation (SAPI)  
for  
Establishment of an Organization for  
the Operation and Maintenance of  
Metropolitan Railway Lines in Hanoi City  
  
Final Report

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### Acronyms and Abbreviations

ADB	Asian Development Bank
AFC	Automatic Fare Collection
AfD	Agence Française de Développement
BMCL	Bangkok Metro Public Company Limited
BOT	Build-Operate-Transfer
BTO	Build-Transfer-Operate
BT	Build- Transfer
BTSC	Bangkok Transit System Company
DMCL	Delhi Metro Company Limited
DFR	Draft Final Report
DOF	Department of Finance
DOT	Department of Transport
EIB	European Investment Bank
EMU	Electric Multiple Unit
EPC	Engineering Procurement Construction
ERP	Electric Road Pricing
FS	Feasibility Study
GC	General Consultant
GDP	Gross Domestic Product
HAIDEP	The Ha Noi Integrated Development and Environment Programme
HAPI	Hanoi Authority for Planning and Investment
HPC	Hanoi People's Committee
HR	Human Resources
HRB	Hanoi Metropolitan Rail Transport Project Board
I/F	Interface
IC Card	Integrated Circuit Card
IMO	Infrastructure Maintenance and Operations
IPO	Initial Public Offering
ITO	Integrated Train Operation
ITR	Interim Report
JICA	Japan International Cooperation Agency
JKT	JKT Association
L/A	Loan Agreement
LRTA	Light Rail Transit Authority in Manila
MD	Minutes of Discussion

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MOT	Ministry of Transport
MRB	Hanoi Metropolitan Railway Management Board
MRT	Mass Rapid Transit
MTR	Mass Transit Railway
NFPA	National Fire Protection Association
O&M	Operation & Maintenance
OCC	Operation Control Center
ODA	Official Development Assistance
PPP(1)	Public-Private Partnership
PPP(2)	Purchasing Power Parity
PSO	Public Service Obligation
PTA	Public Transport Authority
PTKA	PT Kereta Api Indonesia
PU	Preparation Unit
RPMU	Railway Project Management Unit
SAPI	Special Assistance for Project Implementation
SCADA	Supervisory Control And Data Acquisition
SMRT	Singapore Mass Rapid Transit
TAC	Track Access Charges
TC	Technical Cooperation
TEDI	Transport Engineering Design Incorporate
TOR	Terms of Reference
TRTC	Taipei Rapid Transit Corporation
URMOCC	Urban Railway Management & Operation Control Center
UTC	University of Transport and Communications
VNR	Vietnam Railway Corporation
VNRA	Vietnam Railway Administration
WB	World Bank

## Executive Summary

### Objectives for the Study

The objective of this study is to prepare a plan to establish an O&M organization for the urban railways in Hanoi by gaining a thorough understanding of the current status of each project, with a particular focus on the schedule, and identifying the functions that the O&M organization should have at each stage. Specifically, the aim of this study is to propose an urban railway O&M organization that can provide sufficient service in an efficient manner by carefully considering the intentions and opinions of the project owners and donors. The following is a summary of the tasks to be accomplished by this study.

- (1) Developing a basic plan for the O&M organization for urban railways in Hanoi.
- (2) Developing a roadmap up to the commencements of operations.
- (3) Developing a detailed working plan for the establishment of the O&M organization.
- (4) Investigating the relationship between the O&M organization and other organizations or agencies.

### Study Area and Counterparts

- (1) Study Area: Hanoi City, Vietnam
- (2) Counterparts: Hanoi People's Committee (HPC)  
Hanoi Metropolitan Railway Management Board (MRB)
- (3) Other related agencies:
  - a. Department of Transport (DOT), Department of Finance (DOF), Hanoi Authority for Planning and Investment (HAPI), Department for Home Affairs (DHA) and other departments under HPC
  - b. Center for Transport Development-University of Transport and Communications (UTC)
  - c. Vietnam Railway Administration, Ministry of Transport (VNRA, MOT)
  - d. Agence Francaise de Developpement (AfD), Asian Development Bank (ADB), European Investment Bank (EIB) and World Bank (WB)
  - e. Vietnam Railways Corporation (VNR)

### Current Conditions

- The government promulgated a new Master Plan entitled "General Planning for the Construction of Hanoi Capital up to 2030 with a Vision to 2050 (1259/QD-TTg)" on July 26, 2011. According to this plan, nine urban railway lines are to be developed by 2030.
- At present, there are four on-going lines: Line-1, Line-2, Line-2A and Line-3; Line 5 is currently undergoing a feasibility study (FS). As shown in the table below, there are different authorities



responsible for the construction in Hanoi, thereby necessitating a study for coordinating all the projects.

**Table 1 Summary of Urban Railway Lines in Hanoi**

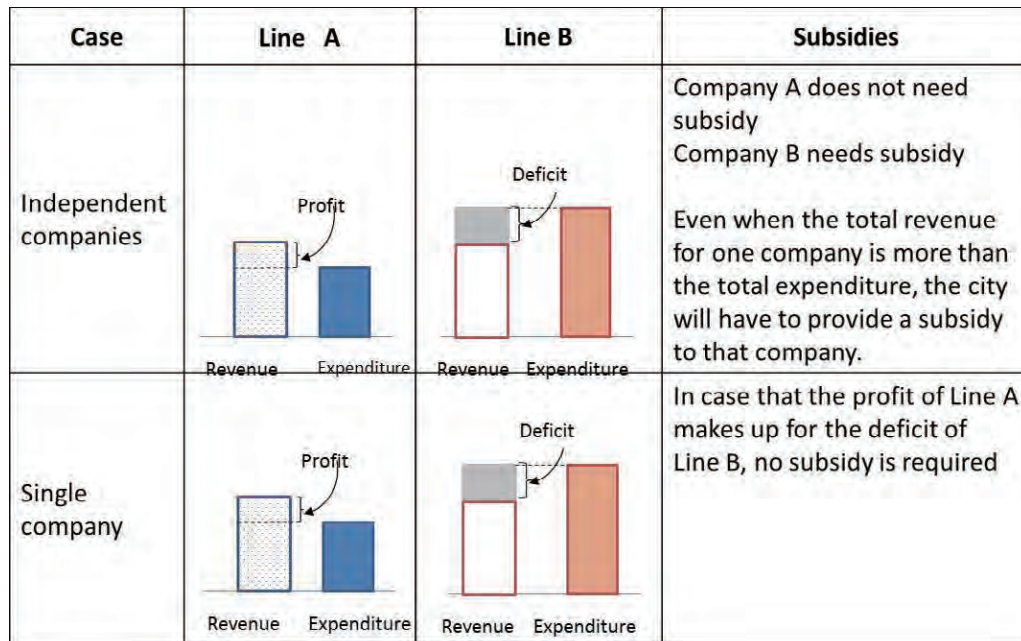
Line	Length	Route	Status	Authority for Construction
Line 1	38.7 km	Ngoc Hoi - Yen Vien, Nhu Quynh	On-going by Japanese ODA for the first section (15.36km)	VNR
Line 2	35.2 km	Nhat Tan - Vinh Ngoc - Noi Bai.	On-going by Japanese ODA for the first section (11.5km)	HPC
Line-2A	14km	Cat Linh - Hao Nam - La Thanh - Thai Ha - Lang street - Nga Tu So - National Highway 6 - Thuong Dinh (linking with Line 2) - Ha Dong - Ba La.	On-going by Chinese ODA.	MOT
Line 3	21 km	Nhon - Hanoi Station - Hoang Mai	On-going by French, ADB and other loans from other donors for the first section (12.5km)	HPC
Line 4	53.1 km	Dong Anh - Sai Dong - Vinh Tuy/Hoang Mai - Thanh Xuan - Tu Liem - Thuong Cat - Me Linh	No specific study.	N.A.
Line 5	34.5 km	South West Lake - Ngoc Khanh - Lang - Hoa Lac	FS is being conducted by JICA.	MOT
Line 6	47 km	Noi Bai - Phu Dien - Ha Dong - Ngoc Hoi	No specific study.	N.A.
Line 7	35 km	Me Linh - An Khanh - Duong Noi	No specific study.	N.A.
Line 8	28 km	Co Nhue - Mai Dich - Yen So - Linh Nam - Duong Xa	No specific study.	N.A.

## Basic Institutional Policy

### General Comments about the O&M Organization

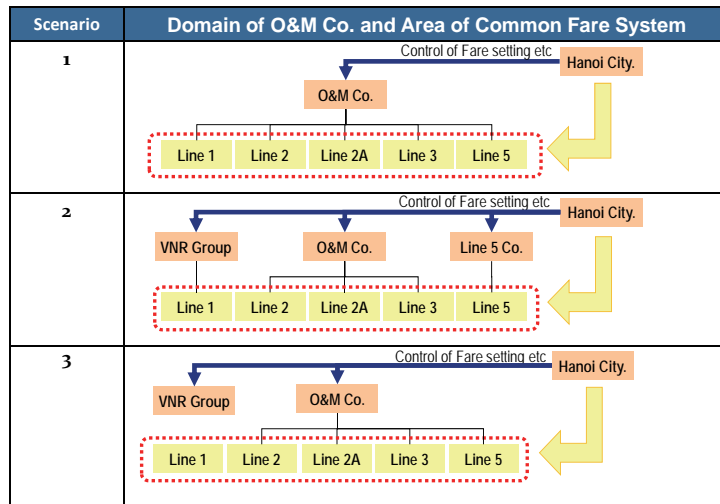
- Almost all urban railways in the world are operated by a single company in one city. Exceptions include Tokyo, Seoul, Shanghai and Singapore.
- It is efficient to have some departments, such as human resource and finance, shared by all lines in the urban railway system.
- It is difficult to integrate the O&M for lines with different project owners. For instance, Line-1 which is under the auspices of VNR, uses the same track as other inter-regional trains, making it difficult for it to be managed by another company. Line-5 is being planned to be developed as a PPP scheme. While the details have not been made clear yet, integration would be difficult because there will be investment from private companies and therefore there will be some form of control by them. On the other hand, though Line-2A is constructed under MOT, it would be possible to transfer this project to HPC for operation since the city area has been expanded to include the entire section of this line within the new boundaries of Hanoi.

- A “independent companies by lines” policy may result in an increase in the amount of subsidies from the government. Please refer to Figure 1.
- A common AFC system is an essential component in the development of a common fare system. A common fare system will dramatically enhance the convenience of all passengers.



**Figure 1 Comparison of Subsidies for Independent Companies versus a Single Company**

- To demonstrate the financial superiority of the single company, a financial simulation (cash flow) was conducted for the operation of an O&M company showing the flow of financial support from the government. The various scenarios used for the simulation are shown in Figure 2. In Scenario 1, all the lines are managed by an O&M company under the control of Hanoi City (HPC). In Scenario 2, a common fare system is implemented for all the lines and financial support from the city is provided to all the lines, including Line-1, which is managed by VNR. In Scenario 3, the financial support for Line-1 is separated from HPC’s responsibility and VNR can keep all surplus profit.



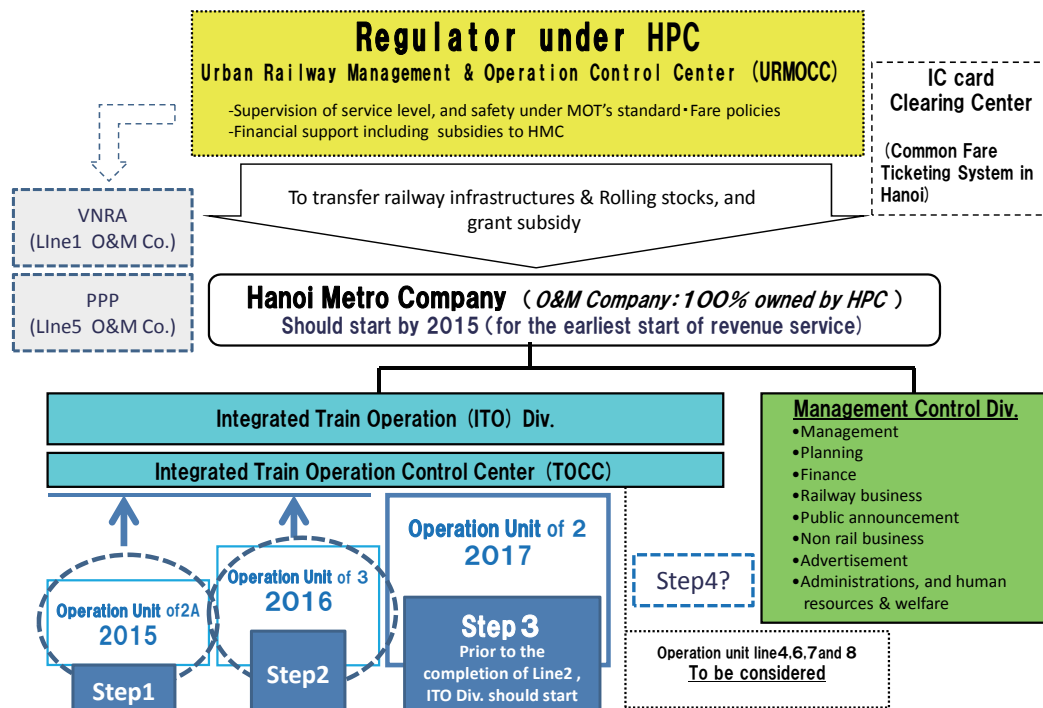
**Figure 2 Scenarios for the Financial Analysis**

- The results of the financial analysis are shown as follows. Scenario 1 is the most preferable one, but from a practical standpoint it would be hard to achieve this arrangement because of the mixture of urban and inter-region trains on Line-1. The second best arrangement is Scenario 3 in which the accumulated financial support provided by HPC over the 30-year time period will be 250 million USD at most.

**Establishment of Integrated OCC, Regulator and Comprehensive Management Structure**

- In Japan, the Operation Control Center (OCC), which is the core facility for train operations, was initially installed on each line. However, these individual OCCs were later integrated for more convenience and efficiency. Therefore, it is recommended that an integrated OCC be built from the beginning in Hanoi.
- The Regulator for urban railways will be in charge of managing fare policy, including subsidies, and supervising service and safety for daily operations. It is recommended that the Regulator for urban railways be established at the earliest stage and then merged into the Public Transport Authority (PTA) later taking the complexity and uniqueness of urban railways into consideration as currently, the World Bank (WB) is establishing a system of technical cooperation for public transport management, including BRT Bus Rapid Transit (BRT) and ordinary buses..
- The Study Team also developed the concrete organizational plan shown in Figure 3. In this plan, in order to respect the difference of each donor for each line, it is proposed to establish Operation Unit for each line. But at the initial stage when Line-2A is opened, there is no other Operation Unit and it is also proposed that at this stage, “Office for Operation Unit” will not be established

since establishment of both Integrated Train Operation Division and Office for Operation Unit will bring redundancy.



**Figure 3 Proposed Overview of the Management Structure for Urban Railways in Hanoi**

#### Interoperable AFC and IC card

- As the urban railway lines are supported by three different donors, the AFC needs to incorporate a common specification for interoperable AFC services that can be used on all lines. Under an interoperable AFC system, all the railway lines constitute a unified railway network. Passengers can travel from any station to any destination using a single ticket that is valid for the entire railway network, regardless of which companies are operating the lines. Without the interoperable AFC system, the railway system is only an assembly of independent railway lines where passengers must purchase a ticket for each transfer.
- “Studies on interoperable AFC system” is attached to this report as the supplementary report. The main contents are as follows.
- The interface specification for the electronic ticket and station equipment is the crucial issue. If the AFC system accepts multiple types of technology for the electronic ticket, each line will be able to adopt respective electronic ticket. However, the AFC equipment needs to be multiple functional units with a unified system configuration, which unfortunately adversely affects processing speed, cost and system simplicity. Clearly, a simple technology for the electronic ticket is preferable.
- The use of Type C smart cards is recommended for the following reasons.
  - The processing speed of the Type C smart card is faster than that of other card types and it has a

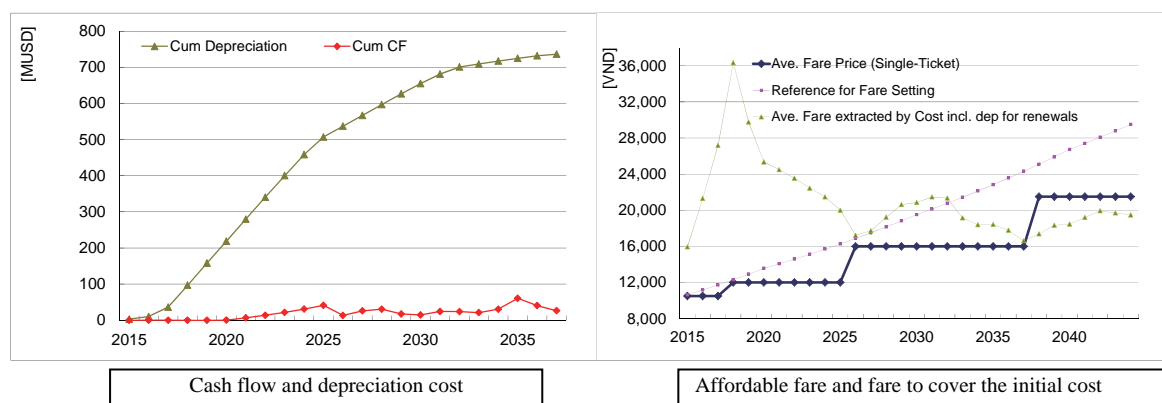
high level of security. Based on the experience in Japan, it is needed to have fast processing at station gates in order to secure the safety of passengers by mitigating congestions at platforms. The security of card itself is also critical since it contains the money of passengers. Type C can be considered as the best type of the IC card for railway passengers.

- b. Use of the Type C smart card could expect support from Japanese railway operators. In Japan, the railway operators, for instance JR East and Tokyo Metro etc., have designed and introduced this technology proactively, and they have a lot of experiences and knowledge on this as they became the largest issuers for public transport smart cards in the world. These companies are currently very positive to support the introduction of their system to Vietnam with a strong support of the Government of Japan.
- c. There is a rumor which says that it is a monopoly of Sony on type C technology, therefore, the price is much higher than others but this is not true. There are several suppliers of type C card in the world and the unit price of Type C smart cards nowadays can be made to be the same as other card by revising the specifications for production in foreign countries other than in Japan.

## Proposed Financial Scheme and Roadmap

### Financial Analysis

- Based on the financial analysis, it is almost impossible to expect that the fare income plus non-fare box business would be sufficient to cover all investments for the urban railway lines. The portion of the accumulative cash flow that can be considered as a resource for repayment is approximately 10-15% of the initial investment cost for Electrical and Mechanical (E&M) portion, which includes rolling stock, signaling, power supply and others. (Please refer the left graph in Figure 4).
- If the fare level is set to an amount that could compensate for the initial investment cost for E&M, the passengers will have to pay much more than they can afford during the first 25 years of operation. (Please refer the right graph in Figure 4).



**Figure 4 Result of Accumulative Cash Flow Analysis (2)****Financial Arrangement Proposal**

- Charter Capital
  - Initial Capital: At the establishment of the O&M company there are no railway assets. Therefore, capital in cash will be the charter capital. The amount of capital in cash should be decided based on the opening expenses. If the amount of capital in cash is assumed to be the equivalent of the quarterly average of the opening expenses from FY2014 to FY2015, approximately 8 billion VND would be needed to cover unexpected delays in the city budget allocation.
  - Contribution in kind: In consideration of the rational coordination of maintenance and renewal (i.e., upgrading, overhaul or replacement) and to enable efficient tax saving, it is recommended that all infrastructure and equipment from the city to the O&M company be a contribution in kind. However, since some assets such as bridges are not subject to renewal work, there are assets that should be retained by the city and provided to the O&M organization free of charge, as shown in the table below.

**Table 2 Funding Sources and Repayment Responsibility for Assets**

Item	Capital (ODA)	Repayment	Ownership of Assets
Infrastructure	Granted from Central Government to HPC	Central Government	<ul style="list-style-type: none"> <li>- Non-replaceable assets: HPC owns the asset and lends it to the O&amp;M company free of charge.</li> <li>- Assets subject to periodic replacement, such as rails, catenaries etc., should be a contribution in kind to O&amp;M.</li> </ul>
Equipment and Rolling stock	Transferred from Central Government to HPC (ongoing-lending)	HPC	O&M company

- Financial Support from HPC
 

Basically the SAPI team plans to develop the financial scheme of the O&M company based on a self-financing source. However, the O&M organization will need financial support from HPC in the following areas.

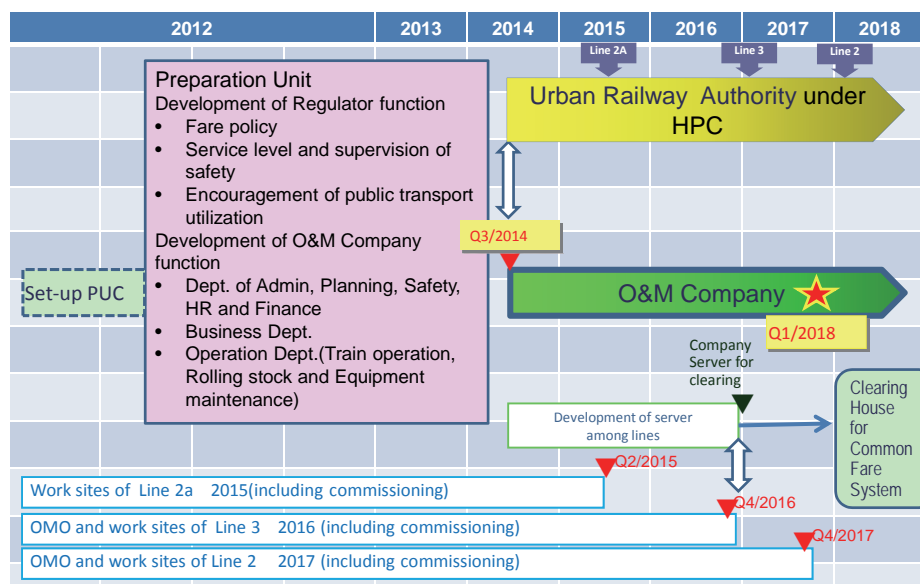
  - When cumulative cash flow of the O&M organization falls into the red, the company may borrow funds from banks. In this case, HPC provides the O&M organization with some portion of the interest as financial support to mitigate the burden of the interest.

If the cumulative cash flow were to be greatly in the red, such as from an investment in additional rolling stock or equipment, and the repayment of the principle becomes impossible, HPC could consider supporting a portion of the investment costs. In addition to the above, HPC could also support the O&M company with tax reductions or exemptions.

- If the cumulative cash flow were to be greatly in the red due to improper suppression of enhancement of fare level by HPC, HPC could consider supporting financially.

## Roadmap

- Key dates
  - The Preparation Unit for setting up of the O&M company and the railway Regulator will start within this year (2012).
  - The O&M company and railway Regulator will be set up in the middle of 2014.
  - The first line for the O&M organization will be put in service in the middle of 2015.



**Figure 5 Roadmap to Start of Operation**

- Some assets, such as an office IT system, the integrated OCC and the headquarters are required for the Management Control Division of the O&M organization. At this moment, there is no such equipment or buildings planned at any urban railway projects yet. Funds must be secured in order to provide such items and steps must be taken to arrange the implementation plan.

## Summary of Recommendations

In summary, this study recommends that the following be implemented.

- A single operation and maintenance (O&M) company for urban railways in Hanoi should be newly established under the auspices of the Hanoi People's Committee to manage all urban railways lines in Hanoi except Line 1, which shares tracks with the inter-regional trains under the auspices of VNR in on-going projects.
- A common fare system and an integrated Operation Control Center (OCC) should be established in order to enable better coordination among the lines. In particular, the introduction of a single specification for the automatic fare Collecting (AFC) system is recommended to enable easy and low-cost coordination of a common fare system.
- Basically all assets related to urban railways, including infrastructure, should be provided as a contribution in kind to the O&M company in order to ensure safety, enhance the financial viability of the O&M company and reduce the amount of annual financial support for operation provided by the city. Estimations show that when all assumptions are fulfilled, the annual financial support by the city would no longer be needed five years after the commencement of operation.
- Railway is very complicated system and establishment of the regulator system exclusively for urban railway should be completed first. Regulator system for bus has been already established, but it cannot be wholly applied to management of urban railways in the very near future. The Regulator function for urban railways will be put into PTA system afterwards.



## Chapter 1 Background and Objectives

### 1.1 Background

The National Assembly issued Resolution Ref. No. 15/2008/QH12 relating to the revision of the administrative boundaries for Hanoi and relevant provinces on August 1, 2008. Under this revision, the area of Hanoi increased 3.6 times and its population almost doubled to approximately 6.6 million in 2009 and is still growing. Currently, the road traffic volume is rapidly increasing, especially in the urban areas, which is causing issues such as traffic jams, deterioration of traffic safety, air pollution and difficulties in access to urban services. As such problems in urban transportation are expected to worsen, it is imperative that a trunk urban transport system that will enable the development of the urban areas on a sustainable basis be established.

On July 9, 2008, the Vietnamese Prime Minister approved the Transport Development Plan for Hanoi Capital up to 2020 (Decision No. 90/2008/QĐ-TTg) implemented by JICA (completed in March 2007), which defines the master plans for urban development in each field including urban transportation toward 2020.

The Line 2 project, which is under the jurisdiction of the Hanoi Metropolitan Railway Management Board (MRB) and supported by the Government of Japan, is scheduled to start operation in 2017. The Line-2A (Cat Linh-Ha Dong), which receives assistance from China, and the Line-3 (Nhon-Hanoi Railway Station), which receives assistance from the French Government, AfD, EIB, and ADB, are under construction, and scheduled to start their operation earlier than Line-2. Under these circumstances, there is an urgent need to establish an organization for the operation and maintenance of the Metropolitan Railway lines in Hanoi (hereinafter referred to as the “O&M organization”).

MRB is planning to submit its basic plan to the upper level organization, and the Hanoi People's Committee (HPC) is expected to approve it within the year 2012. Due to a lack of knowledge and experience in the establishment of an O&M organization for urban railway transport, the MRB has asked the Japanese government for assistance.

In order to develop a system to operate and maintain urban railways in Hanoi, there is an urgent need for assistance in establishing an appropriate O&M organization headquarters and its site offices. This will be accomplished by having discussions with the Vietnamese government and developing coordination among the relevant donors who are managing the construction progress of their respective lines.

This study is carried out as a SAPI (Special Assistance for Project Implementation) for Hanoi City Urban Railway Line-1 and Line-2 project, for which loan agreements (L/A) were signed in March 2008 and March 2009 respectively.

**Table1. 1 Projected Schedule for Establishing O&M Organization and Construction of Urban Railways in Hanoi**

Date	Milestone
Feb. 2011	- Approval for preparatory plan for an O&M Organization for urban rail lines in Hanoi
up to Dec. 2011	- Planning for O&M Organization (with support of GOJ)
	- Submission of O&M Organization Plan from MRB to HPC
Approx. July 2012	- Approval of Plan by HPC
2015	- Commencement of operation of Line-2A
2017	- Commencement of operation of Line-3
2018	- Commencement of operation of Line-2
2018	- Commencement of operation of Line-1

## 1.2 Objectives of the Study

Although the project owners and/or donors of each line in Hanoi are different, establishment of ONE O&M Organization will be pursued. This study targets three lines (2, 2A, &3), which are under the authority of HPC, as the first to be integrated, with the organization for the remaining lines to be addressed at a later date.

In this study, the framework and procedures for the establishment of an O&M organization will be discussed. In this regard, the role of the Regulator for urban railways will be considered as well.

This study is to support the development of a plan for the establishment of an O&M organization for urban railways in Hanoi by obtaining a thorough understanding of the latest project status for each of the relevant lines, including schedules, and by defining the functions that the O&M organization should perform at each stage. The major tasks are summarized below.

- (1) To develop a basic plan for the O&M organization for urban railways in Hanoi.

- (2) To develop a roadmap up to the commencement of operation on the respective lines.
- (3) To develop a detailed work plan for establishing the O&M organization.
- (4) To examine the relationship between the O&M organization, and other organizations or agencies.

### 1.3 Study Area and Counterparts

- (1) Study Area: Hanoi, Vietnam
- (2) Counterpart: Hanoi People's Committee (HPC)  
Hanoi Metropolitan Railway Management Board (MRB)
- (3) Other related agencies:
  - a. Department of Transport (DOT), Department of Finance (DOF), Hanoi Authority for Planning and Investment (HAPI), Department for Home Affairs (DHA) and other departments under HPC
  - b. Center for Transport Development, University of Transport and Communications (UTC)
  - c. Vietnam Railway Administration, Ministry of Transport (VNRA, MOT)
  - d. Agence Francaise de Developpment (AfD), Asian Development Bank (ADB), European Investment Bank (EIB) and World Bank (WB)
  - e. Vietnam Railways Corporation (VNR)

## Chapter 2 Current Conditions and Outstanding Issues

### 2.1 Current Status

#### 2.1.1 Socio-Economic Status of Hanoi Capital City

Hanoi is encompassed by the Thai Nguyen and Vinh Phuc Provinces to the north; Ha Nam province and a part of Hoa Binh province to the south; Bac Giang, Bac Ninh and Hung Yen provinces to the east; and Hoa Binh, Phu Tho to the west.



Source: Hanoi Portal (2011)

**Figure 2.1 Administrative Division of Hanoi**

Hanoi is the centre of the socio-economic, political and cultural aspects of Vietnam. After a revision of its boundaries in August 2008, Hanoi became the largest city in the country. It currently covers an area of 3,324.92 km<sup>2</sup> and consists of 10 urban districts: Hoan Kiem, Ba Dinh, Dong Da, Hai Ba Trung, Tay Ho, Thanh Xuan, Cau Giay, Long Bien, Hoang Mai and Ha Dong, 1 town: Son Tay, and 18

suburban districts: Dong Anh, Soc Son, Thanh Tri, Tu Liem, Gia Lam, Ba Vi, Chuong My, Dan Phuong, Hoai Duc, My Duc, Phu Xuyen, Phuc Tho, Quoc Oai, Thach That, Thanh Oai, Thuong Tin, Ung Hoa and Me Linh. Formerly, these suburban districts were agricultural areas that provided the capital with food and vegetables. Nowadays, there are more and more new factories as well as industrial zones located in these areas.

Following the expansion, Hanoi's GDP growth rate was 6.7% in 2009, higher than the target of 6.5%. This number hit 11% in the following year (2010) and reached 9.4% in the first three quarters of 2011 which is higher when compared to the same quarters in 2010.

The population of Hanoi, as well as its population density, is high, as shown in the Table 2.1.

**Table 2.1 Population in Hanoi in Comparison with the Entire Country**

	Population (000)	Area (km <sup>2</sup> )	Population density (Person/km <sup>2</sup> )	Population natural growth (%/year)
Entire country	86,024	331,051	260	1.08
Hanoi	6,472	3,344	1,935	1.31

Source: General Statistic Office (2009)

According to the data collected by the General Statistic Office as of April 1, 2009, the population of Hanoi was 6.47 million, in which urban citizens accounted for 41.2%, and rural citizens accounted for 58.1%. The population is unevenly distributed among the urban and suburban areas. For example, the population density in Dong Da district is currently over 35,000 persons/km<sup>2</sup> while the density in rural districts such as: Soc Son, Ba Vi and My Duc are less than 1,000 persons/km<sup>2</sup>. High population together with the lack of good planning on infrastructure have caused the urban area of the city to suffer from daily traffic congestion and serious environmental pollution.

### 2.1.2 Hanoi Urban Railway Master Plan

Hanoi is strongly promoting urban railway development to mitigate traffic congestion and air pollution, problems that are becoming more critical each day.

Hanoi City realized the importance of a longer perspective for transport infrastructure development, including urban railways and the Government of Vietnam initiated a new Master Plan entitled "General Planning on Construction of Hanoi Capital up to 2030 with a Vision to 2050 (1259/QD-TTg)" in July 26, 2011. According to this decision, eight urban railway lines will be

developed by 2030. These lines and their alignments are shown in Table 2.2 and Figure 2.2 respectively.

**Table 2.2 List of Urban Railways in Hanoi in Hanoi Transport Master Plan until 2030**

Line	Length	Route	Remarks
Line 1	38.7 km	Ngoc Hoi - Yen Vien, Nhu Quynh	
Line 2	35.2 km	Noi Bai – City Center – Thuong Dinh.	
Line-2A	14km	Cat Linh - Hao Nam - La Thanh - Thai Ha - Lang street - Nga Tu So - National Highway 6 - Thuong Dinh (linking with Line-2) - Ha Dong - Ba La.	
Line 3	21 km	Nhon - Hanoi Station- Hoang Mai	
Line 4	53.1 km	Dong Anh - Sai Dong - Vinh Tuy/Hoang Mai - Thanh Xuan - Tu Liem - Thuong Cat - Me Linh	
Line 5	34.5 km	South West Lake - Ngoc Khanh - Lang - Hoa Lac	
Line 6	47 km	Noi Bai – Phu Dien – Ha Dong – Ngoc Hoi	
Line 7	35 km	Me Linh – An Khanh – Duong Noi	
Line 8	28 km	Co Nhue - Mai Dich – Yen So – Linh Nam – Duong Xa	

Source: Prime Minister’s Decision No. 1259/QĐ-TTg



Source: Prime Minister’s Decision No. 1259/QĐ-TTg

**Figure 2. 2 Urban Railways in Hanoi Transport Master Plan up to 2030**

### 2.1.2 Summary of Progress of On-going Projects

Currently, there are four lines in the stage categorized as an “on-going project”, namely Line-1, Line-2, Line-2A, and Line-3 in the Master Plan. In this section, their current project statuses are summarized below, including their positions and approaches towards the operation and maintenance organization. The information below has been gathered through meetings with the relevant authorities and organizations.

#### (1) Line-1

##### i) Current status and schedule

Deputy Minister of Transport, Le Manh Hung once requested the Phase 1 of the project (Giap Bat – Gia Lam, 15.36 km) to start construction in 2013 and to open in 2018. According to RPMU/VNR, the basic designs have been modified, but the latest version has not been approved by the authority. According to the schedule, the basic designs will be finished by September 2012, completing Phase 1 of this project.

##### ii) O&M plan

**Training:** At present, JKT is developing a training program for staff who will participate in the operation and maintenance of Line-1 in the future. The draft has been submitted to VNR for approval and is waiting for opinions from VNR in order to amend it so that it complies with conditions of Line-1 and actual training conditions in Vietnam. In principle, education and training for the opening of operation will be a requirement for all personnel, such as management training for the top and middle management, and technical training for the operation and maintenance staff who will be working in the front line positions.

**Training of top management:** As the first step, the executives who will be operating the new company will attend management training in Japan immediately after facilitating the launch of the new company.

**Training of core staff:** Core staff members are the leaders of stations and depots. Core staff members, after receiving training for the basic skills and knowledge for implementing urban railways and the maintenance standards of various facilities, will undergo the technical training in Japan. They will also deepen their understanding of the supervisory guidelines for general staff, technologies and



skills through the instructor training provided by the O&M company for Line 1. Based on this, the core staff will compile the manuals and textbooks used for training the general staff.

Training of O&M staff: The operation staff will receive training according to their job roles, i.e., training for drivers, conductors, train operators at stations, and operation depots. The maintenance staff will receive training according to their job roles.

- **Operation:** Line-1 will establish two independent O&M companies, one for operation and the other for maintenance under VNR, since they have both intercity and urban railways. Meanwhile, the project owner of Line-1 indicated in the interview that the other lines (2, 2A and 3) should be placed under HPC (in a single company) for better management.
- **Asset ownership:** On the existing railway system, all civil infrastructures are owned by the government and Vietnam Railways is paying a track charge while the government is paying for them to sublet its maintenance tasks. Rolling stock is currently owned by Vietnam Railways. A new policy is required for urban railways, but at present there is no definitive agreement on this matter.
- **Deficit:** Since Line-1 is composed of both intercity and commuter railway, the project owner thinks that there should be a new policy for each part. However, no arrangement has been worked out.
- **AFC:** Line-1 is about to finish its AFC technical design and a common AFC system is recommended for all lines in Hanoi. According to the Line-1 project owner, the following conclusions have been reached about the AFC system after meeting with some of the relevant parties.
  - Smart cards will be used for all urban transport modes. Line-1 will use Type C. Since some other lines have not fixed their card types yet, the consultant for Line-1 recommended installing multiple type reader/writer (Type A/B/C). The fare inspection system will be a closed system (i.e., with entry and exit gates).
  - Multiple types of tickets will be issued such as single journey, daily and stored value tickets. As there should be a unified AFC system in Hanoi, AFC-related matters are expected to be

decided by the top management levels of HPC and MOT.

VNR and consulting firms have recommended establishing a Central Clearing House (CCH) and Public Transport Authority (PTA) for optimizing the operation and utilization of the urban railways

- OCC:

The OCC for Line-1 will be located in the depot. The project owner of Line-1 indicated that the planned depot is too small to provide the space for an integrated OCC since one consolidated OCC will be implemented to manage all lines.

(2) Line-2

i) Current status and schedule:

The Ministry of Transport has already commented on the basic design and the total investment for the project has been modified. As a result, it is now necessary to gain the approval of the Prime Minister and National Assembly. At present, the Economics Institute is evaluating the modified total investment and therefore the schedule for approval has not yet been fixed. Hopefully, the approval will be given within 2012.

Detailed designs for the elevated sections and the depot are being carried out. They are scheduled to be submitted for evaluation and approval by the end of 2012.

ii ) O&M Plan:

- Training:

The TOR stipulates that training is to be provided by the General Consultant (GC).

- The GC will propose an O&M organization model, make a detailed roadmap for commercial operation and then seek the necessary levels of approval.
- The GC will develop a strategy and plan for training. It will also coordinate the training of the core staff with the project manager and provide the operator with guidance for management and operation.
- The GC will plan, design (or coordinate with the consultants providing technical support for these activities), monitor and supervise the training process.
- The GC will assist and guide the project owner and the O&M organization for the first five years after commencement, including the preparation and implementation of the operation schedule, the organization and development of human resources, financial management,

station development, and commercial activities.

- Operation: Operation will be under the auspices of the HPC.
- Asset ownership: HPC will bear the responsibility for the repayment (both principal and interest) of all the projects within the boundary of Hanoi. Accordingly, equipment (such as rolling stock) and infrastructure will be transferred to the O&M company in accordance with the practices of Hanoi City. The use of a leasing mechanism has not achieved precedence in Hanoi.
- Deficit: HPC will provide a subsidy in the same manner as it does for the bus system in the city.
- AFC: Since Line 2 is funded by Japan, the Type C smart card has been proposed, but it is still under consideration.
- OCC: The OCC for Line-2 is located in the depot. During this study, the SAPI Team proposed using a space of around 2,000 to 3,000 square meters for the OCC building (an integrated OCC for all UR lines in Hanoi) and the headquarters for the O&M company. MRB reported this proposal to HPC and in Document no.3548/UBND-QHXDGT to agree in principle with this proposal.

### (3) Line-2A

#### i) Current status and schedule:

Construction: The groundbreaking ceremony was held on October 10, 2011 in the depot. As of the time of this report, the leveling of the site has just been finished. Only piles have been driven and girder construction has not yet commenced and even the details of the design are still under evaluation.

Project progress has been affected by different problems, such as land acquisition, bureaucratic procedures on the Vietnamese side, etc. However, the main target is still unchanged. This line is still scheduled to start operation in June 2015.

#### ii) O&M Plan:

- Training: Initially, 975 staff members were expected to be employed in order to start training from early 2012 in time for commencement of the operation. However, this number has been reduced to around 800 now. According to the plan by the Chinese contractor, starting from early next year, one third of those employees will go to Beijing in three groups for training for operation and maintenance. In principle, the remainder of the employees will be trained in Hanoi. Additionally, the employees to be hired will span from top management level to the direct worker level. However, it is important to note that the O&M company management skills and knowledge are not included in the training course in China. That is probably

because the Chinese training is mainly focused on the technology transfer. The training program of version 2 is under evaluation by a third party consultant.

- Operation: VNRA was initially planning to have one O&M group established under VNRA, after which it would be possible to make the transfer to HPC in order to comply with the current railway laws that require that the urban railways be managed by local authority. However, it is still necessary to obtain the necessary decisions from the government. At present, HPC has directed the MRB to discuss the details of this matter with VNRA/RPMU.
- Asset ownership: In the context that HPC will bear responsibility for the repayment for all lines, it is possible that Line-2A will be transferred to HPC. Investment capital is divided into two parts, which results in the division into the following two groups of assets:
  - Infrastructure belonging to the local government.
  - Equipment or vehicles belonging to private sector entities that will be responsible for the repayment.

However, the issue requires more discussions and decisions by the government.

- Deficit: HPC should subsidize the deficit when this line is transferred to HPC authority.
- AFC: Line-2A has not fixed its AFC system yet. Therefore, VNRA, the project owner of Line-2A needs more advice on how to integrate this line with other lines in the future.
- OCC: The OCC for Line-2A will be located in the depot.

#### (4) Line-3

##### i) Current status and schedule:

Current status of the nine packages:

- Package 1 (Elevated section – Line): Tendering is scheduled in August 2012 and the construction is expected to start in December 2012
- Package 2 (Elevated section – Stations): Tendering is scheduled in July while the construction is expected to start in December 2012.
- Package 3 (Underground section – Line and Stations): The detail design is under evaluation, but the construction is expected to start in August 2012.
- Package 4 (Depot infrastructure): The construction is expected to be completed in August, 2012.
- Package 5 (Depot building): Tendering plan has been approved. The construction is expected to start in September 2012.
- Packages 6 (Rolling stock, signaling, depot equipment, telecommunication, OCC / SCADA,

Power supply), 7 (other E&M), 8 (Track), 9 (AFC). The detail designs are under evaluation and contractors are expected to be selected in 2013.

All phases of these packages (including the general integration system process and the period up to the end of the Employer Take Over process) are to be mostly completed by November 30, 2016. Once all phases have been completed, a one-month trial run (from November 30, 2016 to December 31, 2016) will be conducted.

#### ii) O&M plan

- Training: No specific training is scheduled. The contract states that SYSTRA, a French consulting firm of this project, is to be responsible for providing assistance for the training of the operating and maintenance staff. Specifically, SYSTRA will assist in forming a training data base that includes the following.
  - Documents prepared by MRB, if any.
  - Documents prepared by the consultant, such as timetables for operating the Hanoi metro line, charts for the operation company and related departments, including job descriptions, job responsibilities, duty rosters, etc.
  - Documents prepared by contractors such as operating and maintenance manuals, materials to support training courses at factories or on site. SYSTRA will supervise the training performed by the contractors.
- Operation: Operation will be under the auspices of HPC.
- HPC will bear the responsibility for the repayment (both principal and interest) of all the projects within the boundary of Hanoi. Accordingly, equipment (such as rolling stock) and infrastructure will be transferred to the O&M organization in accordance with the practices of Hanoi City. The use of a leasing mechanism has not achieved precedence in Hanoi.
- Deficit: HPC will provide a subsidy.
- AFC: This line has officially proposed the use of the Type B card. The package for AFC system is scheduled to be installed between November 27, 2013 and June 18, 2016 and general integration system will be done between June 19, 2016 and November 20, 2016.
- OCC: The OCC for Line-3 will be located in the depot.

In addition to these on-going projects, feasibility study for Line-5 is being conducted by JICA –PPP scheme. The following is a summary of Line-5 information.

#### 5) Line-5

i) Situation and schedule:

TEDI is a local consultant firm selected by VNRA for making the feasibility study. TEDI submitted its draft final report to MOT.

On August 17, 2011, JICA and VNRA signed a Minutes of Discussion in which JICA agreed to finance the Preparatory Survey for Hanoi Line-5 Project from South West Lake – Hoa Lac – Ba Vi for a total length of 41km under PPP scheme. On September 19, 2011, the kick-off meeting of the survey was held at MOT's office. This study was to be carried out within one year. The Study Team finished the interim report and now is preparing its draft final report.

ii) O&M Plan:

The Study Team for Line 5 proposed that MRB (proposed to be the future Railway Regulator for Hanoi) would sign a concession contract with a Japanese operator (Keihan) for the operation of this line. MRB is to be paid a concession fee for its O&M services

- Regarding the sharing of the investment, the Study Team proposed an option in which a private sector entity (Keihan) would invest in the rolling stock and AFC machines, with the remaining investment cost being borne by the Vietnamese government.

## 2.2 Outstanding Issues

### 2.2.1 Nature of the Railway Business

Operation of an urban railway is mainly financed by the income from the fares from passengers. However, there are several problems that are innate to the business, but which tend to be neglected. In Table 2.4, several business factors are summarized for better understanding of the characteristics of railway business management. It is true that there are some organizations in Southeast Asian countries where these factors are not understood well by the stakeholders. As a result, they have failed to provide sound management. In the successful companies, the organizational and institutional planning for O&M is carried out by the stakeholders who have a clear understanding of these factors.

In order to establish an O&M organization for urban railways in Hanoi, it is very important for the relevant authorities to understand the following points. Frequent meetings and seminars with the stakeholders will help to enhance their understanding.

**Table2.3 Important Business Factors for Urban Railway Businesses**

Category		Factors
Income	Number of passengers	Long term demand forecast is conducted based on the limited information such as estimated future GDP and population. This often causes a gap between the estimation and actual ridership.
		It takes some time for citizens to become familiar with using an urban railway system. Moreover, the network of the urban railway will be insufficient at initial stage. Therefore the number of passengers tends to be less than predicted.
	Fare setting	The construction cost for urban railway is huge. However a high fare level can hardly be set to repay the construction cost from fare income because it will not match the affordability level of the passengers.
		Fare is often set at a low price for political reasons, and it may bring about an adverse effect on the sound business operation of the urban railways.
Expenditure	Responsibility for a huge asset	Urban railways are a part of the social infrastructure for city development. Therefore the strong leadership and responsibility of the city are essential to cope with the huge amount of money required for such infrastructures.
	Accounting	It is difficult to understand the concept of depreciation since this is not a tangible item.
	Imported goods /fuel	Those items are affected by external factors, such as exchange rate and inflation, and can seriously affect the sound management of an operation. .

Source; JICA Study team

### 2.2.2 Lessons Learned from Other Countries

Nowadays, urban railways are one of the key infrastructures in Asian megacities. A huge number of passengers have been using urban railways, but the financial conditions of the respective operators vary greatly among countries and cities. It can be seen that the railway operators, whose governments have good perspective and plan by themselves, and provide the necessary support to the operators, show a revenue surplus. The railway operators, whose governments have relied on private money, tend to hold a huge debt on their businesses.

In Japan, it is highly respected to learn from “failures.” Usually the reasons for failures are hidden and are seldom revealed. Therefore, the revealing of the facts about failures in the annual reports by some railway operators may help the stakeholders in Hanoi to understand the various critical factors.

**Table 2. 4 Financial Status and Critical Factors of Urban Railway Operators in Asia**

City/Country	Financial Status	Critical Factors
Bangkok/ Thailand	One of the two railway companies has gone bankrupt, and the other is facing financial hardship.	Depends too much on private investments and foreign companies. There is no subsidy from the government.
Delhi/India	Sound	Delhi Metro Company was given the necessary power and authority from the government, which enabled the construction to be completed as planned. This helped to reduce overall investment cost. The government gave some land to the O&M organization for stabilizing the management.
Singapore	Sound	To reduce the expense of the operation companies, all infrastructure and facilities including rolling stock were owned by the government and lent with small fee at the initial stage. Currently, railway system components, such as rolling stock and signaling, are owned by the operator. Some part of the purchasing cost was granted by the government. The government has been conducting various TDM (traffic demand management) policies such as road pricing in order to promote more usage of public transport including urban railways.
Jakarta/ Indonesia	It shows positive profit-loss, but the train operations are not well organized.	The fare is set at a very low level due to political reasons while the subsidy from the government is not enough. The management lacks competence, for instance, they don't spend the money for keeping the train operation as planned since they want to show a positive profit-loss statement.
Manila/ Philippines	Poor management	The fare is set at a very low level due to political reasons. The government support is not enough.

Source; JICA Study team

### 2.2.3 Financially Sustainable Organization

Urban railways need a grade separation with road traffic in order to avoid the collision accident with road traffic. Urban railways also need to have an advanced signaling system that enables the high-density operations for carrying large numbers of passengers. Because of these factors, urban railways require a large amount of financing and investment. On the other hand, the affordability of fare depends on the personal incomes of the passengers. During the initial stages, ridership tends to be exceptionally small because of the inefficient service level that can be provided as a network. Therefore, during the initial stages, it is almost impossible for railway operators to maintain a sound financial condition from fare income alone.

Urban railways are not to be constructed with the intent of gaining a profit, but rather for solving urban problems such as traffic congestion and air pollution. In this regard, it is necessary for the city government to provide sufficient subsidies to the railway operators.



Generally speaking, governments tend to use political methods for controlling the requests from railway operators for increasing the fare level. However, it is important to remember that this kind of control will result in larger subsidies to cover the deficits that will ultimately occur. Most municipal governments, not only Hanoi city, are suffering from a poor budget due to the vast range of items that must be taken care of by city management. The amount of tax income tends to be smaller due to the macroeconomic conditions. Therefore, it is understandable that the city government will attempt to reduce the subsidy to railway operators. In this sense, when railway management depends on subsidy income, its operation tends to be very unstable. It is not easy to achieve a revenue surplus during the initial period. Therefore, it is recommended that MRB and other relevant authorities seek to achieve a financially sound organization with less subsidy from the government.

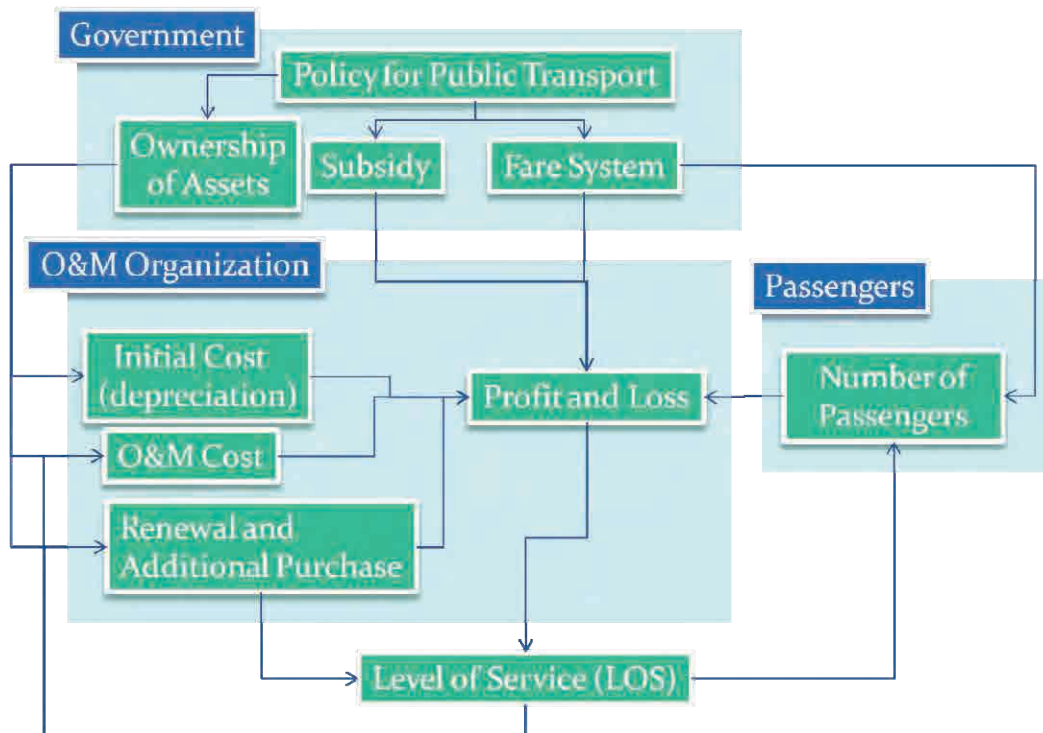


Figure2.3 External and Internal Factors Affecting O&M Operation

## Chapter 3 Basic Institutional Policy

In this chapter, the scheme of the O&M organization is discussed, and the process for providing the leadership for the most appropriate form of the organization is explained. To state the conclusion first, a “one member limited liability company” is recommended. Then the domain of the O&M organization is discussed and the establishment of a single operating company for all lines in Hanoi is recommended as the best solution. To realize a single operating company, the use of a common fare system is discussed. In order to implement the common fare system, the unification of equipment is required. Integration of AFC and OCC are also discussed. Since the management of urban railways is consigned to the provincial PC, the function of the Regulator needs to be defined. Compliance with the laws and the regulations as well are important as the foundation of the discussions. In this study, the Study Team reviewed the relationship among the laws and regulations regarding the urban railway projects in Hanoi with the local law firm. These issues are provided in the following sections.

### 3.1. Scheme of the O&M Organization

#### 3.1.1 Operational Organizations of Metros in the World

Most of metros in the world are operated by public entities that are a part of their respective local governments. In other words, they are not established as joint stock companies. Please see Table 3.1.

**Table3. 1    Metros in the World**

Area	City	Name of Operating Entities	Owner of the Company	Number of Routes
Asia	Beijing	Beijing Mass Transit Railway Operation Co. Ltd.	Public sector	12
		Beijing MTR Corporation Limited.	Public sector	2
	Shanghai	Shanghai Shentong Metro Group Co.,Ltd.	Originally public sector, now a listed company	11
	Hong Kong	MTR Corporation Limited	Originally public sector, now a listed company	9
	Taipei	Taipei Rapid Transit Corporation	Originally public sector, now a listed company	9
	Seoul	Seoul Metro	Public sector	4
		Seoul Metropolitan Rapid Transit Corporation (SMRTC)	Public sector	4
		Seoul Line 9 Operation Co., Ltd	Private sector	1

Area	City	Name of Operating Entities	Owner of the Company	Number of Routes
	Tokyo	Tokyo Metro Co., Ltd.	Public sector	9
		Bureau of Transportation, Tokyo Metropolitan Government	Public sector	4
	Osaka	Bureau of Transportation, Osaka Metropolitan Government	Public sector	8
	Bangkok	Bangkok Metro Company Limited	Private sector	1
	Delhi	Delhi Metro Rail Corporation Ltd. (DMRC)	Public sector	3
	Singapore	Singapore Mass Rapid Transit Corporation Ltd. (SMRT)	Public sector	4
		SBS Transit	Private sector	1
North America	Montreal	Société de Transport de Montréal (STM)	Not identified	4
	Toronto	Toronto Transit Commission (TTC)	Public sector	4
	Chicago	Chicago Transit Authority (CTA)	Public sector	8
	New York	MTA New York City Transit (NYCT)	Public sector	27
	Washington DC	Washington Metropolitan Area Transit Authority (WMATA)	Public sector	5
	San Francisco	San Francisco Bay Area Rapid Transit District (BART)	Public sector	5
South & Middle America	Mexico City	Sistema de Transporte Colectivo (STC Metro)	Not identified	11
	Buenos Aires	Metrovias SA	Not identified	6
	Santiago	Empresa de Transporte Suburbano de Pasajeros Metro S.A. (Metro de Santiago)	Not identified	5
	Sao Paulo	Companhia do Metropolitano de São Paulo-Metrô	Not identified	4
Europe	Moscow	Moskovski Metropoliten	Public sector	12
	St. Petersburg	St. Petersburg Metropoliten	Public sector	5
	Athens	Athens-Piraeus Electric Railways S.A (ISAP)	Not identified	1
		Attiko Metro Operation Company S.A (AMEL)	Not identified	2
	Budapest	Budapest Transport Closely Held Corporation (BKV Zrt)	Public sector	3
	Stockholm	Storstockholms Lokaltrafik (SL) (Stockholm Public Transport)	Not identified	3
	Berlin	Berliner Verkehrsbetriebe (BVG)	Public sector	9
	Roma	Met. Ro, Metropolitana di Roma S.p.A	Public sector	2
	Milano	Azienda	Not identified	3
	Oslo	Oslo T-banedrift AS	Not identified	6
	Paris	Régie Autonome des Transports Parisiens (RATP)	Public sector	16
	London	London Underground Limited (LUL)	Public sector	11
	Madrid	Metro de Madrid S.A	Not identified	14
	Barcelona	Ferrocarril Metropolita de Barcelona S.A (TMB)	Public sector	6
Lisbon	Metropolitano de Lisboa, E.P.E		4	

Area	City	Name of Operating Entities	Owner of the Company	Number of Routes
Middle East	Tehran	Tehran Urban & Suburban Railway Operation Co. (TUSROC)		4
Africa	Cairo	Cairo Metro	Public sector	2

Source: JICA Study Team

Note: There are some metros whose ownership structure could not be clearly identified.

There are some metro operators that have changed their organization form from a public-owned entity to the joint stock company by means of an initial public offering. In this table, only two cases, i.e., Seoul Line 9 Operation Co., Ltd and the company for Bangkok urban railways could be identified as organizations established by private funding. In the case of New York Metro, it is operated by New York City Transit Authority. The term authority here does not mean that it is an entity for regulation or supervision, but rather that it is an entity that is owned by the local government and is not a joint stock company. This fact shows that the construction cost of urban railways is high and that railways generally are not profitable businesses. To cope with this issue, there are some cases in which vertical separation has been adopted, such as BMCL in Bangkok, Seoul Line 9 in Korea and SMRT in Singapore.

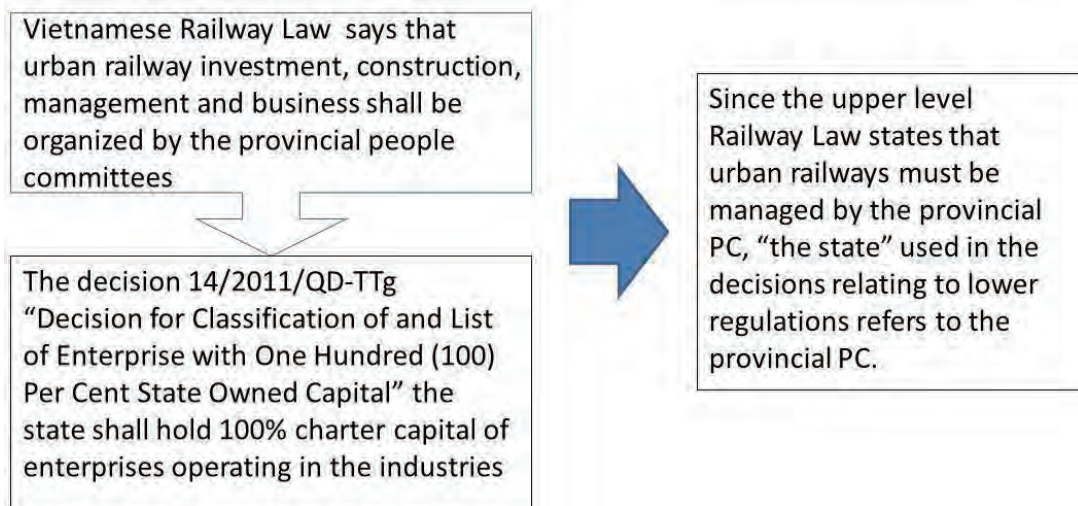
Considering these facts, it is appropriate that the operational organization in Hanoi be established as a public entity.

### 3.1.2 Legal Study

According to the decision 14/2011/QD-TTg “Decision for Classification of and List of Enterprise with One Hundred (100) Per Cent State Owned Capital”, the state is to hold 100% charter capital of enterprises operating in the industries relating to the “management and operation of urban railways”.

Article 55.2 of Vietnamese Railway Law says that the investment, construction, management and businesses on urban railway system shall be organized by the provincial people committees. Additionally, under Article 82.8 and 85.2 of the law on the organization of the People Council and People Committee, the provincial People Committee (PC) can exercise the representative right for state-owned capital in enterprises and organize the management of works/projects of urban transportation. Therefore, generally, the PC can hold 100% charter capital of a state-owned entity engaged in urban transportation business. It is clear that “the state” in the decision 14/2011/QD-TTg includes not only “the central government” but also “provincial government”. In reality a 100%

provincial government owned company already exists in Vietnam. (For the details, please see “3.7 Legal Study on the relationship among the related laws and regulations” in this chapter.)



**Figure 3.1 Legal Responsibility for Urban Railways**

While the above argument is only for an urban railway with state investment, private enterprises are generally permissible under Article 4.2 of “Decision 71/2010/QD-TTg on the issuance of regulation on pilot investment in Public-Private Partnership (PPP) forms.” Decision 71 says that railways are among the areas in which it is permitted to apply pilot investment in the form of PPP.

### 3.1.3 Functional Study

For the public entity suggested in 3.1.1, two options are left for an O&M organization. One is the direct operation by HPC and the other is the establishment of a 100% state-owned company. As HPC is a part of the government and not a company as required by the Decision as the entity for the operation of the urban railways, the direct operation by HPC may not be suitable. But for reference, these two options are compared below.

In Table 3. , the options are compared and it shows that a 100% state-owned company has more advantages. The following are the reasons for this conclusion.

(Finance comparison)

In order to free the O&M organization from the burden of the amortization and interest payments incurred from initial construction conducted by HPC/MOT/VNRA/VNR, the O&M organization should be separated from these government entities.

(Organizational comparison)

When there is direct operation, the special requirements of a railway business tend to be ignored while the total management by the city is being initiated. In regards to human resource management when under direct operation, the officers tend to come from totally different organizations and then leave, so it is difficult to keep continuous and consolidated management. This means that specialist in urban railways will not be nurtured by this arrangement. To cope with this, Osaka Metro in Japan, for example, operates as one of the bureaus within the city administrative structure of Osaka, and has a special arrangement in which once management officers have been assigned to the Osaka Metro, they will not be transferred to another bureau.

(Other comparison)

The investors will be able to receive profit when the company is publicly listed.

**Table 3.2 Comparison of Direct Operation and 100% State Owned Company**

Evaluation Criteria		Direct Operation by Authority, HPC	100 % State Owned Company
Finance	Separation of the O&M organization from amortization and interest payment of construction cost	Impossible	Possible
Organization	Ease in retaining staff in the O&M Organization	Difficult	Easy
	Flexibility in the management	Low	High
Others	Profit from Initial Public Offering	No	Yes

Source: JICA Study Team

### 3.1.4 Summary

Based on the description in Section 3.1.1, it can be said that the operation of the urban railways should be carried out by public entities and not by a joint stock company. However, in the description of Section 3.1.2, under the current conditions, the Vietnamese Decision requires that the O&M of urban railways be carried out by a 100% state-owned company. And Section 3.1.3 shows that operation by the O&M organization would be more advantageous than direct operation by a department of HPC. Table 3. also shows that a 100% state-owned company can provide profit to its founders when an IPO is issued in the future.

Interviews and discussions with stakeholders of this study indicated that there was no support for the option of direct operation as a department under HPC.

Consequently, the Study Team recommends the adoption of a “100% state-owned company” as a company scheme.

## 3.2 The Domain of the O&M Organization

### 3.2.1 Study on the Current Status of the Metro Systems throughout the World

Table 3 shows the current status of the metro systems throughout the world. Here it can be said that a “metro” system in this table indicates urban railways whose lines are at least partially run underground. It can be also seen that most of the metros are operated by a single company, which are mainly in the public sector. Please note that Beijing, Shanghai, Seoul, Tokyo, Bangkok and Singapore have more than two operators.

The Study Team extracted the reasons why these cities have more than two metro operators. The reasons for having two operators are arranged in Table 3.3. The main purposes are to introduce numerous investors, to promote competitiveness, and to cope with special issues, such as labour issues. It should be noted that the latter cases were introduced after stable operation had been established.

As can be seen from the above discussion, “a single company in a city” is a common approach, at least at the beginning stage. Even if “a single company in a city” system is adopted, generally it has to make every effort to avoid the disadvantages of a monopoly. In fact, most of these companies do not suffer from the “monopoly disease”, such as the lack of a competitive mindset or labour problems, and are also strictly trying to prevent their expansion. From the railway company management point of view, it is not a good idea to raise such problems. Beijing, Shanghai, and Seoul can be identified as the rare cases of having separate companies.

**Table 3.3 Purposes for Establishment of More than Two Metro Companies in a City**

Purpose	Description	City	Timing of Implementation
To have a number of funds	A new company is established in order to introduce private funding.	Bangkok, Seoul	From the beginning
	A new company is established in order to invite a provincial government for accelerating the construction speed of the urban railways.	Tokyo	After establishment of stable railway operation
To promote competitiveness	A new company is established in order to promote competitiveness in the city	Seoul, Singapore	After establishment of stable railway operation

Purpose	Description	City	Timing of Implementation
To cope with labour issues	A new company is established for employing the construction staff after completion of the construction.	Beijing, Shanghai	After establishment of stable railway operation

Source: JICA Study Team

### 3.2.2 Meaning of the Integration of Lines into a Single Company

The following table has been prepared to present the advantages of integrating the lines into a single company .

**Table 3.4 Advantages of Management by a Single O&M organization for City**

	Advantage	Description
1	Common fare system can be realized easily. (Please see Section 3.3 for details about the common fare system)	Passengers can travel to their final destinations using single tickets within the lines of the company. If they travel to destinations whose stations belong to another company, they have to buy another ticket at the interchange station to change trains. The establishment of the common fare system across the companies requires further arrangement, which is discussed in the following section.
2	Deficit of one line can automatically be filled by the profit obtained from another line	Some lines may not have enough fare revenue and are in a deficit. Other lines may have large fare revenues and be profitable. The O&M organization collects fare revenues from all those lines and pays out the necessary expenditures, such as salaries and power costs, regardless of the revenue from the respective lines. Consequently, HPC does not need to provide subsidies to cover the deficit as long as the total financial result of the company is profitable. If a consolidated O&M organization is not established, the profitable one will not transfer money to the line with the deficit. In such a case, the profitable companies will pay a dividend to HPC, and HPC will use it to subsidize the companies in deficit. But in some cases, HPC has to subsidize the companies in deficit even if the total result is profitable.
3	Human resources of the operator can be utilized efficiently	Transfer of drivers is easy from lines having sufficient drivers to ones having a driver shortage. Effective allocation of drivers is one of the tasks of the operating company. Each line is freed from worrying about new employment, and can save money.
4	Staff numbers of common or indirect departments can be saved	The departments like the administration, HR, and financial departments are commonly required in every company. To integrate these departments in a single company enables these departments to be managed by the personnel that are bare essentials.
5	Arbitration of conflict among departments or lines can be done easily	In case several operators run railways separately, it is not easy to arbitrate their interests by themselves. As the result, the service



	Advantage	Description
		level to passengers may stay at a low level. Such arbitration may be shouldered by the owners of these companies or the Regulator, but usually they don't have a power to intervene such conflicts.
6	Integration of OCC can be done easily (Regarding the details of the integration of the OCC, please refer to the section 3.5)	Train operation control is basically one of the major tasks of the urban railway operators. OCC is the center for train operation and control, which is representing the company. Hence to consolidate respective OCCs for each company into an integrated OCC may be difficult.

Source: JICA Study Team

As can be seen in the table above, there are various benefits to establishing one big company. Furthermore, generally speaking, the bigger the company, the more it can enjoy profit. From the viewpoint of railway management, operating all railways in Hanoi by a single company is strongly recommended.

### 3.2.3 Study on a Plan for a Single Line by a Single Company

The benefits of a single O&M organization have been discussed in Section 3.2.2. It is obvious that the urban railway in Hanoi should be operated by a single O&M organization. However, there are some opinions that one line should be operated by one company. Their reasons to support “a single line by a single company” are provided in Table 3. 5.

**Table 3. 5 Perceived Advantages of the Plan to Operate a Single Line by a Single Company**

	Advantage	Description
1	The originality of the line can be demonstrated	Competition among lines can be expected.
2	Strained relations with respective donor can be avoided	Respective donor does not need to be nervous about the control from other donors through the O&M company.
3	Disadvantages of a monopoly can be avoided	A single company for urban railways in Hanoi could become powerful and it is feared that this company will not follow the instruction from HPC.

Source: JICA Study Team

These opinions from the stakeholders must be highly respected. That is because the different lines have different donors and it is important to decrease their anxieties and dissatisfaction about establishing a single O&M organization as much as possible. In the next table, the ways to utilize these suggestions in the total plan are explained

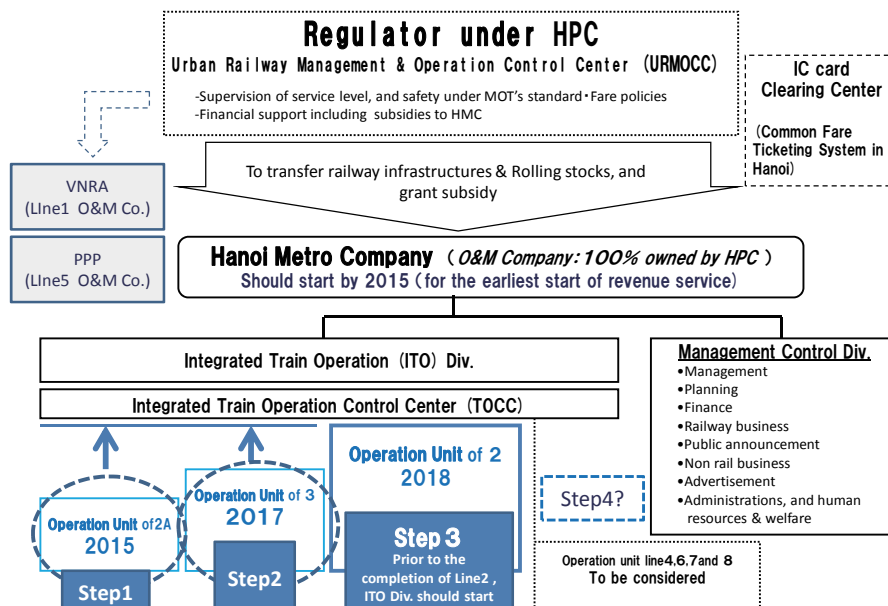
**Table 3.6 Utilization of Suggestions**

	Advantage of Operating a Single Line by a Single Company	Description
1	The originality of the line can be demonstrated	The originality can be demonstrated by the specifications of equipment and the level of customer care achieved through staff training even when all lines are consolidated into a single O&M organization
2	Strained relations with respective donor can be avoided	As in Figure 3. , there is a plan to form the Operation Units which would be in charge of management of the respective lines in order to respect donors in each line.

Source: JICA Study Team

The Study Team also developed the concrete organizational plan shown in Figure 3.2. In this plan, in order to respect the difference of each donor for each line, it is proposed to establish Operation Unit for each line. But at the initial stage when Line-2A is opened, there is no other Operation Unit and it is also proposed that at this stage, “Management Control Unit for Operation Unit will not be established since establishment of both Integrated Train Operation Division and Management Control Unit for Operation Unit will bring about redundancy.

Regarding the issue of monopoly, the owner of the O&M organization is HPC, and it is quite unlikely that the company will not follow the instructions from HPC. It is assumed that there is no need to consider the possibility that the development of a monopoly will become obstacle in Hanoi City.



**Figure 3.2 Proposed Overview of the Management Structure for Urban Railways in Hanoi**

Note that this plan was drafted on the assumption that Line-1 and Line-5 will be out of the domain of the O&M organization.

If the companies will be established by lines, the amount of adjustment work among the operators will increase, such as negotiations for determining the final departure times at interchange stations. The Public Transport Authority is one of the possible entities that could perform arbitration of a conflict of interest among lines. The PTA is an authority but it will not implement railway operations by itself. However, settling such complicated issues /conflicts requires a lot of time and effort and it is unlikely that the PTA could be powerful enough to take care of these tasks.

### 3.2.4 Study on the Status of Each Respective Line

VNR has discussed the O&M organization for Line-1 with the related ministries and reached the conclusion that the O&M organization for Line-1 has to be established separately from the O&M organization by HPC due to the close relationship with Vietnam Railways. On the other hand, Railway Law requires that the urban railways have to be managed by provincial governments.

The central government states that Line-2A has to be operated by HPC based on the stipulations of the Railway Law. The operating unit for Line-2A should be established immediately, since the staff training will be starting from January 2012.

Line-5 is scheduled to be established by a Public Private Partnership (PPP) scheme on the precondition that the PPP scheme for a railway business will be approved in the near future. It is said that part of the capital invested in this line is from the private sector, so ultimately the company for Line-5 cannot be established under HPC. Regarding Line-3, the funding source is different from that of Line-2, but the project owner of both lines is MRB. Therefore, the integration of these two lines can be carried on by the leadership of MRB. The issues to be solved towards integration of the lines by the O&M organization under HPC are arranged in the following table, which explores the possibilities that Line-2, 2A and 3 can be integrated under one O&M organization. The integration of these three lines would be easier than that of Line-1 and 5.

**Table 3.7 Constraints to Consolidation and Possible Solutions**

Line	Issues	Description
1	Operation arrangement between urban trains and intercity trains	An operating arrangement between urban trains and intercity trains is indispensable because both lines run on the same track. Intercity trains shall belong to VNR continuously. Inclusion of intercity trains into the O&M organization is

Line	Issues	Description
		not viable legally.
	Fund procurement was done by VNR	The funding for this project was invested not only for urban railways but also for intercity railways. Separation of the Line-1 operation from the intercity train operation may be difficult.
	In the railway law, it is stipulated that the management of the urban railways is consigned to the provincial government	The company that operates the urban railways has to be supervised by the provincial government.
2	No issues	Construction of this line is managed by MRB and inclusion of this line in the jurisdiction of O&M organization can be settled without discussion.
2A	Assets transferred from MOT to HPC. Fund procurement was done by MOT since a part of its ROW (right of way) was located outside Hanoi city.	In consideration of the expansion of the area of Hanoi city, transfer of assets from MOT to HPC will be required. Originally funding was through an ODA loan from China, which the central government borrowed. After the completion of the construction, assets can be transferred from MOT to HPC, provided this arrangement is approved by the central government.
	In the railway law, it is stipulated that the management of urban railways are consigned to provincial government.	The company to operate the urban railways has to be supervised by the provincial government.
	There is a plan to set-up the operating unit in the construction project in early 2012	This unit's operation cost is covered by construction expense. No consideration has been given for the needs for common departments, such as the financial department, at this moment. Hence this unit can be designated as the operation unit of the O&M organization.
3	No issues.	Donors are France, ADB, and etc. The counter part of Vietnamese side is MRB. Involvement of this line with an O&M organization should not pose any major problems.
5	The fund providers are MOT and the private sector. As their Feasibility Study was just started, no policies have been clearly identified at this time.	When this line was planned, a part of its right of way was located outside Hanoi city. However, later the area of Hanoi city was expanded to include that part.
	The capital of the operating company for this line will be contributed from private sectors. Thus, this is not relevant to 14/2011/QĐ-TTg "Decision for Classification of and List of Enterprise with One Hundred (100) Per Cent State Owned Capital"	Under Article 4.2 of Decision No. 71, railways should be built within the areas where it is permitted to apply pilot investment in the form of PPP. Under Decree No. 108, railway projects also fall within the list of areas promoted by the Government for investment in the forms of Build-Operate-Transfer, Build-Transfer-Operate, and Build-Transfer. The portion of the state participation is included in the total investment capital of the project, but no equity contributions by the state are made in case of PPP basically and therefore are not associated with the right to receive profit distribution from the project revenue.

Source: JICA Study Team

### 3.2.5 Options for the O&M organization (Summary)

It is true that when the domain of the O&M organization becomes large, the passengers will receive better services, the O&M organization can be managed in a more efficient manner, and consequently the subsidy HPC provides can be minimized without any special arrangements. A special arrangement could include the vertical separation of assets and the use of a gross cost system, so that the financial burden on the O&M organization may be reduced. In vertical separation, the government owns the assets other than the operating equipment and/or rolling stock, and the O&M organization owns only the assets for operation. The gross cost system is the system where all operational risks are shouldered by the government. In this system, the Regulator takes all fare income and distributes the money equal to the full operation cost to each O&M organization.

From the study of the current conditions of each line, it was found that integration of Line-2, 2A and 3 in the O&M organization seems to be relatively easy. This is because Line-2 and 3 are constructed by MRB under HPC and Line-2A can be transferred to HPC from MOT/VNRA after completion. Integration of 1 and/or 5 may be rather difficult. The major reason for this comes from the differences of their owners and types of funds from the other three lines. Specifically, the funds for Line-5 is from private sources. In the following table, the options for a consolidated O&M organization are explained.

**Table 3.8 Options for the Consolidated O&M organization**

	Targeted Lines	Description
Option-1	1,2, 2A, 3, 5	This may be rather difficult since the owner of Line-1 and 5 is not HPC. Specifically, the owner of Line-1 is VNR, and the owner of Line-5 is private. If the operation of Line-1 is consigned to VNR, the train operation of Line-1 can be well managed. However, the asset transfer from VNR to HPC may be difficult, and it also will not be easy to enter into a business agreement for the consignment of train operation. If the gross cost system is adopted, Line-5 can be integrated.
Option-2	1,2, 2A, 3,	It may be rather difficult since the owner of Line-1 is VNR, not HPC and its type of the funding is different from that of the other lines. If the operation of Line-1 is consigned to VNR, the train operation of Line-1 can be well managed. However, the asset transfer from VNR to HPC will be difficult and it also will not be easy to enter into business agreement for the consignment of train operation.
Option-3	2, 2A, 3, 5	This may be rather difficult since the owner of Line-5 is private, not HPC. If the gross cost system is adopted, Line-5 can be integrated.
Option 4	2, 2A, 3	This option may be easier than Option-1, 2 and 3

Source: JICA Study Team

### 3.3 Common Fare System and the Financial Scheme

#### 3.3.1 Meaning of Common Fare System for the Passengers

The common fare system can improve convenience for passengers who travel throughout the entire city by urban railways. Passengers can travel with one ticket as far as the lines are integrated into a single company or common ticketing zone. A common fare system provides passengers with the following advantages.

- (1) Passengers can buy a single ticket at their departure station that can be used all the way to the destination station, even if they change lines.
- (2) Passengers can travel for the cost of the shortest route to their final destination, regardless of the actual route travelled.
- (3) Passengers do not need to pay the base fare for the second line onward when they change lines.

#### 3.3.2 Common Fare System in a Company

As mentioned in the previous section, once the lines are integrated into the same operating company, they should adopt a common fare system.

The profitability of lines may vary. Some may have a deficit while others may have a profit. The O&M organization will manage and control these lines financially. It collects fare revenue from all lines, pays staff salaries and disburses the money as required to the respective work sites. This

process works as a mutual subsidy system within the company. In other words, the domain of the operating company is the same as the area of the common fare system. The bigger the O&M organization is, the larger the area for the common fare system will become. Figure 3. shows a map of the London Underground as an example of “a single company in a city.” The London Underground has 13 lines. If all planned lines in Hanoi city are integrated into the O&M organization, a common fare system like that found in London can be established automatically.

**Table 3.9 Issues Facing the Common Ticket System**

	Issue	Handling
1	Is it possible to use a single ticket to travel to the destination on all lines belonging to the company?	Yes, it can be done. If passengers have to go outside the gate once for changing lines because the stations are not physically integrated, the validity of the tickets can be limited to the few minutes required for transfer.
2	Is it possible to use an IC card to ride on every line in the common ticketing zone?	Yes, it can be done.
3	Is there a charge for the initial minimum fare at the time of transfer?	No, it is not charged.

Source: JICA Study Team



**Figure 3.3 Route Map of London Underground**

In Tokyo, there is a movement for consolidation of the Toei Subways (Bureau of Transportation Tokyo Metropolitan Government) and Tokyo Metro. The boosters of this movement are suggesting that the initial minimum fare that is incurred for transfer currently being charged to passengers become unnecessary. While this would be an advantage for the passengers, it is a major disadvantage for the operators because their revenues will decrease.

### 3.3.3 Common Fare System among Companies

In this section, cases of cities utilizing common fare systems are introduced. From these cases, it can be said that the governments may need to provide money for supporting such systems and may have to strongly control the railway companies in order to realize a perfect common fare system among the companies.

#### (1) Tokyo

There are many private operators in Tokyo and the use of a common fare system had been a pending issue among them for a long time. A part of this issue was solved with the introduction of an AFC (Automatic Fare Collection) system. Currently, two IC card systems have been established so far in Tokyo utilizing AFC and contactless card technology. The PASMO system is one of the two systems that was developed by private railways including Tokyo Metro and Toei Subways. The outline of PASMO system is described in Table 3.10 .

**Table 3.10 Outline of the PASMO System**

	Railway	Bus
Number of operators	26 operators	77 operators
Number of railway lines and buses introduced to PASMO	89 lines (1,279 stations)	About 14,000 buses

Source: JICA Study Team

The convenience of passengers has been greatly enhanced by this common fare system. Passengers can use PASMO for almost all railways and buses in Tokyo. However, there are still remaining issues, as shown in the following table.

**Table 3. 11 Issues Still Facing the Common Fare System in Tokyo**

	Remaining issue	Countermeasure in PASMO system
1	Use of a single ticket to travel to the destination on all lines belonging to the company.	Direct connecting gates between lines are now available at some of the interchange stations.
2	Use of an IC card to ride on every line in the common ticketing zone when a different IC card is used.	Now a passenger can use a PASMO card to ride on JR lines, which use the SUICA card. PASMO and SUICA can now exchange the ticket data with each other.
3	Initial minimum fare charged to transferring passengers.	Now there is a reduction of initial minimum charge realized for passengers who transfer trains between Tokyo Metro and Toei



	Remaining issue	Countermeasure in PASMO system
		Subways.

Source: JICA Study Team

## (2) Singapore

In Singapore, initially SMRT was the only operator. Later the Singapore government decided to arrange a concession contract with SBS Transit (the public bus service company in Singapore). This was never meant to reduce the convenience of passengers, and as a result, it has enabled passengers to be able to ride on the metro regardless of the domain of the operation company. It can be said that this is one of the most successful cases. This success is brought about by the fact that these two companies are fully controlled by the Singapore government.

It should be noted that the structure of interchange stations in Singapore is well designed to enhance passenger convenience.

**Table 3.12 Targets for Common Fare System Among Companies in Singapore**

	Targets	Currently on Singapore System
1	Use of a single ticket to travel to the destination on all lines belonging to different companies.	Now possible.
2	Use of an IC card to ride on every line in the common ticketing zone.	Now possible.
3	No initial minimum fare charged to transferring passengers.	Achieved

Source: JICA Study Team

## (3) Seoul

There are three metro operators engaged in the urban railway business in Seoul, and Korean Railway also operates commuter trains. The City of Seoul had difficulty in keeping their service level high because of labour problems. The city took action to enhance their service levels to meet the policy of the city. The City of Seoul had no intention of reducing passenger convenience by separating the operating companies. As a result, the common fare system was implemented for not only the metros, but also for the operation of Korean Railways in Seoul, which is perfect.

**Table 3.13 Targets for Common Fare System Among Companies in Seoul**

	Target	Currently on Metro system
1	Use of a single ticket to travel to the destination on all lines, especially those belonging to another company.	Realized, including Korean Railways
2	Use of an IC card to ride on every line in the common ticketing zone.	Realized, including Korean Railways
3	Elimination of initial minimum charge for transfer passengers.	Realized, including Korean Railways

Source: JICA Study Team

## (4) Paris

In Paris, RATP and SNCF operate commuter lines. The fare is fixed within the city, but the fare to outside of the city for SNCF lines varies by distance. With a single *carte*, a passengers can get on/off at every station in Paris including SNCF line without concern about the charge. It is very convenient for passengers, but the financial support for the operators may be required. (Please see Table 3.15). This system is costly for the government.

**Table 3.14 Targets for Common Fare System Among Companies in Paris**

	Target	Currently on Paris Metro system
1	Use of a single ticket to travel to the destination on all lines, even those belonging to another company.	Realized
2	Use of an IC card to ride on every line in the common ticketing zone.	Realized.
3	Elimination of initial minimum charge for transfer passengers.	Realized

Source: JICA Study Team

**Table 3.15 Supporting System of Ile-de-France from the Government**

Roles of National and Local Governments and Subsidies for Railway Development	Roles of National and Local Governments in Railway Passenger Operations
<ul style="list-style-type: none"> <li>-National government organized the basic urban development plan. Under the plan, a Contract of Plan is concluded between national government and local government.</li> <li>-Costs are shared among national government, local government and operators (RFF or RATP).</li> <li>-There are low-interest loans from the local government</li> </ul>	<ul style="list-style-type: none"> <li>-National government administrates and coordinates public transport through le Syndicat des Transports d'Ile-de-France (STIF).</li> <li>-Under the contract with operators, STIF commits management to operators providing social compensation for fares, inclusive of subsidy, sales incentives, bonuses or penalties for services, etc.</li> </ul>

Roles of National and Local Governments and Subsidies for Railway Development available for the operators	Roles of National and Local Governments in Railway Passenger Operations
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Source: JICA Study Team

#### (5) Common fare system for the railway operator (Summary)

Common fare system brings about the following advantages and disadvantages to the railway operator. Generally the burden on the government tends to increase.

**Table 3.16 Advantages and Disadvantages of the Common Fare System to the Railway Operator**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Demand will increase since the usage of the public transport becomes easy</li> <li>• Cost reduction by the simplification of ticket gate work can be anticipated</li> </ul>	<ul style="list-style-type: none"> <li>• Cost increase may be brought about since fare clearing among companies becomes complicated.</li> </ul>

Source: JICA Study Team

#### 3.3.4 Need for Discussion about Common Fare System in Hanoi

The need for a common fare system in Hanoi can be summarized as follows.

(1) There is a possibility that multiple operators will be established in Hanoi, and the ticket systems for these companies will be different. In such a case, the common fare system will be required to provide convenience.

(2) HPC wants to prevent the citizens from feeling any sense of inequality about fares when using different lines because each urban railway is to be equally governed by HPC.

#### 3.3.5 Distribution of the Fare Revenue

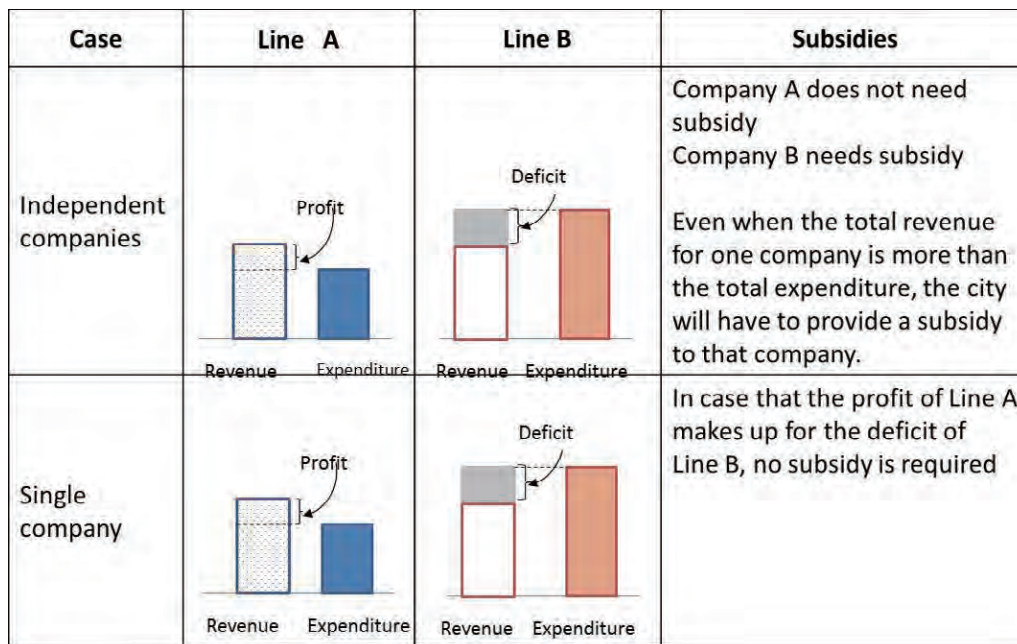
When the common fare system is adopted, the way to distribute fare revenue to each company may become a major issue to be settled. There may be two ways to distribute the fare revenue, as shown below.

(1) In the case of an independent company by lines

In this case, the revenue that each company originally obtained is distributed to them.

Since AFC is planned to be installed at each station in Hanoi, the amount of fare revenue which each respective company obtains can be calculated automatically.

As discussed in the previous section, HPC has to provide support to any operating company with a deficit, so that all the lines can maintain equal levels of service. However, the details of the subsidy system have not been finalized. (This issue is also discussed in Chapter 4). If some of the lines were showing a deficit, HPC would have to pay each of them a certain amount of money in order to compensate for their deficit, even if the total revenue from all the lines was showing a profit because of good business on some lines. Please refer to the following figure.



**Figure 3.4 Comparison of Independent Company with One Company Case**

(2) In the case of a single company

In this case, all fare revenue will be gathered by the headquarter of the O&M organization and the headquarters of the O&M organization pay all the expenditure incurred by each line. By adopting this system, the amount of subsidies from HPC can be minimized.

(3) Gross cost case

In this case, the amount equivalent to the expenditure is distributed to each company regardless of the amount of fare revenue.

This system is called the “gross cost model”. All fare revenue will be gathered by HPC (currently, no organization under HPC has been nominated yet for this work) and HPC assumes the burden of all the expenditure incurred by the O&M operators. All risk related to fare revenue is burdened by HPC.

By adopting this system, the amount of subsidies from HPC can be minimized. Instead, HPC has to supervise the O&M operators and keep them in line on spending. Because it is fundamentally a state-owned company, each operator has to get instruction from HPC about the details prior to taking any action. This kind of company cannot carry out its operation autonomously and will not become an attractive company when it is listed as a joint stock company in the future.

### 3.3.6 Summary

Based on the information provided above, the common fare system will be difficult to handle, regardless of the method, but the common fare system is basically a system for the passenger convenience and may entail costs.

**Table 3. 17 Issues Brought about to HPC by the Common Fare System**

	Cases	Issues	Remarks
1	Independent companies by lines	Subsidy may not be minimized.	
2	Single company		
3	Gross cost system under HPC	The Regulator has to have the management capability of the operating companies. The workload of the Regulator may increase drastically.	This is the same as when the Regulator operates all the companies under HPC.

Source: JICA Study Team

In Singapore and Seoul, the common fare system has already been established. Those integrated transportation providers share a common factor. Namely, they used to be a single company. On establishing the second company, the common fare system was developed based on a common foundation. Hanoi has a different background. Each line is newly established under different forms of financial assistance. Each line has independent plans and policies for the design of the system. It will not be easy to establish the common ticketing service with varied systems such as these.

As is shown in Section 3.3.2, a common fare system can be established easily within a company. In order to enhance the convenience for passengers, it is important to increase the lines integrated into the O&M organization as much as possible so that the area of the common fare system will be as extensive as possible.

The advantages and disadvantages of the common fare system from the viewpoint of the authority, railway operator and passengers are summarized in the following table.

**Table 3.18 The Advantages and Disadvantages of Common Fare System (Summary)**

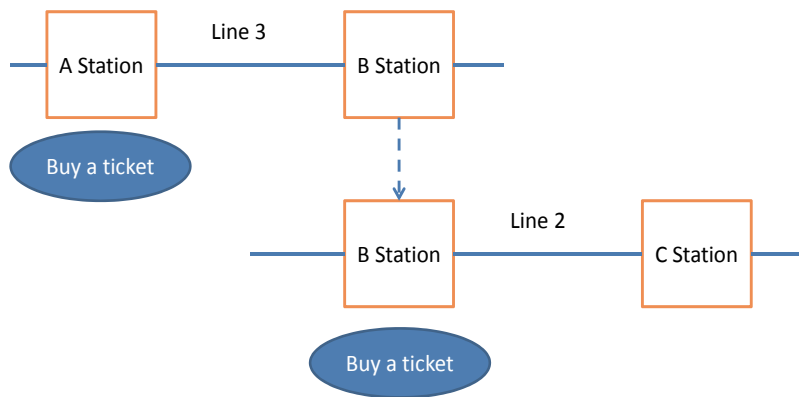
	Advantage	Disadvantage
Authority	May accelerate the development of the city and mitigate the road congestion. Complaints on inequity may not be brought about among citizens.	As a result of introducing the common fare system, discount on base fare is required, resulting in the increase of financial support from the city.
Railway operator	Demand will increase since the usage of the public transport becomes convenient. Cost reduction by the simplification of ticket gate work can be expected.	Cost increase may be brought about since fare clearing works among companies becomes complicated.
Passengers	Passengers can buy a single ticket at their departure station that can be used all the way to the destination station, even if they change lines. Passengers can travel with the charge for the shortest route regardless of their actual travel route.	Not identified especially

Source: JICA Study Team

### 3.4 Integration of AFC

#### 3.4.1 Necessity of Integration

An AFC system using a contactless IC card is planned to be installed on every line in Hanoi. But because the donors are different, even if the lines are consolidated under one O&M organization, building consensus for one particular AFC system among the lines will be very difficult because each line considers its system to be the best. Please refer to passenger flow in Figure 3.4. This flow diagram assumes that a passenger will travel from A station of Line 3 to C station of Line 2. Since the owner of Line-3 and Line 2 is HPC, at least these two lines may be integrated into the O&M organization under HPC. In such case, if the AFC at B station of Line 2 cannot read the information on the IC card ticket bought at A station, the passenger will not be able to board a train at B station of Line-2. Consequently, the passenger will have to buy another ticket at the interchange stations. It needs to be noted that a common ticket system will not work properly if the system specification for the AFC is not same, even among the integrated lines.



**Figure 3.5 Transfer and the Necessity of Integration of AFC Specifications**

The specifications of AFC need to be compatible among the lines even within the company to be able to read the information in the IC card. AFC compatibility is also required among the lines inside a common ticketing zone.

**3.4.2 Basic Requirement for the Specifications of AFC and Contactless IC card**

In this section, the specification items for the AFC and contactless IC card are described. Consensus regarding these specifications should be built among the relevant lines as soon as possible.

**Table 3.19 Basic Requirements for the Specifications of AFC and Contactless IC Card**

Items	Description	Remarks
Communication type	Communication between AFC and contactless IC card is made through telecommunication. There are some types of communication registered as international standards. The communication type of the AFC and IC card should be compatible among the integrated lines. IC card must be the high performance type in order to reduce the number of AFC and to secure the money in the card.	It has been said so far that the high performance IC card is costly. However, the price is getting lower these days.
Data format	Data content and format in the IC card should be common.	
Server specifications	To collect fare revenue data from stations, a server will be installed for each line. To collect the data from these servers, a server needs to be installed in the O&M organization. The detailed specifications, such as interface, data format, etc., need to be defined for communication among these servers.	
Handling of IC	Contactless IC card enables "touch and go"	Since a contactless IC card is costly, IC

Items	Description	Remarks
card at the gates	passage at the entrance/exit gates.	cards for a single trip are basically reused. The handling manner for reused IC cards needs to be discussed

Source: JICA Study Team

In this case, the Type C card used in Japanese railways is recommended for the reasons shown below.

a. The processing speed of the Type C is faster than those of other card types and it has a high level of security.

b. Support from Japanese railway companies can be expected.

Card system are not only defined by card types. There may be a lot of travel patterns of passengers. In order to cope with such situations, it is necessary to select the required data items and format it properly. The number of cards issued by Japanese railways is the highest in the world and they have a lot of experience. Since railway companies are not competitors they are willing to provide such a knowhow to the urban railway companies in Hanoi. A technical report relating to interoperable AFC systems is attached to this report as a part of this cooperation.

c. The unit price of Type C cards may be the same as other types.

It was said that the unit price of Type C card is higher than those of other card type. However, the suppliers revised its specifications for production in countries other than Japan and now they can offer this card type at a price that is competitive with other types of cards being proposed to Vietnam. The Type C card is not a monopoly; there are several suppliers of Type C cards in the world.

The advantages and disadvantages of card unification analyzed from the viewpoint of passengers, the railway operator and contractors are shown in the following table.

**Table 3. 20 Advantages and Disadvantages of Alternatives for Card Unification**

	Policy	Advantage	Disadvantage
Option 1	No coordination among lines. Each project will provide its own system of AFC.	There is no change of design and procurement for facilities for each project.	Passengers cannot travel on multi-lines using one single card. A common fare system cannot be achieved.
Option2	Request to all project to install multi-type of readers and writers (two kinds, at most).	Passengers can enjoy travel with one single card.	All projects need to modify their specifications. System will be more complicated to carry multi systems. Maintenance cost is the highest among all options. Speed at gates will be slower than with other options.
Option3	Request that all projects install one single type of reader and writer (highest	Passengers can enjoy traveling with one single card with high speed	Some projects need to modify their specifications totally.



	type).	without any extra cost. Some projects do not need to change their specifications.	
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Source: JICA Study Team

### 3.4.3 Interchange Stations in Hanoi

At interchange stations, the gates of both lines have to be directly connected for passenger convenience. However, all interchange stations planned in Hanoi are found to consist of an elevated station and underground station, where passengers will have to go out of the station premise for transfer.

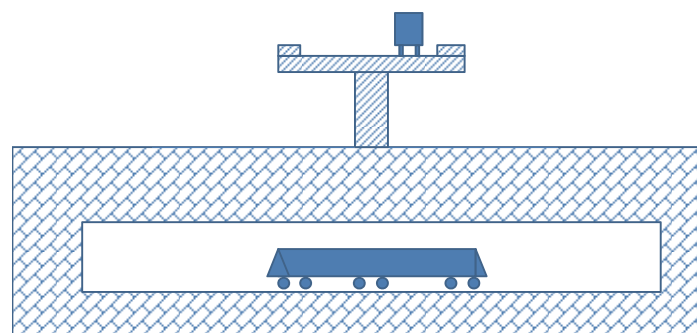
**Table 3.21 Number of Interchange Stations by Lines**

Lines	1	2A	2	3	5
1		-	(2)	(1)	-
2A			(2)	-	-
2				1	(1)
3					(1)
5					

The sections where construction projects have not started yet are shaded in gray. Numbers of interchange stations are indicated in brackets.

Source: JICA Study Team

At these stations normally when passengers go out of the gate, the AFC system recognizes that their travel is finished and they cannot continue their trip any more. Therefore, some steps have to be taken to enable transfer passengers to continue their trip with one ticket.



**Figure 3.6 Interchange Station of Elevated Section with Underground Section**

There are steps that can be taken to solve such problems. At some Tokyo stations of JR East, the station facility is elevated for some lines, such as the Yamanote Line, but it is directly connected to the

station facility for underground sections, such as the Keiyo Line. Passengers can transfer from the Yamanote line to the Keiyo line without passing through ticket gates. However, it should be noted that the structure for enabling this is expensive.

#### 3.4.4 Providing Interchange Stations Where Both Stations are Not Directly Connected

In Tokyo, there are some interchange stations without direct connection gates. This can be found with the stations of Tokyo Metro. On the other hand, there are stations with direct connection gates to transfer such as those seen with Tokyo Metro and Toei Subways. A connecting service at interchange stations has been established for just such cases. The solution between stations of Tokyo Metro is that the initial minimum charge for transfer is not charged when the passengers go through specific transfer gates at the alighting station. The solution between Tokyo Metro and Toei Subways is that the initial minimum charge for the transfer is discounted when passengers buy tickets between both stations, and go through the specific transfer gates at the alighting station.

**Table 3. 22 Patterns for Transferring At Stations Not Directly Connected**

Pattern	At stations where passengers alight for transfer		At stations where passengers ride on the next train	
	First train company	Action required by passengers	Connecting train company	Special arrangement for initial minimum fare
1	Tokyo Metro	Need to walk out of station premise to access to next station	Tokyo Metro	Required
2	Tokyo Metro		Toei Subways	Required
Directly Connected (For reference)	Tokyo Metro	No need to pass through gate since platforms are directly connected within station premise	Tokyo Metro	Not required

Source: JICA Study Team

Under such arrangements, passengers can transfer to other lines belonging to the same company or to another cooperating company freely within 30 minutes. When they pass the exit gate of the initial line, the exit time is recorded on the ticket. And at the entrance gate of the second line, AFC checks if the time after the exit time has not exceeded 30 minutes. If it has not, the gate opens for these passengers.

When Tokyo Metro adopted this system, they discussed about the best solution on time taken for the transfer. There was no reason why 30 minutes was adopted. After some trial time it concluded that there was no inconvenience for passengers and Tokyo Metro, and it became the established time limit.

**Table 3. 23 Ticket Arrangement at Interchange Stations of Tokyo Metro**

Type of ticket	Arrangement	Remarks
Ticket for transfer	Ticket is returned to passengers at the gate	At that time, time stamps are added.
Single trip ticket	Ticket is retained in AFC	

Source: JICA Study Team

It should be noted that Tokyo Metro is using paper tickets for single-trip tickets, which cannot be reused. Paper tickets are not recommended because there tends to be paper jams when the AFC system is used.

If a 30-minute allowance is going to be given to passengers for a single journey, the ticket will remain uncollected. If this option is chosen, there should be discussions beforehand about such risks that will contribute to an increase in the cost for compensating for the missing IC cards.

The proposed policy described in the table below was developed based on the following preconditions.

- An initial minimum fare is not charged for transfer, even for the lines that belong to different companies.
- The transfer time is limited to 30 minutes as in Tokyo.

**Table 3. 24 Proposed Ticket Arrangement at Interchange Stations in Hanoi**

Type of tickets	Actions	Remarks
Single trip ticket effective for transfer	Touch and go. If the both station premises are not connected directly, time stamps for transfer will be added to the card.	
Single trip ticket not effective for transfer	Insert IC card into the slot for return(Normal action)	

Note: The passengers with stored fare card can pass the entrance gate with a touch-and-go action at the interchange stations except the case of shortage of fare.

Source: JICA Study Team

### 3.4.5 Summary

(1) Regardless the domain of the O&M organization, the specifications of the AFC system including the IC card has to be integrated according to the requirements described in Table 3. .

(2) Some arrangements for the AFC system, including the IC card are required to support transfer passengers who have to go out of the gate once to change the line as described in Table 3.22.

(3) The structure of the interchange stations should be studied more from the standpoint of passenger convenience.

## 3.5 Integrated Operation Control Center

### 3.5.1 Reasons for Integrating the OCC

The following are the reasons for integrating the OCC.

#### (1) Quality enhancement in traffic service

When an accident occurs on the MRT (Mass Rapid Transit), OCC has the responsibility of informing passengers of it and keeping them updated so that passengers can select alternative transportation such as buses and taxis. Since passengers travel changing trains from one line to another in the city, the OCC should have an up-to-the-minute awareness of all lines and send out the information to the passengers regardless of the line they are currently using (Please see Table 3. 25).

Information of one line could help the operation of another at an integrated OCC. For example, if one line is delayed, the dispatchers for other lines may need to postpone the departure time of the last trains of the day. In such case, if the dispatchers for different lines are working on the same floor, they can quickly exchange the required information with each other. Such arrangements for enhancing passenger service can be expected frequently in daily operation.

Therefore, in order to share information about operating conditions with other OCC personnel, it is better that all the OCCs for respective lines be located in the integrated OCC.

**Table 3.25 Process of Reporting Rolling Stock Trouble**

	Steps	Description
1	Train driver reports the trouble to the dispatcher.	The time required for recovery is not certain when trouble or accident occur.
2	Dispatcher instructs the driver on possible measures to identify the cause of trouble.	The time required for recovery is not certain when trouble or accident occur. Passengers cannot take the proper action without the correct information and start to gather in the station because trains are not carrying passengers away.

	Steps	Description
		At interchange stations, the station staffs for other lines try to guide passengers away from the lines in trouble.
3	The driver finds the cause and tries to fix the problem but fails.	The time required for recovery is not certain at this moment.
4	Dispatcher decides to dispatch a rescue train.	At this time, the dispatcher begins to figure out the time that will be needed for recovery.
5	The following train staying at a station will be dispatched to the site for rescue of passengers. Passengers on the following train are requested to get off the train for safety.	A period of time needed to clear the troubled train is unpredictable since it depends upon the cooperation of the passengers.
6	Rescue train arrives at the site and is coupled with the trouble train.	To estimate the time for the rescue work of train is difficult since something unpredictable tends to happen in this situation.
7	Troubled train starts to move with the rescue train.	Dispatcher can clearly estimate the recovery time at this moment.
8	Line clear is confirmed and the operation is recovered.	Dispatcher has to be sensitive not to bring about disorder among the passengers when restarting the train service.

Source: JICA Study Team

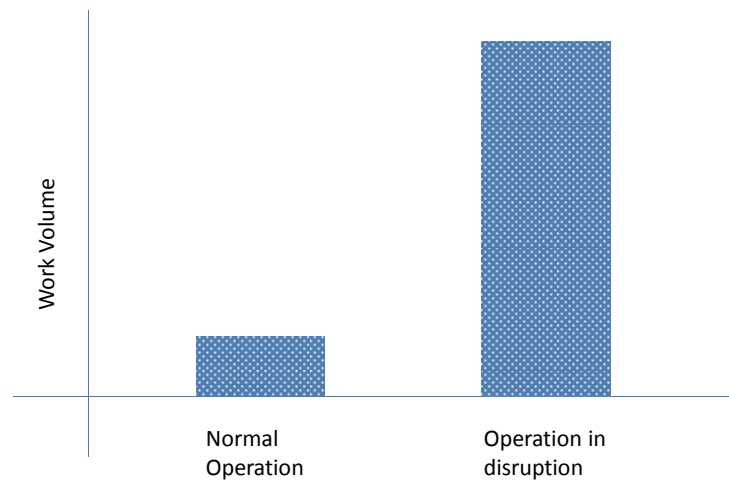
## (2) Enhancement of efficiency for staff allocation

Dispatchers in OCC are required to have special capability since they have to make decisions and issue their orders to the stations and drivers in a prompt manner. When a dispatcher leaves his/her job, it is not easy to find an experienced staff to replace him/her quickly. Therefore, it is necessary to have flexible personnel assignment with a secured number of backup staff. However, having backup staff for every line is not efficient management. If the OCC is integrated, personnel can be shared among the lines and the number of backup staff can be reduced.

When a contingency situation arises during train operation, the following actions increase drastically.

- Communication with drivers and station staff
- Manual operation of the route control when the automatic control does not work.
- Provision of the traffic information to passengers and mass media.

Therefore support from headquarters is indispensable for contingency actions. If the headquarters are not located nearby, the OCC has to retain its staff against contingency, which is not very efficient.



**Figure 3.7 Schematic of the Work Volume of Dispatchers**

### 3.5.2 History of Integration of OCC in Japan

There are two types of OCC integration used in Japan.

[Type A] Japanese National Railways

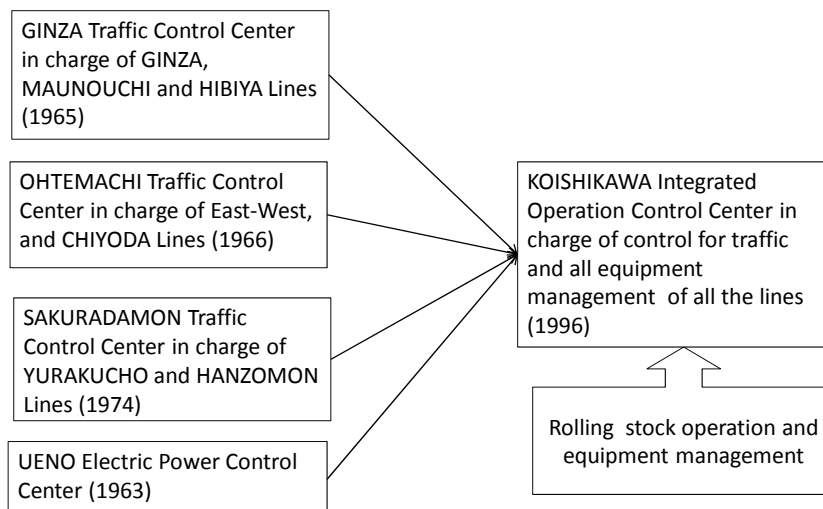
The dispatchers used to give their orders to the stations only by phone. At that time, signal/switch operation was done by the staff at the stations. The Study Team assumes VNR is operating lines in a similar fashion. In recent years, the system has progressed and the dispatchers can operate the signal routes directly from the dispatcher room. Accordingly, the dispatcher room has become larger and transformed into the OCC. A picture of the Tokyo OCC for JR East is displayed below. It should be noted that the “mimic display panel” was not installed intentionally here so that space and cost can be reduced. Every dispatcher can see the information once displayed on the mimic panel on the PC at his console.



**Figure 3.8 View of Tokyo OCC of JR East**

[Type B] Tokyo Metro and Osaka Metro

The OCCs for the metros in Tokyo and Osaka were built when the line was constructed in order to enable the operation of signals/switches remotely from the OCC. The OCCs were established by lines and their tasks were limited only to routing and traffic control. Later, the respective OCCs have been consolidated into an integrated OCC in order to improve their operations. Tokyo Metro renovated the control equipment thoroughly and centralized all functions related to train operation, including power supply control



**Figure 3.9 History of the Integration of the OCC at Tokyo Metro**

### 3.5.3 Required Specifications for the Integrated OCC

Following are the required specifications for the integrated OCC.

(1) The OCC should be located at a site adjacent to headquarters in consideration of obtaining quick support from headquarter for contingency operations.

(2)The location of the OCC can be far from the line since the control equipment at OCC can be connected to the sites by telecommunication cable.

(3)The specifications of control equipment can be different among the lines because the control of each one is independent. (It is better to unify the appearance of the panel boards for an aesthetic effect, but it may be costly.)

(4)The operation room for the OCC should be a big single room. The dispatchers have their own consoles for train control, power control, etc., which require a certain width of space for each one. Also the space for machine room, rest room, stand-by room and other such areas are required.

The actual floor width of the OCC for Osaka Metro is shown in Table 3. 26. This OCC is used to operate 8 lines. The OCCs that are located in nearby stations to control individual lines are planned to be relocated in the newly integrated OCC in conjunction with the timing of their equipment renewal. Up to now, four lines have been relocated to the new integrated OCC. The floor space for each usage area in the integrated OCC of Osaka Metro is displayed in the following table.

**Table 3.26 Space Allocations in the Integrated OCC of Osaka Metro**

Rooms	Spaces	Description
Operation room	970m <sup>2</sup>	Consoles for train operation dispatchers (for 8 lines) Consoles for traffic operation dispatchers (two) Console for dispatchers in charge of passenger care (one) Console for dispatcher in charge of rolling stock operation (one) Console for training Dormitory Training room and Common spaces
Machine room	1,100m <sup>2</sup>	Processors for integrated dispatching Traffic operating system (for 8 lines) Train telecommunication system (for 8 lines) Training system, dispatchers telephone system Power supply unit (for 8 lines) High voltage receiving unit, Spare rooms and Storage

Source; Osaka Metro





**Figure 3.10 Integrated OCC for Osaka Metro**

**3.5.4 Objective Plan for Integrated OCC**

Based on discussions with the Project Management Unit and the consultant for respective lines in Hanoi, an OCC Plan for the respective lines was extracted and is shown in the following table. For this study, the space for the OCC and the headquarters is assumed to be between 2,000 and 3,000 square meters, which is based on the assumption that they are built as multiple-storied buildings. Please see the following table.

**Table 3.27 Required Space by Options**

Facility	OCC		Building for headquarter	Total space required
	Operation room	Machine room	Multi-storied building	
Required space	1,000 m <sup>2</sup>	1,000 m <sup>2</sup>	1,000m <sup>2</sup>	
Option-1	Required space has to be secured	Required space has to be secured on the same floor as the operation room	Required space has to be secured in building that is separate from the OCC	3,000m <sup>2</sup>
Option-2	Required space	Required space has to be	Required space has to	2,000m <sup>2</sup>

	has to be secured	secured on the same floor as the operation room	be secured in the same building as the OCC	
Option-3	Required space has to be secured	Required space has to be secured on the different floor from the operation room	Required space has to be secured in building that is separate from the OCC	2,000m <sup>2</sup>
Option 4*	Required space has to be secured	Required space has to be secured on the different floor from the operation room	Required space has to be secured in the same building as the OCC	1,000m <sup>2</sup>

\*: Currently, this aspect is in the preliminary design stage and this option is not adopted since there is no room for such a contingency.)

Source: JICA Study Team

**Table 3. 28 Location of OCC for Respective Lines**

Lines	Location	Possibility for securing space	Description
1	In the Hanoi station	No space for integrated OCC is available	Since the intercity trains and urban trains run on the same tracks, operation control between them is indispensable. Since intercity trains are operated by VNR, Line-1 OCC cannot be transferred into the integrated OCC.
2A	Inside the rolling stock depot	23 ha Adjacent to Ha Dong station	OCC is planned to be built. No actual consideration has been made regarding the O&M organization and integrated OCC, as well as inviting headquarter into their depot space.
2	Inside the rolling stock depot	17 ha Adjacent to Xuan Dinh station	The spaces for the integrated OCC including the headquarters of the O&M organization are available.
3	Inside the rolling stock depot	15 ha Adjacent to Xuan Nhon station	They already have a concept for establishing their OCC and they have no intention to changing their plan for the integrated OCC, including the headquarters of the O&M organization in their depot
5	Not fixed	Not fixed	The OCC can be located inside the integrated OCC, but the location issue for the headquarters remains yet to be sold.

Source: JICA Study Team

From the above table, it can be seen that only the PMU of Line 2 shows a willingness to provide the space the integrated OCC. That is because other PMUs don't want to delay their schedule in order to modify their plans for the O&M organization. Line 2 project is now at the preliminary design stage and PMU can arrange the integrated OCC and the headquarter inside the depot without any delay for modification. There are a couple of options regarding the integrated OCC for the targeted lines, which are shown below.

**Table 3. 29 Options for the Integrated OCC**

	Involved lines		Description
1	All the lines except Line-1	Line 2-8	Ideal but modification of the approved plan may be difficult. It should be noted that even if their OCC were to be relocated to the integrated OCC, the construction cost may not increase so much, since the functions themselves will not be changed and, basically, extra equipment will not be required.

	Involved lines		Description
2	All the lines except Line 1 and lines already approved by HPC	Line 2, 4, 5-8	In this case, at least the information monitors of non-integrated lines should be installed in the integrated OCC, so that the minimum information of those lines can be obtained. While this is practical, it is doubtful that the integrated OCC without lines whose construction plan were already approved by HPC could have power over lines.

Source: JICA Study Team

### 3.5.5 Summary

Regarding the lines whose plan are already approved by HPC, some delay might be seen if their OCC were to be transferred to the integrated OCC. Therefore, the target lines for establishment of the integrated OCC can be limited to the lines whose plans have not yet been approved by HPC. In this case, there may be cost saving in adopting a strategy where the OCC building should be designed for all the lines in HPC and the OCC spaces should be expanded according to the opening of a new line. The following are the concrete plans for the establishment of the integrated OCC:

- (1) The integrated OCC is proposed for two purposes. One is the enhancement of the service level, and the other is to enable the development of an efficient operation scheme.
- (2) The space for the integrated OCC including the headquarters office for the O&M organization is 2,000 to 3,000 square meters based on the assumption that they are built as multiple story buildings.
- (3) These space can be secured inside the depot of Line-2.

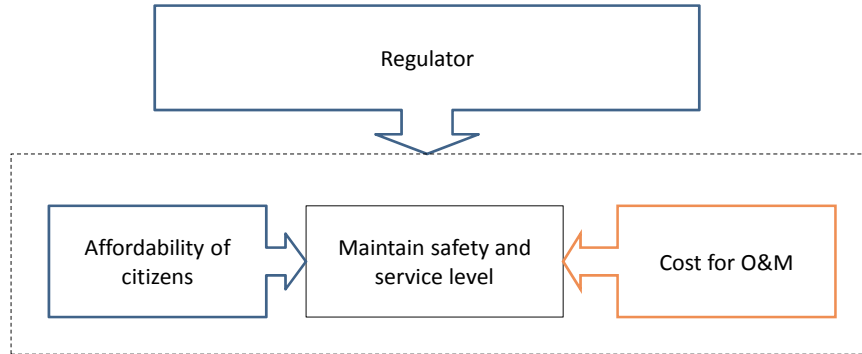
## 3.6 Role of the Regulator for Urban Railways

The operating company has already been discussed, but when the operating companies implement their activities, a Regulator for urban railways will be needed. In this section, the role of the Regulator for urban railways is discussed.

### 3.6.1 Necessity of the Regulator for Urban Railways

In the transportation business, safe operation is essential because it is directly related to the lives of the passengers. Fare income is very important because it is used for the equipment to maintain safety. Still, as the urban railways are infrastructures intended for supporting the daily lives of the citizens, the affordability of citizens has to be considered when determining fare level. The Regulator for urban

railways plays a major role on behalf of the government in establishing the policies that will control and supervise the safety of transportation while maintaining a balance with its affordability of the citizens.



**Figure 3. 11 Relationship Among Regulator for Urban Railways, Passengers and the O&M Organization**

The following table shows the Southeast Asian countries with the Regulator for urban railways already established. In Thailand, they fully utilize the PPP concession contract.

By nature, railways operate as an autonomous system to perform safety control and fare settlement. If railway operators ignore safety and fail to maintain assets and equipment, serious accidents can result. If the railway operator raises the fare level freely without consideration of the affordability of the citizens, the number of passengers will certainly decrease. Since railway operators do not want to cause accidents or reduce the number of passengers, they will naturally maintain safety and will not raise fare level without consideration of the affordability of the passengers.

**Table 3. 30 Regulators for Urban Railways in South Asian Countries**

City/Country	Regulator for urban railways	Remarks
Hanoi /Vietnam (for reference)	VNRA under MOT The Regulator for urban railways has to be established by the provincial government for urban railways.	Railway law says that the urban railway has to be managed by provincial governments.
Jakarta /Indonesia	Directorate General of Railways under Ministry of Transport and Communications.	PT.KA, former Indonesian National Railways provide commuter service in Jakarta.
Bangkok /Thailand	MRTA (Mass Rapid Transit Authority) and BMA (Bangkok Metropolitan Administration)	PPP operator (Bangkok Metro Company Limited) operates subways by concession with MRTA PPP operator (Bangkok Transit System Company) operates elevated urban railway by concession with BMA. MRTA and BMA don't play the role of the Regulator for urban railways.
Singapore	Land Transport Authority under MOT	Singapore Mass Rapid Transit and

City/Country	Regulator for urban railways	Remarks
		Singapore Bus Service Transit (both owned by public sectors) operate the urban railways
Manila /Philippines	Department of Transport and Communications	Railway operator for Line-1 and 2 is Light Rail Transit Authority under DOTC
Delhi/India	Commissioner of Railway Safety under Delhi Development Authority is in charge of inspection for the safety of Delhi Metro.	Delhi Metro is the company established by the central and local governments.

Source: JICA Study Team

### 3.6.2 Role of Regulator for urban railways in Hanoi

In Vietnam, the management of the urban railways is consigned to the provincial government and MOT conducts the supervision of the safety. Therefore, HPC is recommended to establish the Regulator for urban railways as an executive organization which secures the sound operation of urban railways for the sake of Hanoi citizens. Study Team presents the major tasks of the Regulator for urban railways referring to the Japanese Regulator for urban railways system and MOT in Singapore in the following table.

**Table 3.31 The Tasks of the Regulator for Urban Railways**

	Tasks	Description
Economical regulation	Accreditation of proper fare level	Regulator for urban railways submits a plan for fare level for approval to HPC. Evaluation system for proper fare level will be discussed later.
	Accreditation of subsidy from HPC	There may be some risks such as inadequacy of fare level or passenger numbers. The Regulator for urban railways conducts proper institutional design to avoid such risks as much as possible. If HPC must support operators when they are in trouble financially, and their service is indispensable for the development of Hanoi City, the Regulator for urban railways may calculate the amount of a subsidy based on a certain rules stipulated beforehand and submit it to HPC.
Social regulation	Supervision of proper operation	In order to improve service levels to meet the expectations of commuters and to make urban railways their first choice, the Regulator for urban railways supervises operators' performance. For example, the Regulator for urban railways checks the congestion ratio not to exceed the maximum number of passengers each train can carry.
	Supervision of safety	To secure safety is the basic requirement for all transportation modes. The safety of the urban railway has to be supervised. This is basically the task of MOT. This task may need to be carried out also by the Regulator for urban railways in Hanoi through consultation with MOT.
Political initiative	Promotion of commuters to the public transport	Reducing the number of motorcycles to mitigate the road congestion is one of the major objectives related to constructing urban railways. The Regulator for urban railways has to take political initiative on these issues by utilizing the political powers of the government to implement initiatives, such as instituting a vehicle usage tax or restricting traffic rights.
	Securing the internal return for area development along the line	In order to secure fare income, area development along the lines is required. At the same time, HPC has to secure the internal return for area development of the lines in order to secure the fund for repayment and subsidies to the O&M organization. The Regulator for urban railways has to manage this issue through cooperation with the related departments, such as DPI and DOT

Source: JICA Study Team

Preparation of the Regulator for urban railways will be conducted in the Technical Cooperation, which is planned to be done after this project.

### 3.6.3 Consolidation of the Regulator for Urban Railways to Public Transport Authority (PTA)

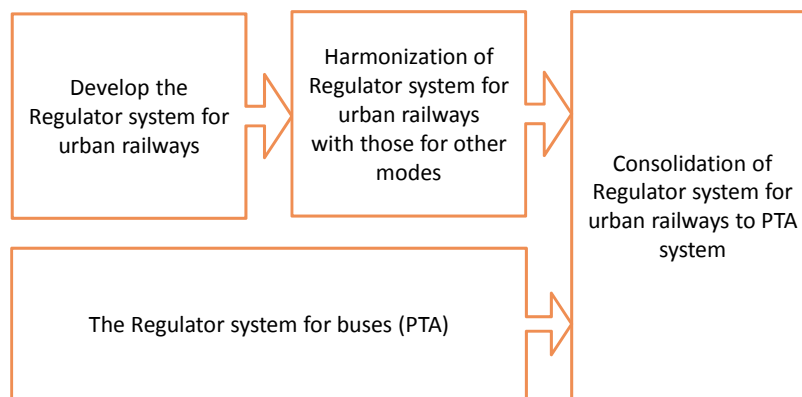
The World Bank has proposed that the PTA be the organization to manage various transport modes in Hanoi. This plan has not been approved yet by HPC. Since it seems that the Regulator for urban railways may have a similar concept as the PTA, the relationship between two organizations will be discussed in this section.

Apparently PTA is planning to establish a means to manage various transport modes including urban railways. In order to consolidate the PTA and Regulator for urban railways, the following approach has to be taken.

(1) A railway is a very complicated system so the establishment of the Regulator for urban railways system should be completed first. The Regulator for buses has been already established, but it cannot be wholly applied to the management of urban railways.

(2) The common areas for all transport systems should be identified by comparing the bus and taxi systems with urban railway operating area. Reform or modification may be needed in order to have a more effective system. It should be noted that an effective system cannot be realized from the beginning since there is no perfect model to meet the requirements of the urban railways.

(3) The Regulator for urban railways function will be put into the PTA system.



**Figure 3. 12 Process of Transfer to PTA**

#### 3.6.4 Summary

In Vietnam, the Regulator for urban railways system has already been established for the Vietnam railways. Management of the urban railways is consigned to provincial governments. Therefore, there is a need to establish the Regulator system for urban railways in Hanoi. In other countries, generally the Regulator for urban railways system has been adopted. From these facts, the Study Team recommends the establishment of the Regulator system for the urban railways under HPC.

The basic tasks for the Regulator for urban railways are as follows.

(1) Accreditation of the proper fare level

- (2) Accreditation of necessary support, such as a subsidy from HPC
- (3) Supervision of the proper operation
- (4) Supervision of safety
- (5) Promotion of urban railways to commuters
- (6) Securing the internal return of the area development along the lines

Regarding the consolidation with PTA, it should be discussed after development of the Regulator system for the urban railways.

The Study Team will propose “Hanoi Urban Railway Management Center,” as tentative name for the Regulator for urban railways to be put under HPC.

### 3.7. Legal Study of the Related Laws and Regulations

#### 3.7.1 Institutional Scheme of O&M Organization

The following are the four legal documents highly related to the establishment of an O&M organization for urban railway.

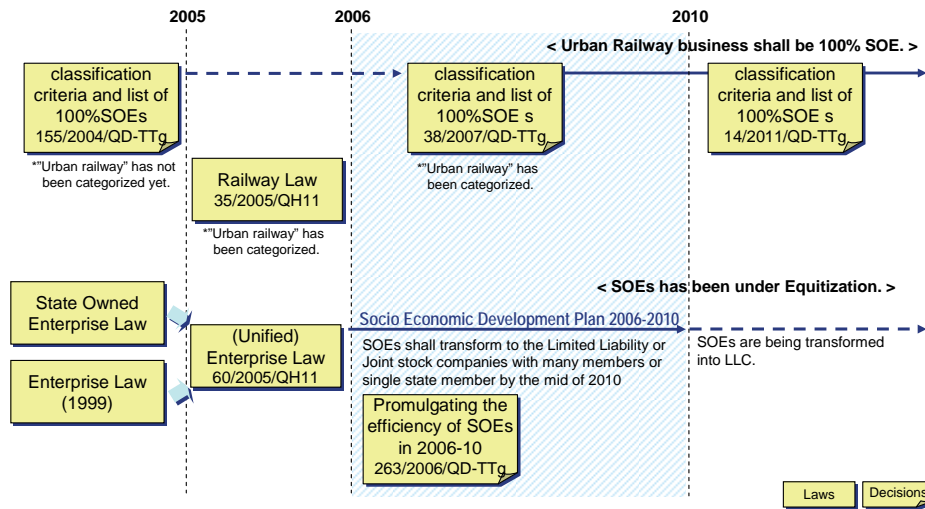
- “Classification criteria and list of 100% SOEs: 14/2011/QD-TTg”,
- “Promulgating the Government's Program of action for stepping up the reorganization, renewal, development, and raising the efficiency of state enterprises in the 2006-2010 period: 263/2006/QD-TTg”
- “Law on the organization of the People Council and People Committee: 11/2003/QH”
- “Railway Law: 35/2005/QH11”

As per 14/2011/QD-TTg, an urban railway business receiving investment from the state must be undertaken by a 100% state-owned entity while some non-critical businesses such as maintenance, cleaning, security, etc. may be outsourced. In other words, any company in which the government holds less than 100% charter capital cannot manage and operate an urban railway.

In reviewing many arguments and Prime Minister Decision 263/2006/QD-TTg about state-owned enterprises (SOEs) in Vietnam, the Study Team understand that SOEs have been instructed to



transform into Limited Liability Companies (LLCs) or Joint Stock Companies (JSCs) with many members or a single state member as defined in the Enterprise Law in order to reduce state subsidies.



**Figure 3.13 Vietnamese Legal Framework for the Establishment of O&M Organization**

In this regard, O&M organization for urban railway must be established as an LLC of which 100% of its charter of capital is held by the state. The option of having operation and maintenance work for an urban railway handled directly by state organization is quite unrealistic, since other transport modes, such as the national railway and bus in Hanoi, have already been transferred from direct operation by state to one-LLC in order to realize financial transparency.

As the “Constitution of the Socialist Republic of Vietnam” stipulates, people's committees are the executive agencies of the respective people's councils and the local administrative state bodies. Additionally, under Article 82.8 and 85.2 of the Law on the organization of the People Council and People Committee, the provincial People Committee (PC) can exercise the representative right for state-owned capital in enterprises and organize the management of works/projects of urban transportation. Article 55.2 of Vietnamese Railway Law also says that urban railway investment, construction, management and business shall be organized by provincial-level people's Committees.

Thus, in general, HPC can hold 100% charter capital of the state-owned entities for urban railway in Hanoi.

### 3.7.2 Legal Relationship among Relevant Parties

(Safety)

Under Decision No. 61, an enterprise doing railway transportation business must obtain a safety certificate. The authority in charge of granting the safety certificate is the Vietnamese Railway

Authority (“VNRA”). Therefore, the O&M organization must apply to VNRA for the safety certificate.

(Fares and subsidies)

Regarding fares and subsidies, the Ministry of Transport (“MOT”) will chair and work with the Ministry of Labor, Invalids and Social Affairs (“MOLISA”) and the Ministry of Finance to issue the guidance on fare exemption and reduction. The price of fare for urban railway transportation is determined by the Provincial People Committee, i.e. HPC. However, at this moment, there is no guideline for urban railways. Therefore, it should be finalized before beginning the registration procedure for the O&M organization.

(Timetable)

With regard to the train operation timetable, the Minister of the MOT will determine the priority order for trains, issue guidance on the formation and promulgation and announcement of the train operation timetables for the urban railways.

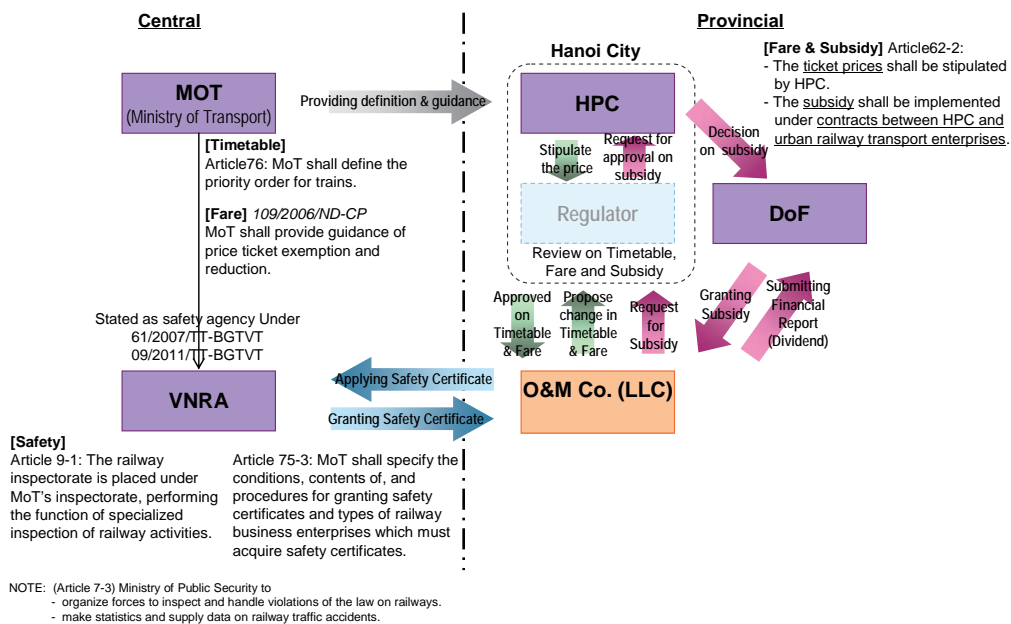


Figure 3.14 Typical Scheme for Hanoi Urban Railway

### 3.7.3 Private Investment in Urban Railway Sector

According to Decision No.14, state-owned enterprises that engage in the business of the management of national or urban railroads (Schedule 1) must be 100% state-owned. Hence, if the O&M organization is to receive investment from the state, it must be owned 100% by the state.

However, Decision No. 14 does not mean that all enterprises engaging in such business must be 100% state-owned; that is, private enterprises are permitted in principle.

Under Article 4.2 of “Decision 71/2010/QĐ-TTg on the issuance of regulation on pilot investment in Public-Private Partnership (PPP) forms,” railways are among the areas in which it is permitted to apply pilot investment in the form of PPP. Under “Decree 108/2009/ND-CP on investment in the form of Build-Operate-Transfer, Build-Transfer-Operate, or Build-Transfer contracts,” railway projects also fall within the list of areas encouraged by the government for investment in the forms of BOT, BTO and BT.

Investment in the public-private partnership (PPP) form means that the state and investor jointly implement projects for the development of infrastructure or provision of public services on the basis of project contracts. The participating portion of the state is included in the total investment capital of the project, but is not an equity contribution by the state and is not associated with the right to receive profit distribution from the project revenue. Therefore, it can be said that Decision No. 71 is not generally applied to PPP schemes, so private investors can set up a company that operates an urban railway.

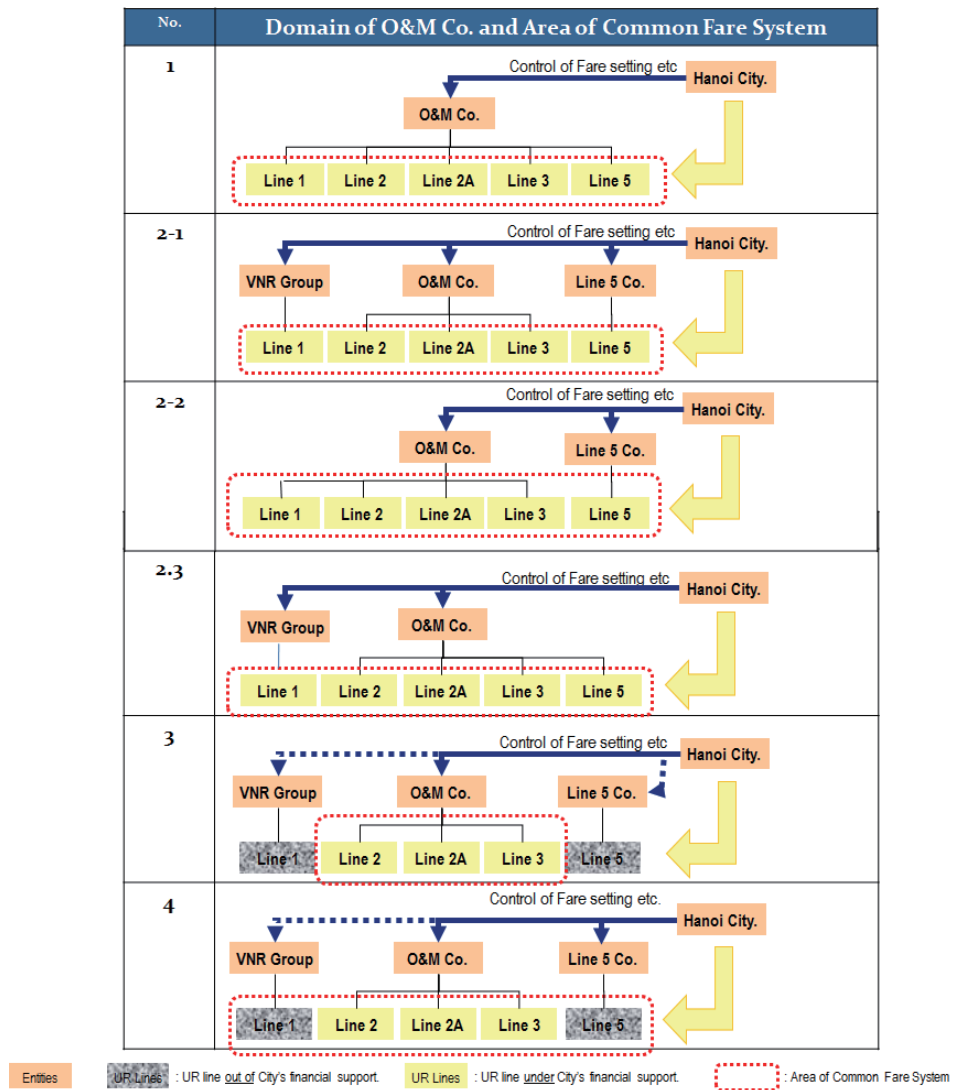
### 3.8. Summary of the Basic Institutional Policy

#### 3.8.1 Domain of the O&M organization and the Area of the Common Fare System

(1) The wider the domain of the O&M organization, the more convenience and services the passengers will enjoy.

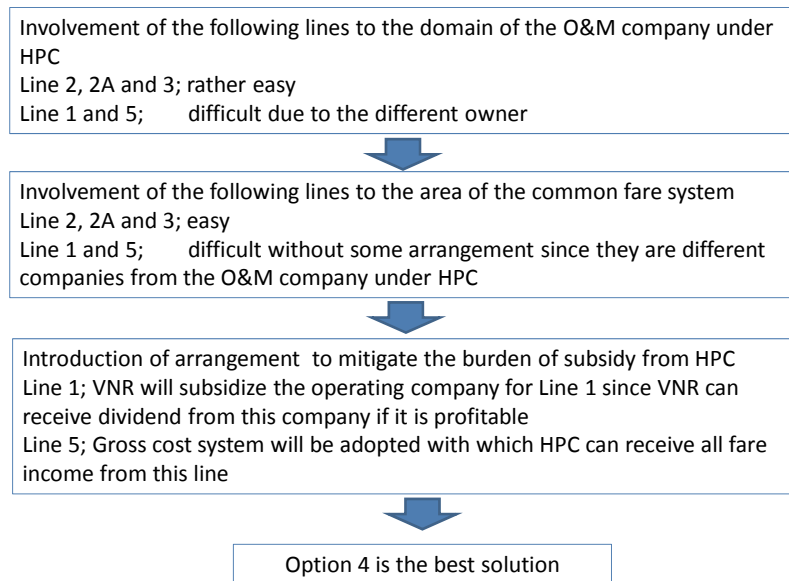
(2) The area the common fare system covers should fit with the domain of the company. Otherwise, HPC cannot minimize the subsidy to be given to the operation companies and it will give rise to such risks as that the Regulator for urban railways under HPC will have to supervise every expenditure the O&M organization makes and the O&M organization may lose its independence. In such cases, they will become unattractive companies for investors when they go public.

From these two constraints, the following six options can be provided for the domain of the O&M organization.



Source: JICA Study Team

**Figure 3.1 Options for the Domain of the O&M organization and the Areas for Common Fare System**



**Figure 3.16 Approach to Select the Best Solution**

### 3.8.2 Arrangement of Equipment for Integration

#### (1) AFC and contactless IC card

The following technical matters should be addressed for AFC and contactless IC card installation in order to enable travelling among lines that have different donors.

- Communication method used between AFC and IC cards
- Data format
- Server specifications for the lines and for the company and their interfaces
- Handling of IC card at the gates

#### (2) Improvement for the structures of the interchange stations

All the interchange stations currently planned do not have direct connection routes or facilities to provide access to the other lines at this moment. Further study into providing an effective structure is required. None of them have started construction yet, but modification of their structural design may not be possible as the approval of HPC has already been acquired.

### (3) Integration of the OCC

With the integration of the OCC, overall information can be delivered to the passengers especially when there is a disruption. Moreover, it enables an efficient operation scheme to be established.

The space for the OCC can be secured inside the depot of Line-2, but as the construction plan for each line has been approved by HPC, some delay may be expected if the current OCC plan were to be changed to the integrated OCC plan. Therefore, it seems appropriate that the target lines for integration into the OCC should be the ones that have not obtained approval for their plans from HPC. In this case, it may be economically beneficial to design the OCC building to accommodate all lines under HPC and then expand it with the opening of each new line. There are two options, as shown below.

**Table 3.32 Options for the Integrated OCC**

	Involved lines		Description
1	All the lines except Line-1	Line-2-8	Ideal, but modifying the approved plan may be difficult. It should be noted that even if the OCC were to be changed to the integrated OCC, construction cost may not increase drastically since the functions themselves would not be changed and, basically, extra equipment would not be required.
2	All the lines except for Line-1 and the lines already approved by HPC	Line-2, 4, 5-8	In this case, the information display for the lines that are not included in the integrated OCC will be installed in the integrated OCC. This is practical, but it is doubtful that integrated OCC without the lines already approved by HPC would be effective. .

Source: JICA Study Team

### (4) Recommendation to HPC

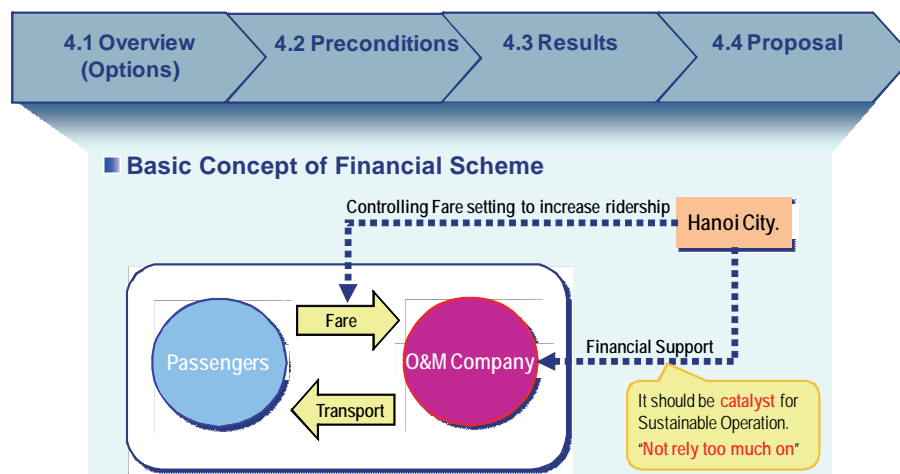
For the domain of the O&M organization and the integrated OCC, JICA study team presents options respectively in Figure 3.15 and Table 3.16. Each RPMU (Railway Project Management Unit) has focused on their line only. In other words, they are lacking the viewpoint of management and maintenance for Hanoi City as a whole. These options may be brought about due to the lack of total management of all the projects. To select an option from among them may be hard work for HPC, but it may be the last chance to integrate the planned urban lines that are being constructed by different donors. The Study Team has been sensitive to respect the originality of each donor. If HPC makes the decision to modify the approved plan, most of the problems will be resolved without large amount of extra money, even though it would take a lot of effort for the officers in charge of these projects to carry it out.

## Chapter 4 Proposed Basic Financial Schemes Based on Financial Analysis

### 4.1 Overview

In this chapter, in order to compare the options described in Chapter 3, the financial conditions of the O&M company and Hanoi City in regards to the options are reviewed in four steps along with the basic concepts of the financial scheme. This process helps to clarify the conditions for financial sustainability. Since the cash flow is the most important indicator of a sustainable operation and the minimization of subsidies that the Task Force has to consider in its proposal to HPC<sup>1</sup>, this process is focused on the cash flow as it relates to both parties.

The bus system in Hanoi is currently applying the gross cost method. TRAMOC, the Regulator for bus system, collects the fares from passengers and pays the portion for the O&M costs to the bus companies. This arrangement gives little incentive for minimizing O&M costs and increasing ridership, which results in a huge fiscal burden on the city. The following basic concept is proposed in order to avoid putting any further burden on the city .



**Figure 4.1 Concept of Financial Analysis**

Line 5 is considered in the options of Section 3.8. However, the project conditions of Line 5 fall under the feasibility study and since its financial conditions have not yet been determined, the following options excluding Line 5 are analyzed from a financial point of view.

<sup>1</sup> Article 2 of Decision 4283/QĐ-UBND

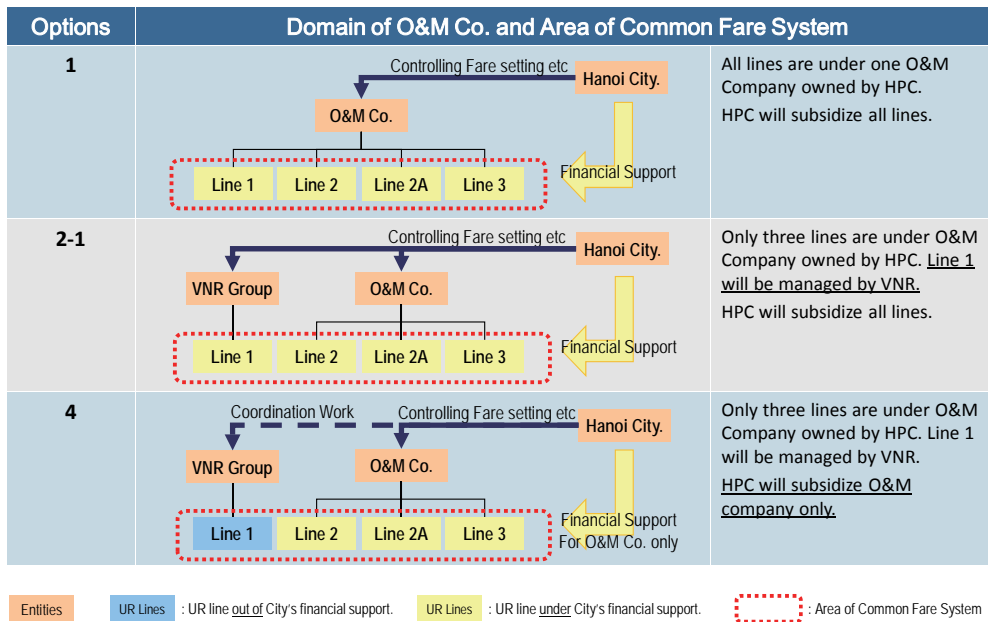


Figure 4.2 Options for the Financial Analysis

#### 4.2 Precondition for Financial Analysis

The following conditions are assumed in the creation of the financial forecast for the O&M company. These conditions were then used to estimate the net cash flow through the indirect method, using net-income as a starting point. Fare revenue, O&M cost and the amount of the assets are required for this method. The following section explains the measures used to obtain these figures.

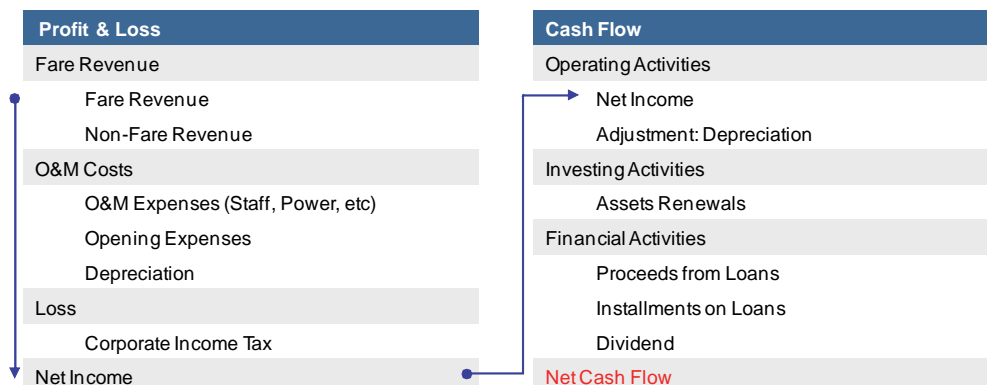


Figure 4.3 Net Cash Flow Calculation Method



#### 4.2.1 Asset Ownership

Asset ownership is directly connected to the ownership of the investment fund for the renewable assets. Therefore it should be set as a precondition before starting the financial calculation.

Separation of the asset ownership from the O&M company will bring about a complicated relationship with the city.

Railway facilities are generally categorized into two types. One type is the "infrastructure," such as tunnels and bridges, and the other type is "E&M," which includes rolling stock, signals and power supply systems. The following are the three sets of options for asset ownership for Line 2, 2A and 3.

- Option A: No assets are transferred from the city to the O&M organization.
- Option B: Only E&M assets are transferred to the O&M organization as equity in kind and infrastructure assets are left to the city.
- Option C: Both the E&M and infrastructure assets are transferred to the O&M organization as equity in kind.

It is assumed that in all cases, operation and maintenance will be done by the O&M company and fare revenue will be brought directly to the O&M company. The following shows the concrete advantages and disadvantages of each type of asset ownership arrangement.

#### **(1) Qualitative Analysis**

In Europe, most of the entities adopt the vertical separation system. It is said that the adoption of this system brings about two advantages. One is that multiple operators can run on the same tracks. The other is to mitigate the cost of asset ownership by having the government own the infrastructure. In the case of urban railways in Vietnam, a multiple operator system is not planned at this stage. Moreover, from a practical standpoint, there is little possibility of adapting a multiple operator system due to the tight headway.

It should be noted that when the owner of an asset and its user are different, it is normal for a track access fee to be charged, so there is a need for money transactions among the relevant organizations. In addition, if the city has some of the assets, these assets will require an organization and a staff to

manage them making the system complicated. In Asian countries, adopting this type of system tends to bring about conflict.

From these discussions it can be seen that vertical separation, i.e., Option B, is not recommendable.

In addition to the above, the issue of asset renewal also needs to be considered. When the assets become old they have to be renewed (i.e., renovated or replaced). If the assets are owned by the O&M company, the management board of the company could make the proper decisions by themselves by evaluating the life cycle costs of the assets. However, if the asset ownership is retained by the city, the O&M company might request that the assets be replaced earlier than necessary in order to mitigate its burden of maintenance. In contrast, the owner will always try to use the assets as long as possible in order to save investment costs. Under these circumstances, Option C would be the best solution.

## **(2) Quantitative Analysis**

Compared to Option A, the anticipated cash shortage will be less in both Option B and Option C because Option A cannot expect the effect of the tax shield derived from depreciation costs in its corporate income tax (CIT). Option C also may have an advantage in its “net present value” (NPV), while Option A is expected to offer the fastest gain in profit. The performance in cash flow, as it shows the amount of cash shortage, i.e. its NPV, is generally more important than the performance in profit and loss, since a cash shortage may cause suspension of the company operation. Although Option A looks a more efficient company because it has the least amount of assets, but Option C is more likely to offer more stable public transportation service because it is more likely to have sufficient cash and assets.

## **(3) Conclusion**

In consideration of the above, the financial calculation will be conducted based on the following preconditions.

All assets are to be delivered to the O&M company as an in-kind contribution from Hanoi City and, essentially, the O&M company is assumed to be responsible for adding to and renewing the assets.

For Line 1, it is assumed that vertical separation will be used as VNR is operating on the existing national railway system. Therefore, the entity owning the E&M assets should pay an access charge equal to 8% of fare revenue to the owner of the infrastructure assets.

Asset Ownership for Line 2, 2a and 3

		Option A	Option B	Option C
Assets Transferred from State to O&M CO		None	Only E&M assets, as equity in kind	Both E&M and infra assets, as equity in kind
Ownership of Original Assets (with responsibility of Asset Renewals)	E&M (Operating)	State	O&M CO	O&M CO
	Infrastructure	State	State	O&M CO
Pros & Cons				
		Least	Large	Largest
Incentive to Efficiency		Least effective	Modestly effective	Most effective
Risk Separation from HPC		Largest	Least	Least
Anticipated Cash Shortage		Least	Modest	Largest
Net Present Value		Earliest	Middle	Last
Expected Timing of Realizing a Profit				

• Asset owner should prepare the maintenance budget for their own assets every year.

**Figure 4.4 Comparison of Benefits of Asset Ownership for Line 2, 2A and 3**

#### 4.2.2 Fare Revenue

The two main factors determining fare revenue -- ridership and fare setting -- are discussed below.

##### (1) Ridership Forecasting

The forecasted ridership of each line is summarized, compared and examined. Table 4. 1 represents the summary of forecasted ridership of each on-going line, namely Line-1, Line-2, Line-2a and Line-3 according to their studies.

**Table 4. 1 Summary of Forecasted Ridership for Each Line**

Lines	Year of Operation	Length (KM)	No. of Passengers (pax/day)		Ave. Passengers per KM (pax/day/km)		Peak load (pax/hr./direction)	
			2020	2030	2020	2030	2020	2030
Line-1	2018	24.1	390,200	543,800	16,200	22,500	18,300	26,200
Line-2	2018	11.5	535,300	661,500	46,500	57,500	30,400	37,100
Line-2A	2015	12.7	579,000	851,800	45,600	67,100	14,900	21,600
Line-3	2017	21.0	428,000	754,000	20,400	35,900	16,500	23,900

Source: Latest Feasibility Study / Preliminary Design of each line

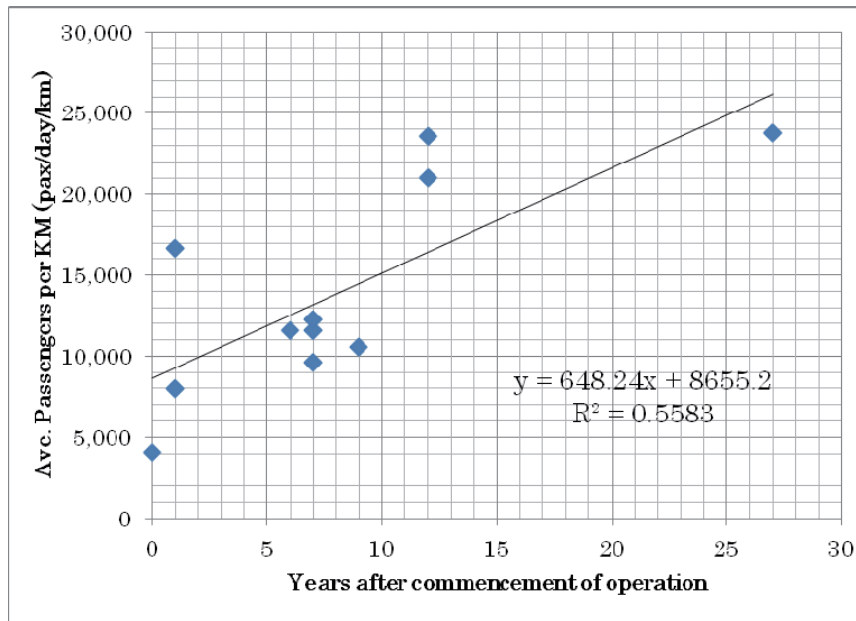
Since these are the official numbers from each project, these results are used as the basis for the calculation of the profit and loss table in the financial analysis of this study. Of course, the ridership of each line should vary, and the results of demand forecasting may vary in the same manner, depending on the nature of corridor of each line. However, from the summary table, it can be seen that the result of the demand forecasting on Line-2 (both for the number of passengers and the peak load) and Line-2A (number of passengers) are comparatively high. In order to check the likelihood of these demand forecasts, the actual ridership of urban railways in the neighboring cities in South East Asian such as Bangkok, Delhi and Manila were obtained and examined.

Table 4. 2 shows the summary of actual ridership of those cities. According to the table, the numbers of passengers varies by length of the line, but there is nothing higher than 25,000 passenger/km. It appears that the longer the operation period, the higher the volume of ridership becomes. Fig. 4.5 shows the plot of operation and average numbers of passengers per length of urban railways in neighboring cities during the years after commencement. The relationship between these two numbers were examined and it was concluded that two variables show somewhat of a correlation ( $R^2=0.56$ ), therefore this linier regression equation is used to check the likelihood of the results of demand forecasting used for Hanoi.

**Table 4. 2 Summary of Actual Ridership of Neighboring Cities**

City	Line	year of operation	Length (KM)	pax/day	Ave. pax/km
Bangkok	BTS	1999	23.0	482,000	21,000
	MRT	2004	20.8	200,000	9,600
Delhi*	Red Line	2002	25.2	265,600	10,600
	Yellow Line	2004	44.7	519,600	11,600
	Blue Line	2005	58.7	681,300	11,600
	Green Line	2010	21.8	173,200	8,000
	Violet Line	2010	20.0	334,900	16,700
	Airport Exp.	2011	22.7	92,400	4,100
Manila	LRT1	1984	17.2	409,000	23,800
	LRT2	2004	13.8	170,000	12,300
	MRT3	1999	17.0	400,000	23,600

\* Estimated by total number of passengers and operating rolling stock by lines  
Source: Various statistical data



**Figure 4.5 Plot of Years After Commencement of Operation and Average Numbers of Passengers per Length of Line**

According to the calculated linear regression equation, the number of passengers per length of each line is estimated by the anticipated year of operation. The number of passengers of each line is adjusted for the length of the line. The adjustment ratio is calculated based on those figures and the peak load is also adjusted accordingly. Table 4.3 shows the result of this adjustment. The results shows that the demand for Line-2And Line-2A should be adjusted to about 25% of the current estimations, 50% for Line-3, and two-third for Line-1. These figures can also be taken into consideration in the sensitivity analysis of the financial soundness of the company. However, these results do not mean that the capacity of the infrastructure needs to be adjusted.

**Table4.3 Ridership for Revenue Calculation**

Lines	Year of Operation	Length (KM)	No. of Passengers (pax/day)		Ave. Passengers per KM (pax/day/km)		Peak Load (pax/hr/direction)		Adjusted Ratio
			2020	2030	2020	2030	2020	2030	
Line-1	2018	24.1	241,400	395,900	10,000	16,400	11,300	19,100	67.3%
Line-2	2018	11.5	115,000	188,600	10,000	16,400	6,500	10,600	25.0%
Line-2A	2015	12.7	151,100	233,700	11,900	18,400	3,900	5,900	26.8%
Line-3	2017	21.0	222,600	359,100	10,600	17,100	8,600	11,400	49.8%

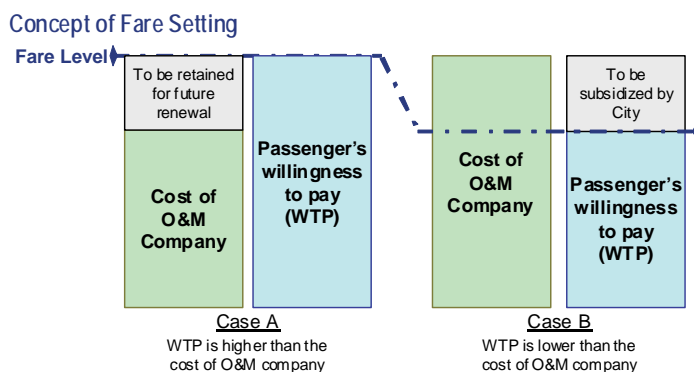
Note: These figures are calculated based on the ridership forecast of each line project as of 1 October 2011, and the actual ratio of the increase in ridership in other Asian countries.

In addition to the above, in order to comply with the social-policy beneficiaries as per Article 21 of Decree 109/2006/ND-CP, 4.5% of passenger is deducted from Table 4.3 for revenue calculation.

## (2) Fare Setting

(Relationship between affordability and cost )

Fare setting is one of the most important conditions for financial calculation. When the ticket price is too expensive, ridership will decline, and when it is too low, the company operation will be in trouble. Thus the Study Team takes the following approach for setting a realistic fare price. The fare standard calculated from the accumulation of the costs is compared with the one derived from passenger affordability. If the fare standard derived from passenger affordability is higher than the one calculated from the costs, the fare price is set as the fare standard derived from passenger affordability and the difference of two prices is to be saved as fund for future investment. When the fare standard derived from passenger affordability is lower than the one calculated from the costs, the fare price is to be set lower and the Hanoi City will render the appropriate amount of subsidies to the company as an operational subsidy.



**Figure 4. 6 Concept of Fare Setting**

(Fare Price Setting based on Affordability)

In this calculation, passenger affordability was estimated based on current bus fares and taxi fares. Based on the current fare system used for Hanoi’s bus transportation, the use of both single tickets and monthly passes is adopted. Therefore, the Study Team applies the passenger ratio of monthly passes to calculate fare revenue. The ratio to be applied is based on the Tokyo Metro where 60% of passengers are using passes and 40% are using other types of tickets.

Since the fare price should be adjusted annually according to the number of actual passengers and current economic conditions, it is not appropriate to discuss detailed pricing at this stage. Therefore

the fare price proposed by Department of Finance (DOF) in year 2012, which should be affordable to the passengers, may be set at the midpoint between the minimum bus fare (5,000VND) and initial fare of a taxi (12,000VND), with average trip length 5.3km (HAIDEP). Therefore, the affordable price is estimated to be 9,000VND. The price of a monthly pass is estimated to be 10 to 17 times that of a single ticket for one line, and 16 to 27 times for a common path on multiple lines, which is the same as what is currently being used on Hanoi's bus system. Therefore, the prices used for calculating fare revenue are 130,000VND per month for one line and 220,000VND per month for common path on multiple lines.

**Table 4.4 Fare Prices Used for Revenue Calculation**

	Average fare in year 2011	Remarks
Single ticket	6,000 +600 x (Travel length in km)	Average fare is approximately 9,000VND
Monthly pass for one line	130,000VND	It is assumed that this price falls between 10 to 16 times the price of a single ticket.
Monthly pass for multiple lines	220,000VND	It is assumed that this price falls between 16 to 27 times the price of a single ticket.

Note: Price is in year 2012; economic growth is taken into consideration in the financial analysis.

(Reduction of Fare Price in Common fare system)

Once a common fare system has been implemented, a reduced fare should be applied for transfer passengers. The basic assumptions is that 30% of passengers from each line are transferred from another line once and in this case a half of the average fare of single tickets is distributed to each relevant line.

(Fare Price Calculation Based on Affordability)

Based on the assumptions and conditions above, the annual fare revenue is estimated by using the equation shown below..

**Revenue Equation:**

$$\begin{aligned}
 & (\text{Pax/year}) \times \{ (1 - *^1:0.3) \times (\text{Ave. Fare} \times (\text{price exemption: } 0.955)) \times (*^2:0.4) + \text{Monthly Pass} \\
 & \quad (\text{one-line})/365\text{days} \times 12\text{months} \times (1 - *^2:0.4) \\
 & \quad + (*^1:0.3) \times (\text{Ave. Fare} \times (\text{price exemption: } 0.955)) \times (*^2:0.4) + \text{Monthly Pass (multi-line)}/365\text{days}
 \end{aligned}$$

$$\times 12\text{months} \times (1 - *2 : 0.4) \}}}$$

Where,

\*1 is “ratio of trips without transfer to all trips”.

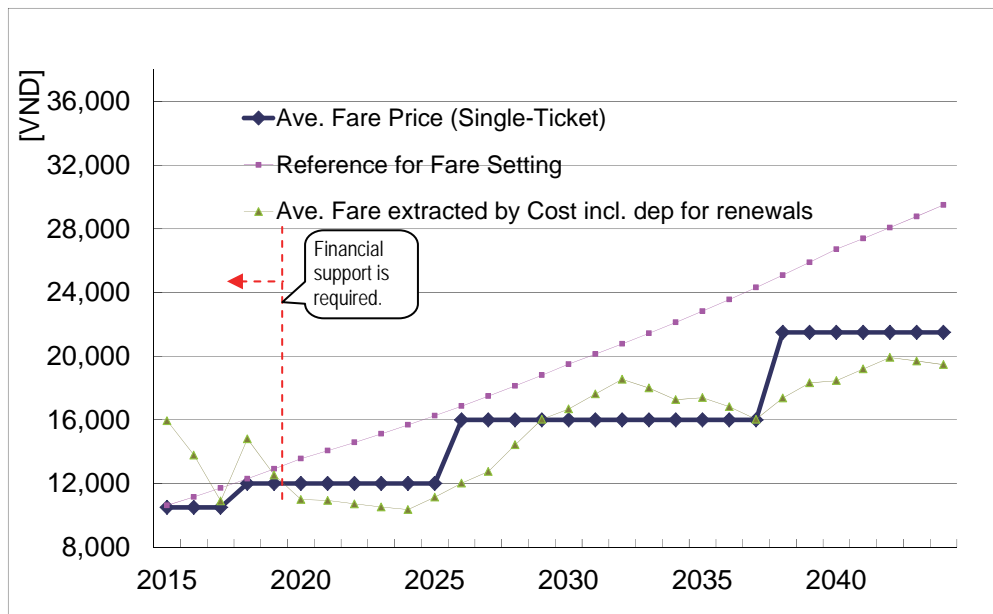
\*2 is “ratio of passengers with monthly passes to all passengers”.

In order to maintain sustainable operation, fare price needs to increase until 2040 based on the costs of the O&M company including depreciation cost renewal E&M assets, utilizing depreciation cost renewal E&M assets shown in subsection 4.2.4.

**Table 4.5 Fare Price for Revenue Calculation**

Year	Fare level in each year	Average fare price
2015-2017	VND 6,800 + 680 x (Travel length in km)	VND 10,500
2018-2025	VND 8,000 + 800 x (Travel length in km)	VND12,500
2026-2037	VND 10,500 + 1,050 x (Travel length in km)	VND16,000
2038-2044	VND 14,000 + 1,400 x (Travel length in km)	VND21,500

Note: 5.3 km is used for average travel length.



**Figure 4.7 Average Fare Price for Revenue Calculation**

Note: Above is based on the O&M company covering Line 2, 2A and 3



### (3) Non-fare Revenue

Non-fare businesses, generally, can be categorized into two types, “railway facility related” and “non-related”. The businesses utilizing railway facilities, such as advertisement services at stations and on/in rolling stock, station space rental, parking lots and kiosks, are categorized in “railway facility related.” The businesses, which does not utilize the railway facilities, such as bus, taxis, and property development are categorized as “non-related.”

Most urban railway companies are embarking in “railway facility related” businesses, since these businesses enable the station to pull in more passengers and earn additional revenue without large additional investments. The O&M company in Hanoi can also embark in these services without difficulty. The average ratio of non-fare revenue (railway facility related) to total revenue of urban railway companies in other Asian cities is approximately 2 to 5%. This figure is used to estimate non-fare revenue of the O&M company. However, 1% is applied for the first year this time, and it is increased gradually to 5% over the next four years because the O&M company needs some time to first build up its management skills and knowledge regarding non-fare businesses.

In Southeast Asia, property development and non-railway transportation services are generally regarded as “non-related” businesses. MTR, the Hong Kong urban railway company, is famous for its success of railway and property development. The organization to manage both construction of urban railway and development of property was founded prior to the railway construction, so that the railway construction and property development were implemented at the same time. The HK government provided MTR with exclusive land development rights at a low price instead of a cash subsidy. To generate income, MTR purchases the properties surrounding its stations at lower prices and sells them to developers at higher prices. The followings are the keys to success that can be extracted from the Hong Kong business model.

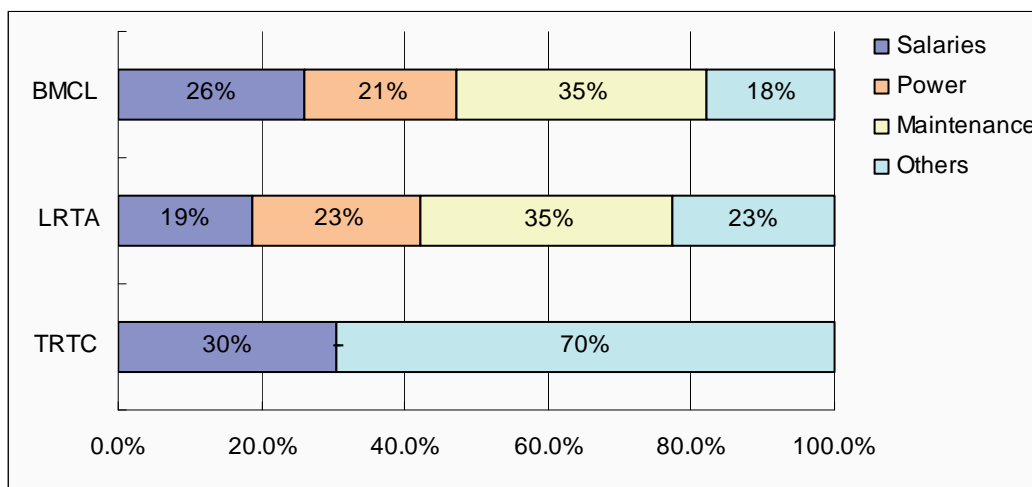
- Strong support from government for property acquisition, such as exclusive rights at low prices.
- Synchronization between property development plans and urban railway construction plans.
- Property acquisition before urban railway construction.

Since it is assumed to be difficult to realize all of the three above, “non-related” business shall not be considered in this financial analysis.

### 4.2.3 Operation & Maintenance Cost

It is important to estimate the annual expenses of the O&M company in the financial analysis. Annual expenses are calculated in four categories: staff costs, power costs, spare part costs (maintenance costs), other costs including non-fare business costs. In addition to those items, “expense before opening” is considered, since it may affect financial condition of the O&M company.

Observation of the operation and maintenance costs of urban railways in neighboring Asian countries shows that staff costs, power costs, and spare parts costs (maintenance costs) account for a major portion of the total cost. Figure 4.8 validates our assumption.



**Figure 4.8 Breakdown of Operation and Maintenance Costs in Other Countries**

Source: BMCL annual report 2010 (Bangkok), LRTA financial statement 2009 (Manila), TRTC annual report 2010 (Taipei)

Note: TRTC includes their power and maintenance costs in “Others”.

#### (1) Staff Costs

The staff costs can be roughly estimated by using the number of staff members and their salaries. At this moment, the number of staff members is being developed by each construction project without any coordination, resulting in a duplication of staffing for administration functions. Because of this, annual railway statistical data, published in 2007 by the Ministry of Land, Infrastructure Transport and Tourism (MLIT) in Japan, is used for the financial calculations.

**Table 4.6 Staff Estimation for Lines as of 01/2018**

Line	Staff Estimation	Source
Head Office	56	Study Team (See Chapter 6)
Line 1	485	Study Team
Line 2	358	Study Team
Line-2A	391	Study Team
Line 3	399	Study Team
Total (L1-L3)	1,689	-
Total (L2-L3)	1,204	

Source: JICA Study team

**Table 4.7 Statistics Data Published by MLIT**

Category	Yardstick	
	Index	Average Number
Train Drivers	Daily Train km per driver	76.7km <sup>*1</sup>
Station Staff	Staff Number per station	12.3 persons <sup>*1</sup>
Rolling Stock	Staff per rolling stock	0.59 <sup>*2</sup>
Civil and Tracks	Staff per route km	3.06 <sup>*3</sup>
E&M	Staff per route km	4.65 <sup>*3</sup>
Head Office (Admin.)	Staff per route km	1.75 <sup>*3</sup>

Source: Annual railway statistical data published in 2007 by the Ministry of Land, Infrastructure Transport and Tourism (MLIT)

Note: \*1: Average of Osaka Metro, Sendai Metro, Tokyo Metro and Yokohama Metro,

\*2: The number of Osaka Metro is used for providing conservative estimations

\*3: Average of Osaka Metro and Tokyo Metro is used for providing conservative estimations

**Table 4.8 Monthly Staff Salaries**

Position	Monthly Staff Cost [USD] * including benefits cost
Management	2,000 → (2,400)*
Managing director	1,000 → (1,200)*
Manager, engineer and skilled worker	650 → (780)*
Deputy manager	500 → (600)*
Semi-skilled worker	350 → (420)*
Unskilled worker	200 → (240)*
Office worker	400 → (480)*

NOTE: 20% of salary is considered to be the cost of the benefits.

Source: The final report of HCMC SAPI

## **(2) Power Costs**

Electric power costs, consisting of power consumption (kWh) and unit purchasing price (VND/kWh) are calculated for traction and non-traction applications. Non-traction applications include electricity for lighting, air-conditioning in stations, depots and tunnels. Traction power is estimated based on ridership and car-km. Non-traction power is estimated from the typical power consumption of stations, depots and lighting in tunnels, and the size and number of planned stations and depots, as well as the lengths of tunnels. The figure stated in Circular 05/2011/TT-BCT is used for the unit price per kWh.

## **(3) Spare Parts Costs (Maintenance Costs)**

Although maintenance cost goes up and down year by year, it can be represented by the cost of imported spare parts. Taking rolling stock as an example, the cost tends to increase on occasions like overhaul inspections. Generally, costs of spare parts are estimated referring to average ratio figured in Japanese rolling stock and E&M. Spare parts generally cost the equivalent of 1.5% of the car price for rolling stock, and 1% of the equipment price for E&M. Most of spares are imported materials and represent a substantial percentage of the total cost. Other miscellaneous cost such as out-sourcing and daily consumable parts are estimated in “Other Costs” below.

## **(4) Other Costs**

Other costs are estimated to cover miscellaneous such as out-sourcing, daily consumable parts and stationeries, water, etc. The amount of these costs is assumed to be 30% of the staff, power and spare parts costs.

## **(5) Cost of Non-Fare Business**

The cost of non-fare businesses including the salaries of temporary staff members is estimated as 60% of non-fare revenue, on average, but it will depend on the type of business.

## **(6) Expenses before opening**

The staff costs considered in the calculation are a rather huge expense that is required until the commencement of operation. These costs could be a major contributing factor towards negative cash flow at the initial stage. Countermeasures for this are discussed in Section 4.3.

Power costs and others are also required by each line for the trial run. However, these costs are not included, because they are classified as costs to be borne by the construction projects

## (7) Price Escalation

For long term estimation, the economic growth is considered as a major factor affecting costs. The rates of the economic growth in Japan, China and France are applied to renewal and additional purchasing of E&M and rolling stocks, in case the equipment is to be imported from those three countries. The economic growth rate in Vietnam is applied for other items locally supplied. To compensate for the fluctuation in the exchange rate between Vietnam and other countries including Japan, 1%, the average annual change in the exchange rate for the last five years, is added to the exporting country's economic growth rates until the year 2020, which is shown in Table 4.9.

**Table 4.9 Average Annual Economic Growth Rate**

Year	Average Annual Economic Growth Rates [%]			
	Vietnam	Japan	China	France
		* after applying fluctuation of exchange rates	* after applying fluctuation of exchange rates	* after applying fluctuation of exchange rates
2006 – 2020	5.0	1.4 → (2.4)*	13.5 → (14.5)*	2.1 → (3.1)*
2021 – 2030	3.7	1.1	5.6	2.2
2031 – 2040	3.2	0.6	3.6	2.2
2041 -	2.5	0.0	2.6	2.4

Source:

- Economic growth rates: Japan Center for Economic Research, Changing Demographics in Asia (January 2007), Asia Development Bank 2011 Report "Asia 2050", and the guardian DATALOG
- Fluctuation of exchange rates: JETRO homepage

Note:

- For staff cost, 2% is applied as escalation rate, since it is generally lower than economic growth.

## 4.2.4 Depreciation and Tax

### (1) Depreciation

The figures estimated in the Feasibility Study or current rough estimations are used to evaluate the depreciation costs of initial assets. Since the construction projects are now formulating the details or basic designs, the investment costs could change at a later stage, so the results of the output of financial analysis may not be the same.

Following the Vietnamese Accounting Standard (VAS), depreciation costs is calculated in accordance with Circular 203/2009/TT-BTC. The useful life applied in financial calculation is that defined in the Circular. However, since the actual life cycles are considered to be longer than the useful life used for the depreciation, figures prepared for the renewal in the table below are to be applied for the renewal investment.

**Table 4.10 Useful Life of Rolling Stock and E&M**

Items		Useful life used for the depreciation	Useful life used for actual renewal
Civil Engineering and Architectural Structures		20, 50 years	> 30 years
Rolling Stock		15 years	30 years
E&M	AFC, Signaling and Telecommunication	8 years	10 years
	Power Supply	20 years	40 years
Tracks		20 year	25 years

Source; JICA Study team

## (2) Corporation Income Tax

Corporate income tax (CIT) is taken into consideration as per Circular 130/2008/TT-BTC.

### 4.2.5 Items related to Investing Activities

Asset renewal in accordance with the useful life shown in Table 4.10 is used for calculation. Investment costs for renewal are to be paid by the O&M company in order to motivate it to maintain the assets efficiently. The O&M company will accumulate the profit gained from fare revenue and use it to supplement any shortfall caused by asset additions or renewals

If the company does not have capacity to pay at the time of renewal, i.e., does not have enough accumulated cash flow, it may borrow an equal amount of money from a bank. At this time, Hanoi City should consider some financial support for the O&M organization.

#### 4.2.6 Items related to Financing Activities

##### (1) Dividend

When the O&M organization makes a profit, 10% of net income after tax will be paid out to HPC as a dividend.

##### (2) Subsidy

If O&M organization faces financial deficit, i.e. negative operating cash flow, it is assumed that a preferential interest loan for up to 10 years from the city could be obtained. Once the operating cash flow of the O&M company becomes positive, the O&M company will repay the loan at a fixed yearly amount, with the city subsidizing the interest portion of the loan payment.

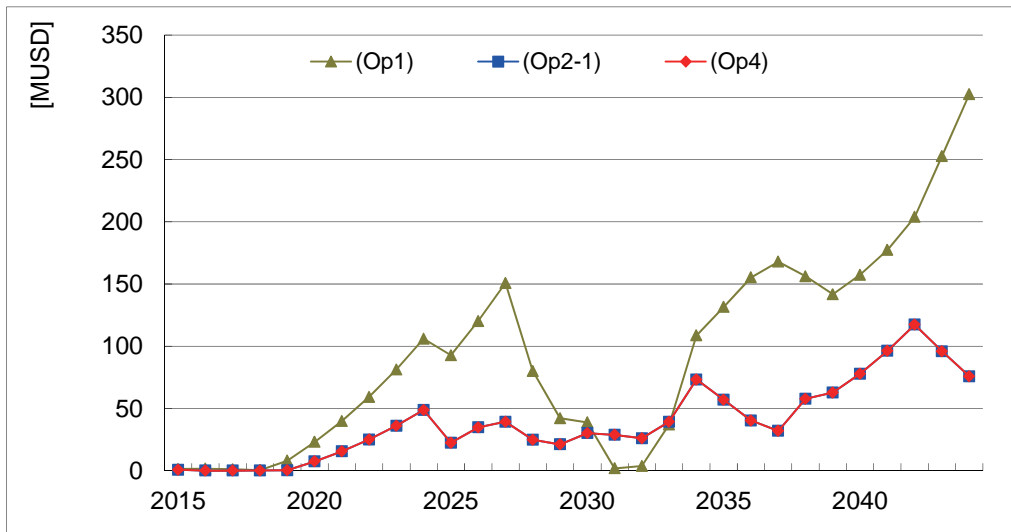
Investments in asset addition and renewal are the responsibility of the O&M company as described in 4.2.6. At the time the O&M company is purchasing the assets, if it is unlikely that the O&M will be able to pay for the assets by using the accumulated cash flow, the city should support the O&M organization by offering a preferential-interest loan for a period of up to 10 years. The O&M company will then return the constant sum of the borrowed money to the city yearly.

Option 2-1 assumes that the same subsidy is given by the city to Line-1. Since the fare price is set by the city based on affordability, the city should compensate Line-1 for any cash shortage.

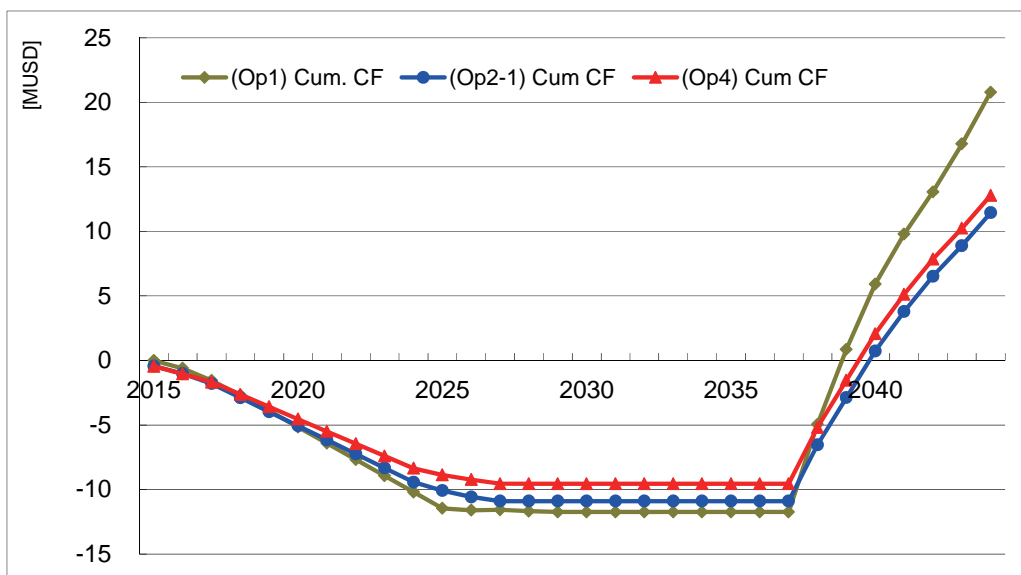
### 4.3 Result of Financial Analysis on O&M organization

#### (1) Selecting Best Option

Based on the above conditions, the “cumulative cash flows” for the O&M company and Hanoi City for all options was plotted for 30 years starting from the commencement of commercial operation. From the charts below, Option 1 which indicates largest cumulative CF for the O&M company and the smallest subsidy from the city is obviously the most appropriate solution. However, as we mentioned previously, it requires coordination among the inter-city railways. It can be said that there are uncertain factors that cannot be included in this calculation and the actual outcome could be worse than the other options, therefore, it is not practical to choose Option 1. Then, Option 4 becomes the most appropriate option.



**Figure 4.9 Cumulative Cash Flow of O&M organization**



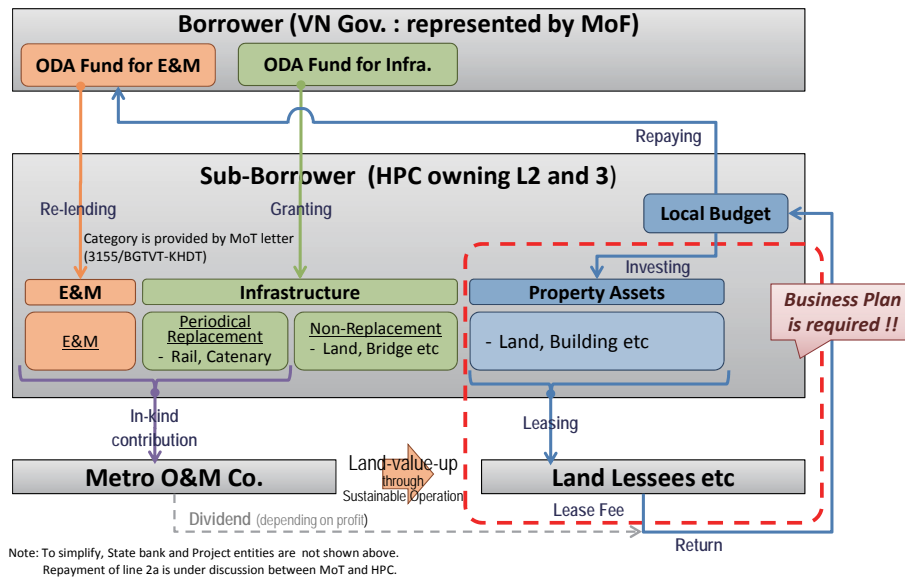
**Figure 4.10 Cumulative Cash Flow of Hanoi City**

Note: This graph focuses on the cash flow between Hanoi City and the O&M company, i.e., the amount of the preferential loan. It does not include the cash flow related to repayment of initial assets and the interest on the loan.

**(2) Repayment of Initial Assets**



As the MOF indicated in 17166/BTC-QLNd, HPC is required to have a specific business plan for the area surrounding stations (e.g., leasing premises for commercial usage along the railway corridor) in order to produce income for repayment. Therefore, the Study Team understands that fare revenue is not expected to be the source of the repayment.



**Figure 4.11 Repayment Scheme**

In order to assess the financial capability of the O&M company, the potential of the O&M company to repay the cost of initial assets to Hanoi City is reviewed based on the following two cases. The Study Team understands that E&M assets are under a re-lending scheme between the central government and HPC, while infrastructures are provided to HPC as grants. Therefore only the repayment of E&M including rolling stock in the Option 4 is considered in this review.

(Fare Price based on O&M Costs)

If the fare price is set based on O&M costs within the limits of affordability and the repayment of the borrowed money is assumed to be made over a useful life that is equivalent to the annual depreciation cost of initial E&M assets, the cumulative cash flow of the O&M company, which is the money that will be used for repayment and the cumulative depreciation of E&M, will be as shown in Figure 4.12. The large difference between the lines indicates that the repayment of the cost for all E&M assets by the O&M company will not be feasible.

(Fare Price based on the Cost including the Depreciation)

If the fare price is set based on the costs including the depreciation of the initial E&M assets and the repayment is assumed to be made over a useful life that is equivalent to the annual depreciation cost of the initial E&M assets, the average fare price extracted will be as shown in Figure. 4.13. As this level is much higher than the affordable price (blue line), it could reduce the ridership, resulting in financial difficulty.

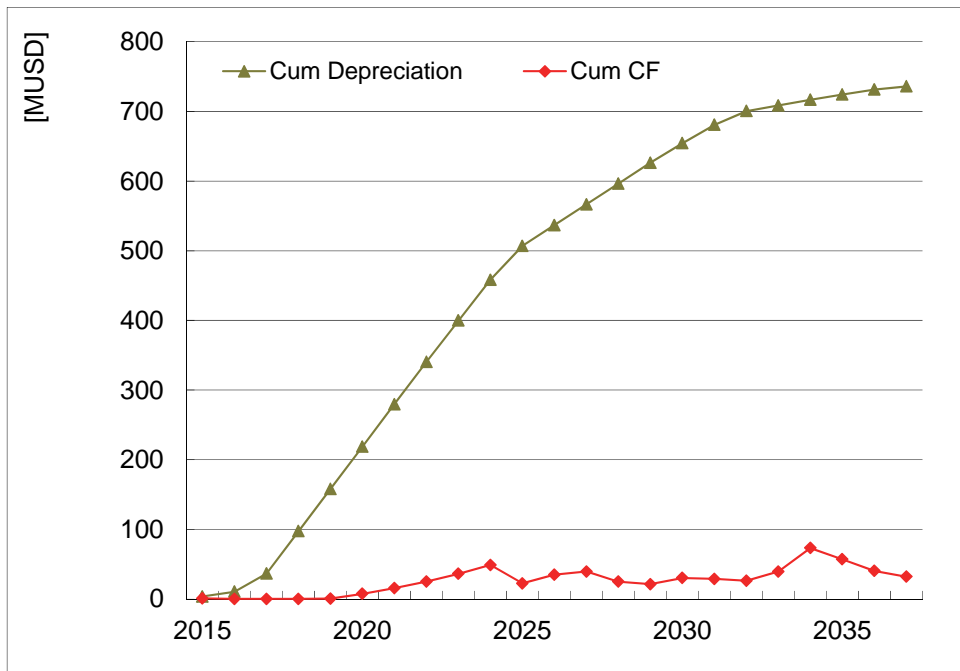


Figure 4.12 Cumulative Cash Flow of O&M organization with Repayment of Initial E&M Assets and Cumulative Depreciation of Initial E&M Assets

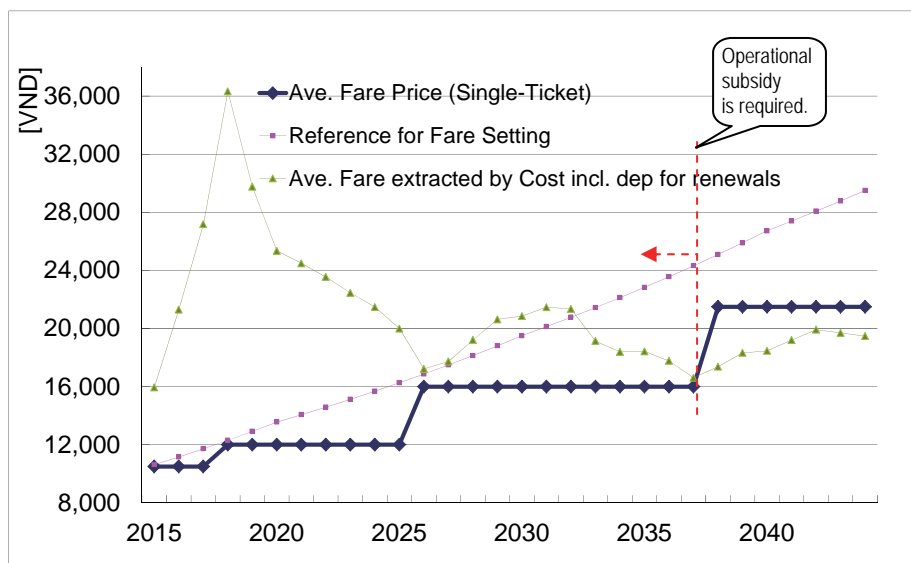
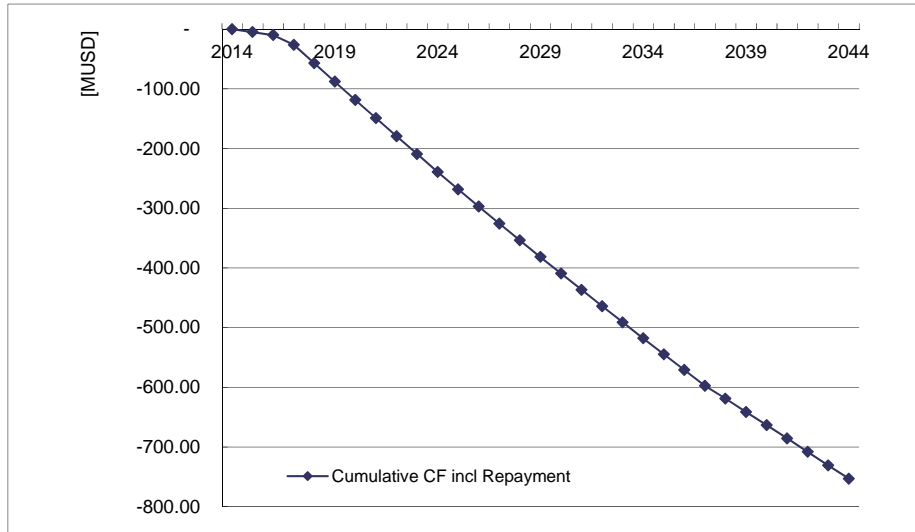


Figure 4.13 Average Fare Based on Costs including Initial E&M Depreciation

(Conclusion)

As described above, it is very difficult to repay the cost of the initial E&M assets from fare revenue. For reference, the cumulative outlay of Hanoi City, which covers the amount of repayment on initial E&M assets and the subsidy for the interest portion of loan payment, is shown in Figure 4.14. By year 2044, it could reach 0.8 billion USD.



**Figure 4.14 Cumulative Cash Flow of Hanoi City for Urban Railway**

Note: This includes repayment on initial E&M assets. 30 years principal equal monthly payments is assumed with the following interest: L2=0.2%; L2A=1.6% ;L3=1.6%.

#### 4.4 Proposal for Basic Scheme for the O&M organization

Taking into consideration the results showed in Section 4.3, the following scheme has been arranged for sustaining the stable operation of urban railways.

##### (1) Capital in Kind

As described in Section 4.2, both E&M and infrastructure assets should be basically contributed in kind to the O&M company as an incentive for establishing a rational asset management system and for the purpose of setting up a tax shield.

If the O&M company is requested to repay the initial E&M assets including rolling stock, fare setting will be much higher than those affordable by the passengers, as is shown in Figure 4.13, and

the O&M company will face financial difficulty. Therefore the repayment obligation should be retained by Hanoi City.

## **(2) Capital in Cash**

A cash contribution has been proposed to cover opening expenses and cash shortages during the initial stage. However, this solution requires the city to prepare huge amounts of cash at one time, while the company is relieved from facing its own financial issues. Considering that four lines will be opened in Hanoi within a three-year period, the total amount of cash contributions within any given term could be relatively large.

Taking into account these circumstances, the Study Team would like to propose that only staff expenses before the opening in year 2015 be covered by cash contributions and others, such as cash shortage at the initial stage, are by preferential loan.

## **(3) Financial Support Scheme**

To gradually foster management efficiency in the O&M company, the Study Team proposes the following three-step scheme. (Figure 4.15)

- First Step: Since the O&M organization will not have any revenue, the city should cover the expenses for their opening activities until the opening of the first line.
- Second Step: Financial losses during the initial stages should be financed by a preferential-interest loan from the city. The O&M company should take responsibility for the repayment of this loan.
- Third Step: At the time the O&M company is purchasing the assets, if it cannot pay for the assets with its accumulative cash flow, the company will have to find another source of funds by itself. However, considering the profitability of the company, the city should support it by tax exemption

The financial analysis was conducted under the condition described in Section 4.2. Changing the preconditions changes the financial outcomes. Therefore, the fare level and ridership should be carefully considered.

In addition, a drastic change in the exchange rate and the CPI could influence the financial condition of the O&M company. Therefore, the fare level should be set based on the affordable level and increased in consideration of the prevailing CPI. Further support from the city should be considered if the unforeseeable occurs.

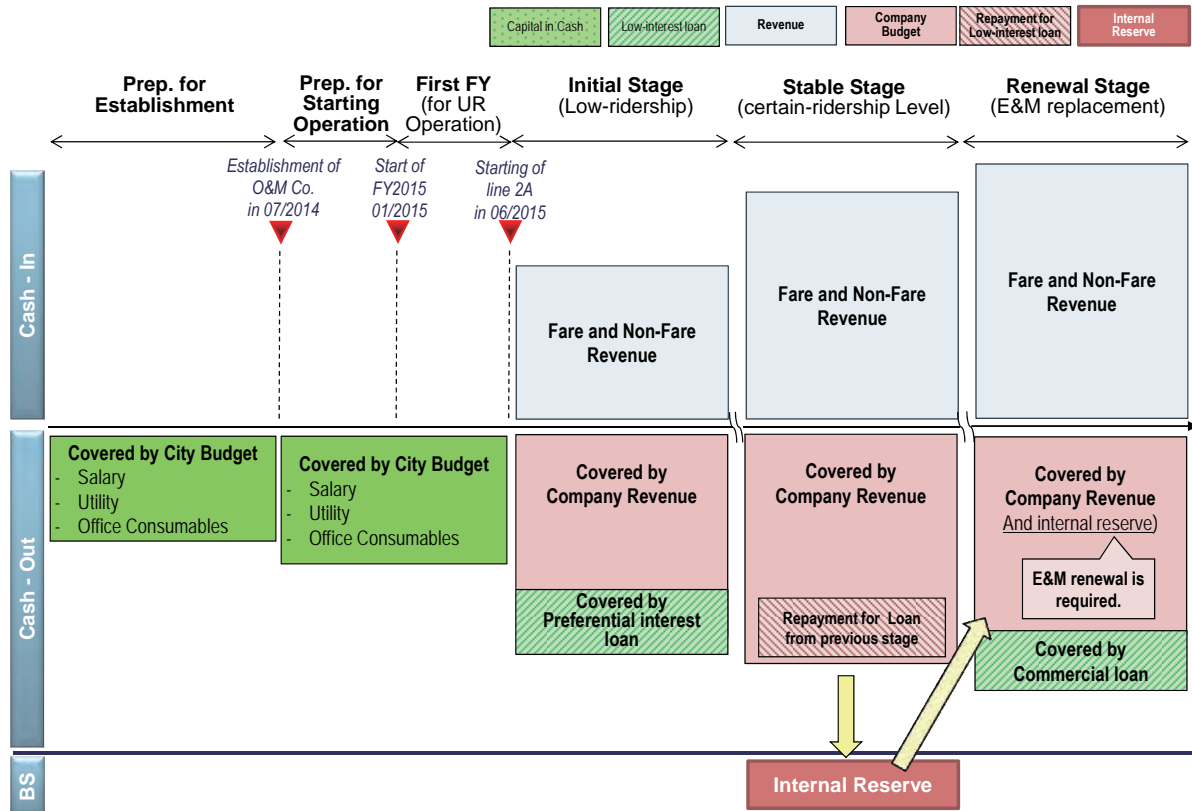


Figure 4.15 Financial Resources of O&M organization

## Chapter 5 Roadmap for the Establishment of O&M organization

### 5.1 Concept of Roadmap

This section describes the steps and concepts for drawing up the roadmap for the establishment of the O&M company and the commencement of line operation for Line-2, 2A and 3. The end point of the roadmap is set as the commencement of operation of the lines. In order to place the milestones, the opening dates of the lines were identified first and then the training schedules were gathered from the construction projects since the employment time of staff is highly dependent on the training schedule. At that point, the timing for the construction asset transfers and the establishment of the O&M company will be identified and the corresponding tasks relating to company registration will be clarified.

Various designs and plans will need to be brought forth to the relevant authorities for their respective approvals so that the company can be registered and start its operation. However, no specific organization in Hanoi City has been nominated as the Regulator for urban railways yet. The period for the Regulator for urban railways to learn about and prepare for conducting its business is also necessary. In this study, it is assumed that the establishment of the O&M company and the Regulator for urban railways are conducted in parallel.

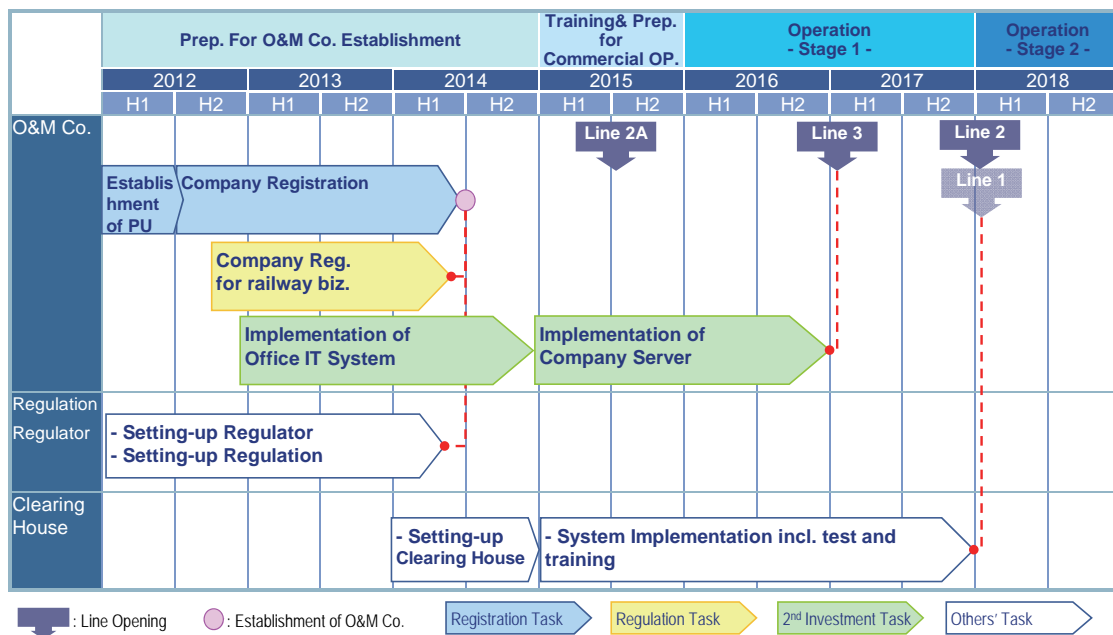
When the common fare system is implemented, a revenue data clearing system, which the Study team will be calling the “Central Server”, will be required by the time the second line starts operation. Furthermore, if clearing with entities other than the O&M company is needed, an independent “Clearing House” must be established. Therefore, activities relating to the “Central Server” and the “Clearing House” must be clarified in the roadmap.

In terms of non-fare businesses, there are some cities that provide land to a railway company so that it can have self-supporting ability, such as Hong Kong, Deli, etc. Most urban railways, however, do non-fare business within their own railway facilities. The Study Team assumes that urban railways in Hanoi will fall into the latter case. Although they cannot expect large revenues from non-fare activities, these activities can contribute to sustaining the operation.

Based on this, a roadmap consisting of the four parts shown below has been created.

1. The timing of commencement of operation, asset transfer and staff hiring (as milestones)
2. Regulator for urban railway in Hanoi

3. Clearing Houses
4. Activities of O&M organization
  - Registration
  - Company regulation
  - Acquisition of know-how to manage a railway company
  - Implementation of required systems (Office IT system, company server and clearing system)



**Figure 5.1 Roadmap for Establishment the O&M organization**

## 5.2 Definition of Time Schedule for Each Line

Since the operation and maintenance bodies for each line have not been officially identified and milestones related to operational activities are not presented yet in the construction projects, their commencement dates are hypothetically defined. The Study Team assumes that it takes 15 months to train management control divisions and train drivers, 12 months for the maintenance staff and 6 months for the station operation staff. Note that the duration of the training may vary depending on job classification. While both Line-2 and Line-3 projects have not yet fixed their training schedules and programs yet, Line-2A has already decided that they will form an operation and maintenance team consisting of 941 people. Those Line-2A employees will take training from the EPC contractor.

**Table 5.1 Identified Timelines for Each Line**

Lines	Given Condition	Assumed Milestones			
	Scheduled Date of the Commencement of Operation	Asset Transfer Date	Trial Run	Staff Hiring	
				Management	Staff
Line-2	01/2018	12/2017	06 to 12/2016	06/2016	01/2017
Line-2A*	06/2015	06 to 12/2014	01 to 06/2015	Q1/2012	Q1/2012
Line-3	01/2017	12/2016	12/2016	06/2015	01/2016

Note\*: Information regarding staff hiring in Line-2A was obtained from RPMU of VNRA.

Because Line-2A ownership will be transferred in the period of July to December of 2014 and the trail run will be conducted between January and July of 2015, the Study Team feels that the O&M organization should be established and start trial operation by July 2014 at the latest.

### 5.3 Crucial Issues for the Development of the Roadmap

#### [Registration]

A process of setting up a state-owned enterprise (SOE) currently consists of the following two steps.

Step 1 To get an internal approval within the various state agencies, and

Step 2 To officially register the business.

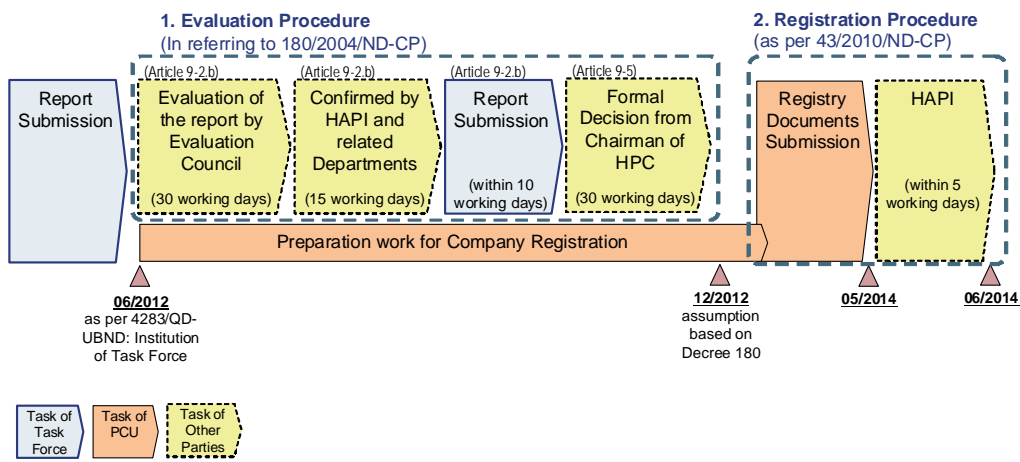
Vietnamese law currently only covers Step 2 in “Enterprise Law” and related Decree 43/2010/ND-CP, and is nothing about Step 1. However, in practice, the main procedure for Step 1 is provided in the outdated “State-owned Enterprises Law” 14/2003/QH11 and related Decree 180/2004/ND-CP, which can still be used as a reference. This does not mean that people/entities have to follow exactly what is stipulated in the law on state-owned enterprises.

However, in actual practice nowadays, proposals to set up a new SOE are submitted to the Prime Minister for approval before the competent authorities officially issue the establishment decisions. In the cases of special importance and large companies, the Prime Minister will issue the decision himself. However, since the urban railway in Hanoi is already under HPC, the Chairman of the HPC should be able to issue the decision about establishing it.



As Decree 180/2004/ND-CP stipulates, the establishment of a state company such as an urban railway must be confirmed by the related parties before the registration. Upon obtaining confirmation, the registry documents are to be prepared and submitted to authorities in accordance with the enterprise law and related decrees. According to the decision known as “Institution of a Task Force assisting HPC to develop O&M and Exploitation entity program for urban railway lines at Hanoi City” 4283/QD-UBND, the Task Force is requested to submit a final report that includes an “organization, business plan, financial plan and roadmap” to HPC for their approval by the second quarter of 2012. The Study Team understands that the evaluation work stipulated in Decree 180 will be started at this time. Registration documents are to include a draft company charter and a list of authorized representatives as of the date of the company registration.

Because it is the first urban railway company in Hanoi, it is possible that it will take a rather long time to prepare such a report. Therefore the Study Team recommends that HPC should form a preparation unit (PU) for company registration by the date of report submission, December 2012, so that the PU can proceed with the preparation work for company registration in parallel with the evaluation tasks.



\*1: Evaluation procedure is based on Decree 180/2004/ND-CP. Decree 180 specifies procedures for the establishment of a new State-owned enterprise, although it must be noted that Decree 180 is for implementing the Law on State Owned Enterprises which, in theory, has been superseded in so far as establishment procedures are concerned, by the Law on Enterprises.

\*2: The registration procedure is based on Law on Enterprise 60/2005/Q11 and Decree 43/2010/ND-CP.

**Figure 5.2 Administration Procedure for a State Company**

**[Regulation and Regulator for urban railways]**

As discussed in Chapter 3, a Regulator for urban railways to govern urban railways in Hanoi based on the regulation. Whether it is newly established or a part of existing organization is an essential component for realizing a sustainable urban railway operation.

One of the important roles of the Regulator for urban railways is to set the fare level for the urban railway. In consideration of the time needed to prepare the business plan for the O&M company, the fare, together with other regulations, must be set one year prior to the opening of Line-2A in July 2014. In addition, the Regulator for urban railways is must be sufficiently qualified to supervise the daily operations by the opening date of Line-2A.

The current regulations related to the railway law raise another issue. They have been established to regulate railways, including urban railways, in general. However, they have been defined for an intercity railway and utilize experience-based standards. For example, as shown in Table 5.2, a driver is required to have 24 months experience as an assistant driver before being licensed as a driver. It can be said that such standards could become huge obstacles to the establishment and operation of an urban railway business. Thus, the Study Team specifies in the roadmap the activities that must be conducted by the relevant Regulator for urban railways and VNRA in order to realize the regulatory development suitable for the expansion of urban railways and their sustained operations in Hanoi City and in other cities in Vietnam as well.

These activities should start immediately because these regulations need to be ready before Line-2A starts its trial run in January 2015.

**Table 5.2 Legal Constraints in Railway Law and Decrees**

Position		Qualification	Work Experience
Personnel in the prime responsibility for technical management of (*1) (*2)	transport operation	A university degree	At least three years' experience in railway transport operation
	railway infrastructure	A university degree	At least three years' experience in operation of railway infrastructures
The leader in charge of safety affairs (*2) (*3)	railway transport	A university degree in railway transport	At least three years' experience in railway transport management
	railway infrastructure	A university degree in railway facilities	At least three years' experience in managing railway infrastructure
Personnel in direct service of train operation (*4)		Professional diplomas or certificates suitable to their titles granted by training establishments recognized by the MoT.	- Not in particular -
Train drivers (*4)		Professional diplomas or certificates in driving railway traffic means, granted by training establishments.	Train assistant-drivers for 24 consecutive months or more

\*1: Decree 109/2006/ND-CP

\*2: This may not apply to all managers but only to the leader of operation/maintenance/safety department of the O&M company.

\*3: Decision 61/2007/QĐ-BGTVT (amended and supplemented by Circular 09/2011/TT-BGTVT) \*4: Railway Law 35/2005/QH11

### [Central Server and Clearing House]

It has become clear during the study that all lines have been planning to have an AFC system, but a

server for clearing is not covered in the construction projects. In other words, the construction projects only make provisions for a closed system. Therefore, if the common fare system is implemented, the O&M company must prepare a Central Server for clearing revenue data among the lines. If the O&M company needs to clear fare with other entities, the independent Clearing House needs to be established.

In this regard, in order to meet the above requirements, the Central Server must be prepared within the O&M company before Line-3 starts commercial operation in January 2017. The independent Clearing House must be established before the commencement date of IC card services by other entities.

The development period of a system usually depends very much on the system specifications. However, in general, it may require 2 to 3 years to develop the clearing system. To meet the opening of Line-3 in 2017, the system basic design should start at the time that the O&M company is established.

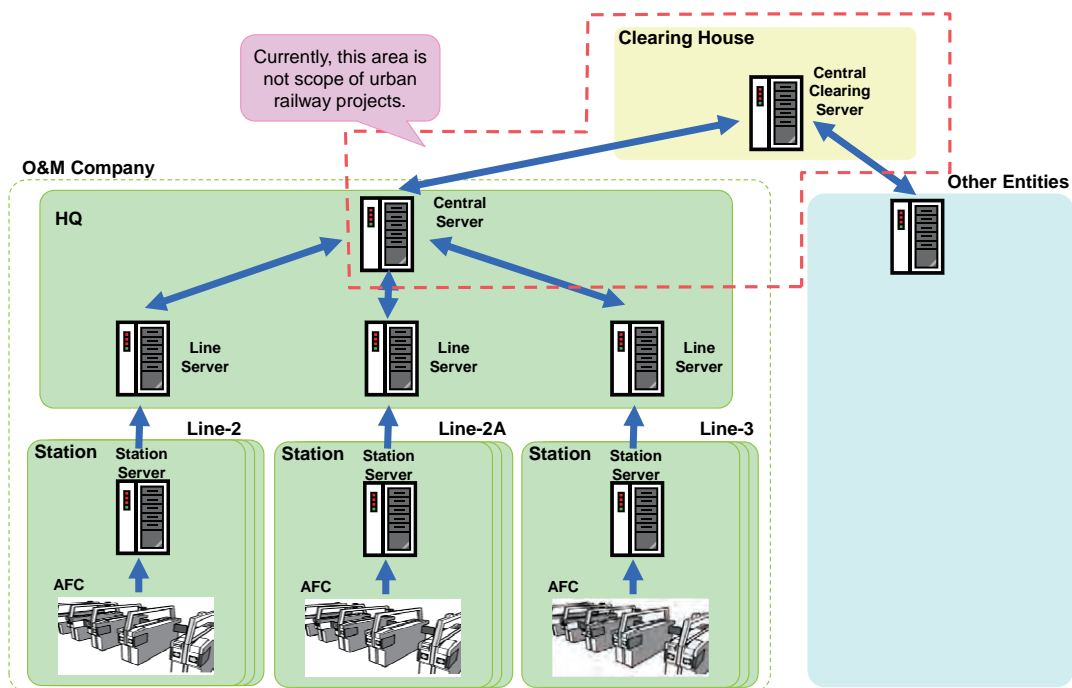
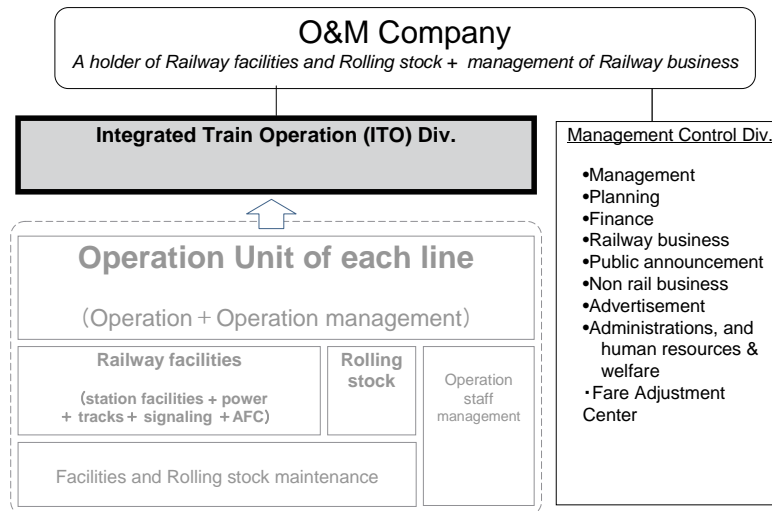


Figure 5.3 Image of Company Server and Clearing House

**[Company Regulation]**

The company regulations must be completed by the start of the O&M company, as well as various business procedures and manuals to introduce the regulations into actual operations. The construction projects will provide training and materials regarding daily railway operation and maintenance after the

commencement of operation. Company regulations, however, are outside of their responsibilities. The program for setting up company regulations is provided in Chapter 7 of this report. It is important to train local staff in the Integrated Train Operation Division (ITOD) and Management Control Division (MCD) through that program.



**Figure 5.4 Area of Training Contents for Operation and Maintenance**

#### [Acquisition of Knowledge and Know-How for Urban Railway Company Management]

It is inevitable for railway company to acquire specific knowledge to keep sustainable operation. The following know-how in particular must be obtained prior to the opening date of Line-2A.

- Human resources and finance: Staff allocation and budgeting
- Operation: Train timetable
- Maintenance: Asset maintenance and renewal plan

## Chapter 6 Setting up of the O&M organization and the Regulator for Urban Railways in Hanoi

In Chapter 6, the plan for the Technical Cooperation (herein after called TC) by JICA for setting up the O&M organization and the Regulator for urban railways in Hanoi are discussed based on the conclusions in Chapters 3 to 5.

Currently, there are different urban railways in Hanoi being constructed by different donors. In this respect, it is essential to have good relations with the concerned parties of each railway. The O&M company for urban railways must be established before Line-2A starts its commercial operation in the summer of 2015. Considering all these conditions, the Study Team proposes the following plan for the TC.

### 6.1 Lines Covered by the O&M organization and Other Issues

#### 6.1.1 The O&M organization and “Common Fare System”

- The lines to be under the administration of the O&M company are Line-2, Line-2A, and Line-3
- The lines to join the “Common Fare System” are Line-1, Line-2, Line-2A, Line-3, and Line-5.

#### 6.1.2 Company Management in Consideration of Passengers

As mentioned in Chapter 3, the scheme that covers all lines in Hanoi City under one company is the most efficient. The comparison of two schemes is shown in the table below.

**Table 6.1 Comparison of Company Schemes**

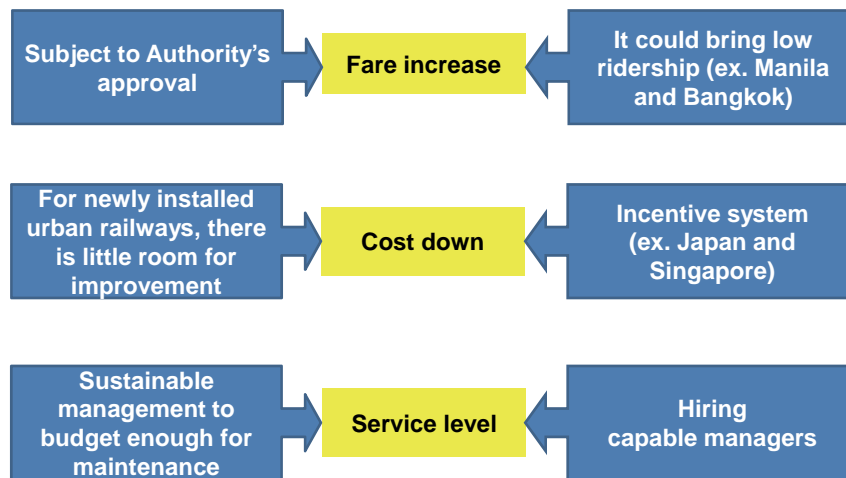
Item	Scheme A (All lines by one company)	Scheme B (One line by one company)	Remarks
Responsibility of sustainable management	One exclusive company has responsibility.	Each company has responsibility for its own line.	Regulator for urban railways has responsibility for supervising company(s), not for management.
Decision on the investment issues across multiple lines.	It can be done under one management.	If there are different opinions among the lines, it would be difficult to make a decision.	Financial support in Scheme B by Hanoi city could be higher than one in A.
Mutual financial support among the lines.	It can be done under management decision.	It cannot be done without Hanoi City's control.	-
Utilization of human resources across lines	It can be done under management decision.	It cannot be done without Hanoi City's control.	The training about other lines is required prior to a personnel reshuffle.

Source: JICA Study Team

Due to the nature of urban railways, when different companies do not operate on the same tracks it may appear that there is a business monopoly. Because of this, passengers may have some concern as follows.

- Fare price will be increased only for the benefit of the company.
- The company probably is not making an effort to reduce costs.
- The company may allow low levels of service to be acceptable.

The Figure 6.1 shows how the above concern could be eliminated.



**Figure 6. 1 Factors and Strategies to Eliminate Customers' Concern**

### 6.1.3 Common Fare System and Interoperable AFC System

The AFC system must be developed under a common interoperable specification in order to realize a common fare system. All components, such as the “IC card”, “card reader/writer” and “data format” must comply with this specification. It is important to note that even when this specification is applied, the cards and other equipment such as automatic gates can be purchased from each respective donor country.

A common specification for an interoperable AFC system is attached as an appendix of this report.

### 6.1.4 Time Schedule

Summer 2014: The Regulator for urban railways and the O&M company will have been established.  
(One year before the opening of the initial line)

Summer 2015: Line-2A will be opened.

Early 2017: Line-3 will be opened. The central server for AFC will have been implemented.

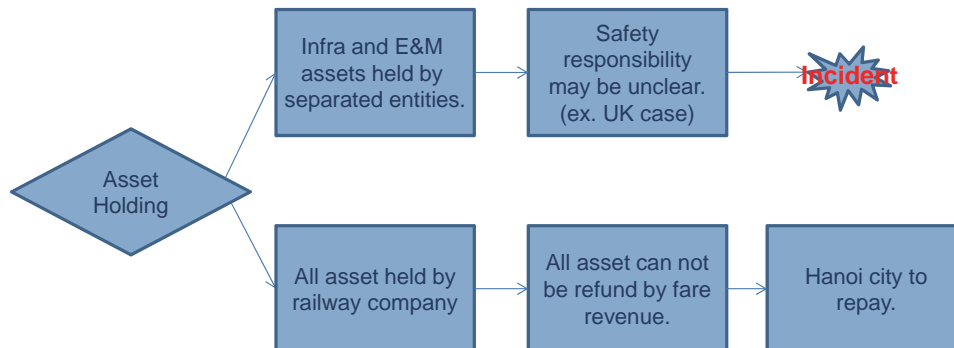
Early 2018: Line-2 will be opened.

## 6.2 Financial Framework

### 6.2.1 Necessity of Asset Management under One Entity

The vertical separation issue has already been discussed from the financial viewpoint in Chapter 4. Here it is discussed from the viewpoint of maintaining safety.

Realizing safe operation and keeping assets on good condition are closely tied to each other. If the asset owner is different than the operator, the owner might try to reduce or postpone maintenance and replacement in order to reduce costs and this will result in a quick deterioration of the assets that could jeopardize their safety. Furthermore, if some incident occurs, there will be a dispute regarding which side, the asset or the operation, caused the incident, for instance. There are two typical cases from the United Kingdom. One is the Clapham Junction accident (1988) and the other is the Paddington accident (1999). It is important to note that there are successful examples with this scheme, but from the viewpoint of safety, it is desirable that all assets be held by one railway company.



**Figure 6. 2 Asset Ownership and Safety Issues**

When a railway company acquires assets with funds other than its own, repayment comes into question. In the case of the O&M company in Hanoi, as it is planned that the initial assets are transferred to the O&M company, there was the same question if the O&M organization is still responsible for the repayment. As described in Chapter 4, since fare-revenue is not enough to repay initial assets, the Study Team recommended that the repayment obligation be retained by the city. The city can be expected to pay back the initial investment through an IPO (initial public offering) in the future.

## 6.2.2 Selecting Financial Framework through Financial Simulation

Before selecting the financial scheme of the O&M company, simulations were conducted considering the following two concepts.

- Establishing the scheme for the O&M company independent of HPC while receiving some subsidy from Hanoi city.
- Minimizing the interaction between the O&M company and Hanoi City in order to simplify the relationship between these two organizations.

The concrete financial schemes are as follows. These financial schemes will be examined again during the TC project in order to establish a soundly operated railway business (please refer to Action 8-5 in Table 7.1 below).

### (1) Capital

- The amount of the initial capital is calculated in the implementation stage.
- After establishment of the company, initial assets are to be contributed in kind to the O&M company by Hanoi City.

If all assets were to be contributed to the O&M company, the asset value of the O&M organization would be huge, causing large depreciation that would lead to a loss. As long as positive cash flow is generated, this would not be a problem. However, there are some assets that do not have to be periodically replaced and should be exempted for financial reasons. For example, long-life assets that are utilized over many years, such as bridges, could be among the items to be retained at the city. The details will be discussed with DOF during the TC project.

**Table 6.2 Funding Sources and Repayment Responsibility by Asset Type**

Asset Type	Capital (ODA)	Repayment	Ownership of Assets
Infrastructure	Granted from Central Government to HPC	Central Government	Non-replacement assets: HPC own and lend it to O&M company free of charge. Assets subject to periodic replacement such as rails, catenaries etc. should be contributed to O&M in kind.
Equipment and Rolling stock	Transferred from Central Government to HPC on-lending	HPC	O&M company

Source; JICA Study team.

### (2) Financial Support

When the cumulative cash flow of the O&M company falls into the red, the company may borrow funds from banks. In this case, HPC provides the O&M company with the financial support to



cover some portion of the interest (in order to realize a low-interest loan).

In the future, when the cumulative cash flow is likely to result in a large deficit due to the addition or renewal of the facilities, such as rolling stock, and the only possible way to avoid this is that with low-interest loans, Hanoi city should consider to partially subsidize these costs. In addition to the above, Hanoi City should support the O&M company finding ways for tax exemptions.

### (3) Fare Level

The fare level should be set to match to affordability level of the passengers. (For the details, please refer to Chapter 4.) Actual prices will be determined a year before the commencement of the commercial operation of the first line. At this stage, the fare levels are assumed to be as shown in the following table. The fare revising system will be discussed in the TC project.

**Table 6.3 Fare Level in Respective Year Periods**

Year	Fare level in each year	Average fare price
2015-2017	VND 6,800 + 680 x (Travel length in km)	VND 10,500
2018-2025	VND 8,000 + 800 x (Travel length in km)	VND12,500
2026-20370	VND 10,500 + 1,050 x (Travel length in km)	VND16,000
2038-2044	VND 12,000 + 1,300 x (Travel length in km)	VND20,500

Source: JICA Study Team

### (4) Business activities of the company

The business activities of the O&M company will be as follows.

- Operation and maintenance of the urban railway.
- Related businesses using urban railway assets and facilities, such as retail businesses inside stations, advertisements in cars, service activities related the urban railway, telecommunications utilizing optical fiber cables. etc.

These activities will be added to the company based on the actual management conditions and then gradually added to the company charter.

## 6.3 Involvement of the Relevant Authorities and Companies

### (1) Hanoi City

Hanoi City should organize the Preparation Unit (PU) within MRB that will prepare for the

establishment of “the Authority for urban railways” and “the O&M company.” Also “a decision” of Hanoi City, which will become the legal basis for the PU, should be drafted and approved by HPC by August 2012. As of June 15, 2012, MRB had already appointed six staff members to this PC and is planning to allocate the remaining resources step by step.

Hanoi City should also establish “the Joint Coordination Committee,” consisting of the representatives of the organizations relating to this project. (Refer to Table 6.4.) Major tasks of the JCC are to assist the activities of the PU and to evaluate the plans for the establishment of the authority for urban railways and the O&M company that the PU establishes.

**Table 6.4 List of JCC Members (Draft)**

Organization	Remarks
Ministry of Transport/Vietnam Railway Administration	
Hanoi Authority for Planning and Investment	
Department for Home Affairs	
Department of Finance	
Department of Transport	
Hanoi Metropolitan Rail Transport Project Board	
Vietnam Railways Corporation	
Japan International Cooperation Agency	A representative from JICA Hanoi and a team leader of the TC team

Source; JICA Study team

## (2) MOT

- The roles of the Regulator for urban railways in regards to safety development are limited to the scope that MOT designates to the authority for urban railways. According to VNRA, forming rules and guidelines about safety are covered by VNRA; operation of urban railway under rules and guidelines are regulated at the provincial level. The tentative roles are agreed to be as follows: i) receipt of reports about accidents, and ii) execution of accident investigation, which is out of MOT’s scope. Making decisions about technical standards will be out of scope of the Regulator for urban railways.
- MOT will participate in JCC, which is to be set up by Hanoi City.

## (3) VNR (Line-1 Related)

- VNR is a member of the common fare system in Hanoi in the same manner as HPC.
- The Regulator for urban railways is to determine the fare level. When the cumulative cash flow of Line-1 goes into the red, VNR will provide subsidies. The manner of funding will be left to VNR, but it is recommended that the basic scheme for the subsidy be the same as that used by Hanoi City.

#### (4) WB and Other Donors

- Coordination will be conducted in conjunction with the following donors: Agence Française de Développement, Asian Development Bank, European Investment Bank, World Bank and the Chinese authorities.

## 6.4 Management Control Division, Related Organizations and Number of Staffs

The precise number of staff in the Management Control Division will be determined based on the analysis done in the PU/TC project. Based on the assumption that a lean organization is to be formed for this division, the following staffing numbers were estimated to be used as guidelines. These staffing numbers are based on examples from Japan. The organizational structure and staff number will be determined by the PU later; the tentatively proposed numbers are shown in the following table.

### 6.4.1 Number of Staff in Management Control Division

Staffing of the headquarters is based on the unit numbers in each department as displayed in Table 6.5 aiming at a lean organization. For example, the staff number for the Administration Department is going to be 7, which is calculated by multiplying 5, the unit number in 2015, by 1.2, the average number of staff to be assigned to each unit, plus 1, a team leader for each department. (7 staff members = 5 units x 1.2 staff members +1 leader for the department.) As for the year 2040, 3 people are provisionally assigned to each unit here. These figures are to be checked closely in the Preparation Unit/Technical Cooperation Project.

There is rather large number of staff members in the HCMC scenario with more staff in operation and engineering areas. However, it is generally more difficult to reduce the number of staff members than to increase it. Therefore, it is better for Hanoi City to start with the small staff when developing a lean organization.

**Table 6.5 Staffing Numbers in Management Control Division (Draft)**

Departments			Initial stage	Matured stage	
Department	Unit	Unit number A	(2015) B=A x 1.2 +1	(2040) C=A x 3+1	
Managing director/Deputy MD			2	4	
Auditor			1	1	
Planning	Management planning, Investment planning and environment	3	5	10	
Administration	Administration, secretary, IT, legal affairs and publicity	5	7	16	
Safety	Safety planning, incident investigation and operational rule	2	3	7	
Human Resources (HR)	Recruitment and appointment, staff allocation, salaries, sanctions, training and welfare and pensions	6	8	19	
Financial affairs	Accounting, budget, finance and procurement	4	6	13	
Business	Fare level, station business, service and non-fare business	4	6	13	
Integrated train operation	Transport	Traffic planning, drivers' operation planning and travel time / operation facilities	3	5	10
	Rolling stock	Mechanical equipment, electric facilities for rolling stock and inspection	3	5	10
	Equipment	Tracks, signal/telecom, power supply, low power supply/ architecture, mechanical equipment and AFC	6	8	19
Total		36	56	122	

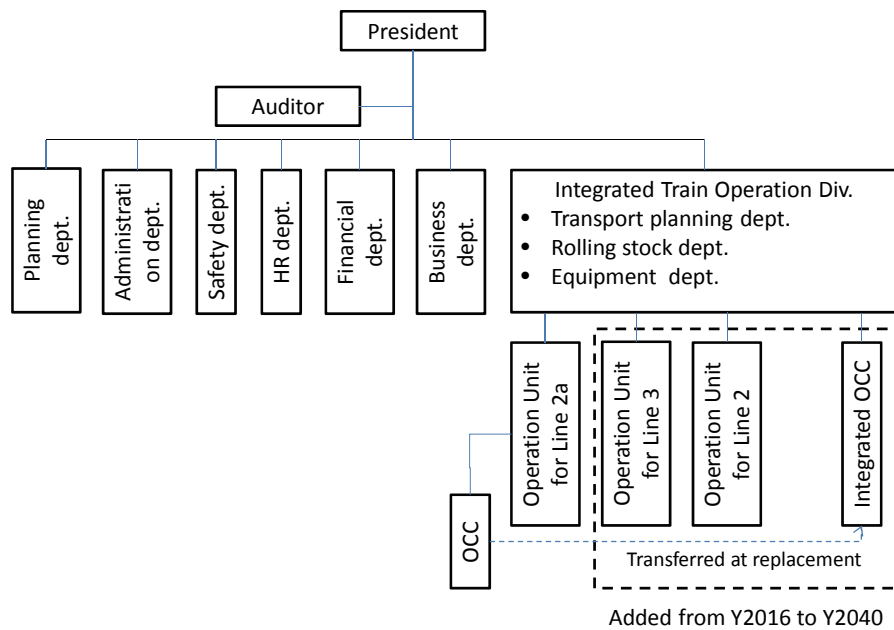
Source: JICA Study Team

Note: The number of dispatchers in the OCC and indirect staff, such as secretaries, are not included (For the number of dispatchers, refer to Table 6.8). The Operation Unit staff members are not included.

At the initial stage in 2014, it is recommended that the departments displayed in Table 6.5 be integrated to make the system more efficient. In Japan, there are cases where several departments such as administration, safety, HR and financial affairs are integrated into a single administration department. Combining the business department and transport department would create the transport and business department. There are also examples of the rolling stock department and equipment department being integrated to make one department.

The initial business of the non-fare section is to be limited to its smallest possible size.

The following figure shows the organization at the commencement of the revenue operation of Line-2A and what it will look like in the year 2040.



**Figure 6. 3 Organization Chart of O&M Organization in 2015 and 2040**

#### 6.4.2 Staffing of PU Team and its Composition

The number of PU staff at different times is calculated based on the information provided in Table 6.5 and is shown in the table below.

- The top priority of this project is the timely opening of Line-2A. It is assumed that JICA will dispatch a short-term expert for the preparation for the TC project prior to the commencement of the Technical Cooperation and that MRB will assign some staff for the preparation. Refer to Section 7.4 for the tasks to be done prior to the commencement.
- To employ a large number of staffs for PU at the start of TC would only create confusion. It would be better to gradually increase the PU staff until the time of establishment of O&M organization. In April 2013, at the halfway point of the two events, some 30 staff members are expected to have been assigned to PU.
- Note that the arrangement of departments is just a proposal. At the initial stage, consideration for administrative efficiency is required, which could include the integration of departments for rolling stock maintenance and facility maintenance, or administration, planning and safety.

**Table 6.6 PU Staffing at Each Key Milestone**

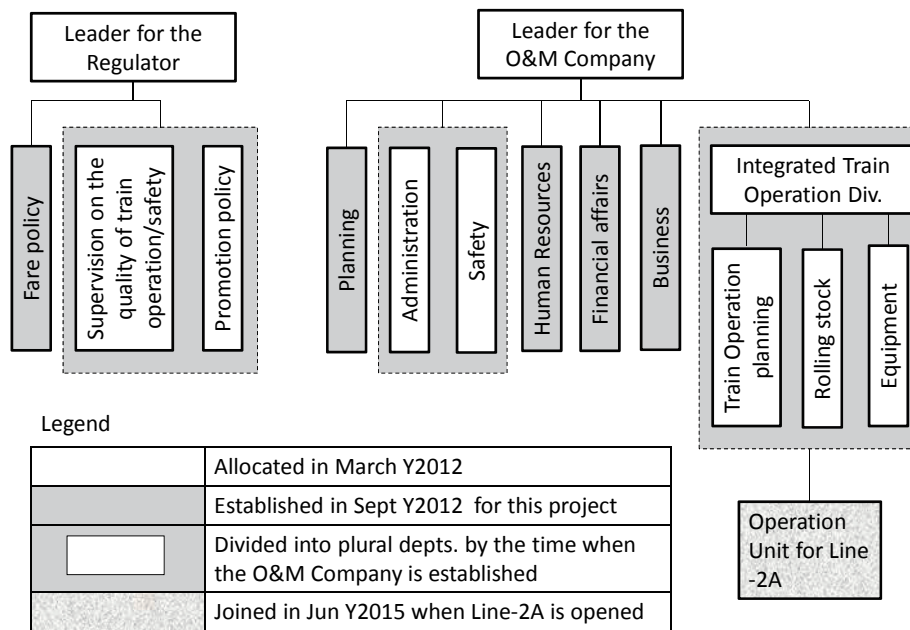
Organizational	Event		Dispatching Short-term Experts in SAPI Study	Commencement of TC	Establishment of the O&M Co.	Opening of Line-2A	
	Time		Mar. Y2012	Jan. 2013	Jul. 2014	Jun. 2015	
Regulator for urban railways	Team leader		1	1	1	2	
	Fare policy			1	1	2	
	Transport policy				1	2	
	Train operation and safety management			1	1	2	
	Common fare			1	1	2	
	Sub total			1	4	5	10
	O&M Co.	Leader/board member		1	1	3	3
Planning		1	4		5		
Administration		1	6		7		
Safety(※)			4		5		
HR		1	7		8		
Financial affairs		1	5		6		
Business		1	5		6		
Integrated train operation		Train operation			1	4	5
		Rolling stock			1	4	5
		Equipment			1	7	8
Subtotal		2	9	49	58		
Grand total			3	13	54	68	

Source: JICA Study Team

(※)The head of this department must have a minimum of three years' experience in railway transport and infrastructure management and a bachelor's degree in a railway transport and facility related field according to the railway law and its related regulations.

Dispatchers are not included in this table. (See Table 6.8)

The following figure shows the transition of the PU organization structure.



**Figure 6. 4 Transition of the PU Organization**

6.4.3 Number of Dispatchers

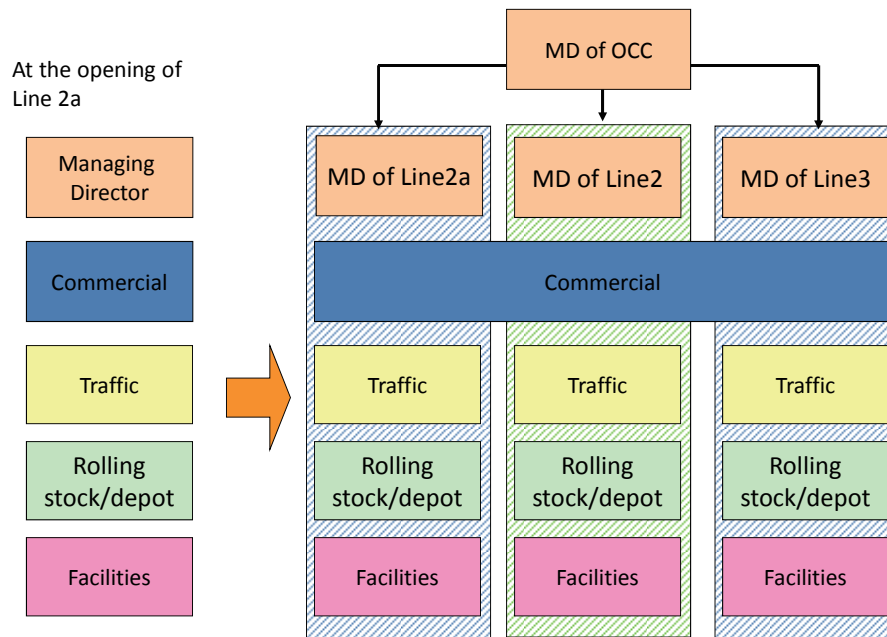
The following table illustrates the major roles of the dispatchers. It is used to calculate the number of dispatchers.

**Table 6.7 Major Roles of Dispatchers**

Part	Major roles
Managing Director	Management of the OCC Making decisions about the policy or strategy of the operation on a contingency basis
Traffic	Route control for trains Drivers' operation planning on a contingency basis
Rolling stock and depot	Instructing drivers for troubleshooting during trouble / failure on their train-set Route control in the depot
Facilities	Delivery of information relating to facility trouble to the related work sites Operating the SCADA system Route control for the facility maintenance work at night
Commercial	Delivery of various information to the stations and mass media relating to contingency operations Instruction to stations relating to the irregular commercial treatment of passengers

Source: JICA Study Team

The following schematic shows the organization of the integrated OCC for the three lines in Hanoi. The table after it shows the staffing of the OCC.



**Figure 6.5 Organization of the OCC**

The estimated number of staff members per line at the OCC is shown in the following table. This is an effective work structure that is equipped with an Automatic Train Supervising system and receives support from the management control division in the contingency.

**Table 6.8 OCC Staffing per Line**

Position	Allocation	Total
Managing director	1 shift (3 staff members)x1	3
Dispatcher	1 shift(3 staff members) x4+2 spare for the midnight duty	14
Total		17

Note: For each shift, a dispatcher is allocated for 24 hours including 6 hours of rest in the OCC (One shift needs three dispatchers)

Dispatchers in charge of commercial operations are not allocated by line. Instead, a single dispatcher in charge of commercial operations is allocated for the entire OCC.

The number of dispatchers for the integrated OCC can be calculated as follows.  
The total number of dispatchers in the integrated OCC = the number of lines x dispatcher number per line (=17- dispatchers in charge of commercial operations (3)) + dispatchers in charge of commercial operations (3)

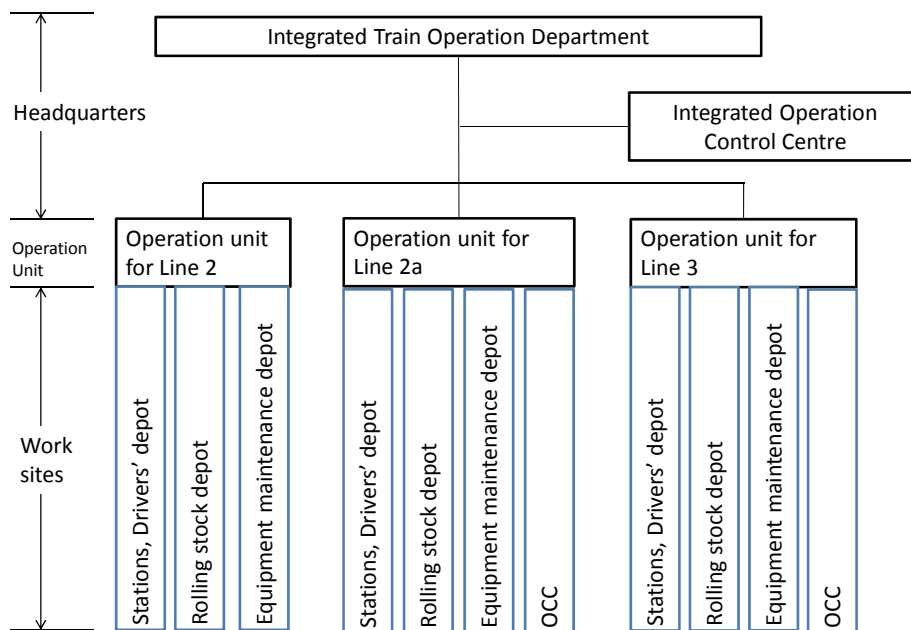
Secretaries are not included in the staff number.



6.4.4 Operation Management Office and Operation Unit

Figure 6.6 shows the relationship among the work sites, the Operation Units and the Integrated Train Operation Division. In a typical railway company, the Integrated Train Operation Division is the integration of the transport, rolling stock, and facility departments. The Operation Unit is the organization that is responsible for daily train operations for the designated line. There are work sites beneath the Operation Unit and above it is the Integrated Train Operation Division. Hence it may not be very large in scale and only have a staff of 10 at most.

The Railway Projects Management Unit (RPMU) for Line-2A says that there will be 975 staff members at its opening, apparently including the management staff, dispatchers and work site staff. This estimate is shown in Table 6.8. The number of staff for the work site will be 948, which is worked out by sending 10 to the Operation Unit and 17 (as estimated by SAPI Team) to OCC (975-10-17=948).



**Figure 6.6 Relationship among Work Sites, Operation Unit and Integrated Train Operation Division**

Relationship between the ITO Division of the O&M company and the Operation Units of the respective lines will be clarified through discussions about the detailed tasks of the divisions in the TC project. The tasks currently assumed by the Study Team are as shown below.

**Table 6.9 Demarcation Plan for ITO Division and Operation Management Office**

Divisions	Tasks
Integrated Train Operation Division	<ul style="list-style-type: none"> <li>● Planning of operation &amp; maintenance</li> <li>● Controlling and coordination of lines</li> <li>● Operation of Integrated OCC</li> </ul>
Operation Management Office	<ul style="list-style-type: none"> <li>● Daily train operation service and maintenance works (excluding Integrated OCC tasks, but including the Line Operation Control Center). In reality as managers are allocated at each work site, most of tasks are carried out at work sites. The OMO is the portal of the line.</li> </ul>

Source: JICA Study Team

#### 6.4.5 Evaluation of Staff Numbers Planned for Each Line Project

Since each line currently under development in Hanoi has a different donor, differences are expected to appear in the equipment specifications related to railway operation. Differences are also expected in staff planning concepts due to the different experiences of donor countries. Even in the management control divisions, which are little affected by equipment specifications, the basic units used in staff numbers may differ among donors. We, therefore, expect the results of this study will prove to be valuable in establishing a financially-sound urban railway operator.

The plan for the staff allocation needed for operation and maintenance of the urban railway will have to be carefully examined and reviewed, while taking these circumstances into account, by the Preparation Unit and Technical Cooperation team to be established.

##### (1) Number of staff members by division planned for each line project

This study was conducted, using the data provided from each line project, to work out the number of staff members that are needed by each division to undertake daily train operation and maintenance of operational equipment. These staff numbers represent the railway operation system planned in each line project. They may include numbers which may need some more review in the future.

Table 6.10 provides a summary of the data necessary for the study: the operating kilometers, number of stations, and staff numbers, and the staff number.

**Table 6.10 Staff Number by Division Planned for Each Line Project**

	Operating (km)	Station number	schedule Speed (km/h)	Headway (min)	Work Site				
					OCC	Operation	Maintenance		Total
							Ro-stock	Equipment	
Line 2A	13.1	12	–	5.00	29	444	78	206	757
Line 2	11.5	10	35	3.75	30	276	46	126	478
Line 3	12.1	12	36	5.00	–	320	130	84	534
Line 1	25.0	15	33.5	4.00	137	1451	97	382	2067

Source; JICA Study team

Excluding Line 1, Lines-2A, 2, and 3 are very similar in terms of operating kilometers and numbers of stations. Though the data do not include detailed unit figures for staff numbers, Lines-2A and 1 have the largest numbers of operating staff members. What makes this is whether or not crews other than drivers (e.g., conductor or assistant driver) are included. It should also be noted that Line 1 plans to include more station staff than the other lines do.

Line 3 has more maintenance staffs for rolling stock. That is due to the considerable number of maintenance and inspection staff for the small parts of the rolling stock. It indicates that the operator itself may undertake the entire task of overhaul inspection. On the other hand, it appears that in the case of Lines-2A and 2, the operator will undertake regular maintenance and inspection, but is considering subcontracting overhaul inspection.

In Lines 2A and 1, a larger number of staff members are planned for the infrastructure and equipment maintenance division. This may be due to the fact that Line 1 has more operating kilometers and also has a longer section for maintenance of civil structures and tracks, as well as various ground facilities.

Note that the data for Line 3 does not contain an explicit staff number for the operation control center, and a “-” (dash) is entered in the table. However, the chapter on train operation management contains a description of the operation control center. Therefore, the number of operation staff, 320, is assumed to be inclusive of that of Operation Control Center (OCC).

Line 1 plans to have more than 100 staff members for the Operation Control Center. This big number is due to the planned supervision to cope with the trains besides those of Line 1, such as existing medium- and long-distance trains and international trains.

(2) The reference values referred to staff numbers of urban railways in Japan

The staffing plan of each line has been compared. At present, the detailed rules for staff planning, such as working regulations in compliance with Vietnamese laws and work tables for drivers, has not yet been established. In order to carry out qualitative comparisons of staffing plans for each line project, the unit number will be established by referring to the staff number of Tokyo Metro in Japan. Then the guidelines for the staff numbers will be determined.

Units and numbers for each job category are shown below.

Train driver division (running without a conductor on board): (No. of staffs/No. of retained train sets) = 5.5 persons/retained train set

Station division: (No. of staff members/No. of stations) = 17.0 persons/station

Rolling stock maintenance division: (No. of staff members/No. of retained train sets) = 3.5 persons/retained train set

Facilities maintenance division: (No. of staffs/operating km) = 6.5 persons/operating km

The number of retained train sets will be the sum of the number of train sets required during rush hours and the standby train-sets (four train sets). The required number of train sets is to be determined by the headway. For this purpose, the time (one-cycle running time) required for the train to make one round trip is determined by adding the turn-back time (5 minutes/time x 2 times = 10 minutes this time) at the station at both ends to the running hours taken from the departure station to the terminal station which is obtained by the operating kilometers divided by scheduled train speed.

For example, one train set is enough if it takes 30 minutes to travel from A station → B station (turn-back) B station → A station (turn-back), if the headway is 30 minutes. Two train sets are needed if this headway is 15 minutes. Accordingly, six train sets are necessary when the headway is five minutes.

The required number of train sets can be easily calculated as follows:

(Required No. of train sets) = (1-cycle running hours) / (headway), rounding up any fractional portion

Table 6.11 shows the reference value for the number of crew members. Note that the scheduled speed for Line-2A was not included in the original data, so it is assumed to be 35 km/h.

**Table 6.11 Reference Value of the Crew Members**

	Train Crew							
	Operating (km)	Schedule speed (km/h)	running time (min)	1-cycle (min)	Headway (min)	Train number	Driver	Crew Conductor
Line 2A	13.1	35.0	45	55	5.00	11	83	83
Line 2	11.5	35.0	39	49	3.75	14	99	0
Line 3	12.1	35.0	41	51	5.00	11	83	0
Line 1	25.0	33.5	90	100	4.00	25	160	160

Source; JICA Study team

The number of train sets shown in Table 6.11 is the amount required to achieve the headway shown in the table. The number of standby sets was added in determining the staff size. On the line that plans to have crew members other than the driver, for the number of crew members the same as that of drivers is counted as shown in Table 6.11. The driver and assistant driver will be assigned to Line-2A and the driver and conductor will be assigned to Line 1.

Similarly, on the basis of the number of stations and operating kilometers, the reference values for the Operation Control Center staff, station staff, maintenance staff for rolling stock, maintenance staff for infrastructure and equipment can be determined as shown in Table 6.12.

**Table 6.12 Reference values for OCC, Station, and Maintenance Staffs**

	Operating (km)	Train number	Station number	OCC Staff	Station Staff	Maintenance Staff	
						Rolling stock	Infra Equipment
Line 2A	13.1	15	12	17	204	53	86
Line 2	11.5	18	10	17	170	63	75
Line 3	12.1	15	12	17	204	53	79
Line 1	25.0	29	15	17	255	102	163

Source; JICA Study team

The number of train sets shown in Table 6.12 includes standby train sets. The Operation Control Center for daily railway operation is assumed to include four categories: the transport commander who controls the train operating conditions, the rolling stock commander who controls the train conditions, the power commander who controls the power supply/demand of substations, etc., and the facility commander who controls the state of facilities and equipment. With four persons/category and one operation control center master, a total of 17 persons comprises one shift.

## (3) Considerations regarding the staff planned for each line project

Table 6.13 summarizes reference values (“calculation” in the table) determined in (2) and the staff number planned for each line project, for each job category.

**Table 6.13 Staff Number and Reference Values for Each Line Project**

	Operating (km)	Station number	Operation Control Center		Operation Train crew & Stationstaff		Maintenance Rolling stock		Maintenance Infra & Equipment	
			Calculation	Estimation of GC	Calculation	Estimation of GC	Calculation	Estimation of GC	Calculation	Estimation of GC
Line 2A	13.1	12	17	29	370	444	53	78	86	206
Line 2	11.5	10	17	30	269	276	63	46	75	126
Line 3	12.1	12	17	–	287	320	53	130	79	84
Line 1	25.0	15	17	137	575	1451	102	97	163	382

	Operating (km)	Station number	ToTal		(Total Staff) / (OP. km)	
			Calculation	Estimation of GC	Calculation	Estimation of GC
Line 2A	13.1	12	526	757	40.2	57.8
Line 2	11.5	10	424	478	36.9	41.6
Line 3	12.1	12	436	534	36.0	44.1
Line 1	25.0	15	857	2067	34.3	82.7

Source; JICA Study team

When it is examined from the standpoint of job categories, there are large differences between the reference value and the value estimated by GC in the infrastructure and equipment maintenance division of Line-2A, the Rolling Stock Maintenance Division of Line 3, and the Operation Control Center, Operation Division and Infrastructure and Equipment Maintenance Division of Line 1. Divisions other than those of Rolling Stock Maintenance Division of Line 3 show a difference of 100 persons or more. Detailed reviews of staff plans for each division have yet to be completed for each line. It is necessary for TC to confirm conditions (equipment specifications, maintenance and control methods, etc.) when confirming the staff number for each line. We must not forget that ensuring safe and stable transportation is the mission and most important factor in public transport.

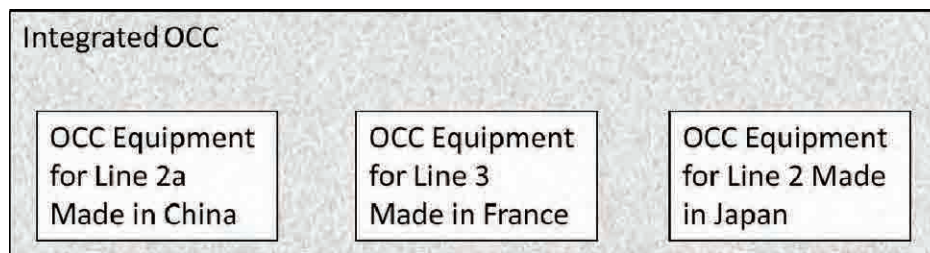
Finally, the staff number is a variable directly affecting staff costs. In Japan, a guideline for the staff number to be engaged in operation and maintenance of an urban railway is about 40 persons/km. Table 6.13 shows that Lines 2 and 3 are close to this guideline, but the staff

number for Line-2A and Line 1 substantially exceed it. Note also that the reference value for staffs presented this time is a guideline for an overview of urban railway management in Japan. Actually, the financial balance of urban railway management in Hanoi must be taken into account when the staff number by job categories is established. This will ensure sound corporate management and activities. Reference values used here are the data used by Japanese urban railway operators without any modification. In the future, the units and numbers will have to be reviewed as various conditions in Hanoi are clarified.

## 6.5 Integrated OCC and Management Control Division

### (1) Integration of OCC equipment

From the visual and practical viewpoint, it is desirable that the equipment be designed based on a common specification. However, this is not mandatory requirement. Equipment made to the specifications established by each line project can be used in the integrated OCC.



**Figure 6.7 Concept of Independent Equipment Specifications in an Integrated OCC**

### (2) Lines already in Progress

Given their current status, incorporating Line-2A and 3 into an integrated OCC may cause delay in progress and additional cost. Therefore, Line 2A and 3 should keep their original plan at present and consider integration at the timing of equipment replacement. If the useful life of OCC equipment is 20 years, the completion of an integrated OCC could be achieved around 2035 and 2040.

Even if the OCCs for Line2A and 3 are not integrated, the operational information can still be shared with the staff in the integrated-OCC by providing operation status monitors for each line.

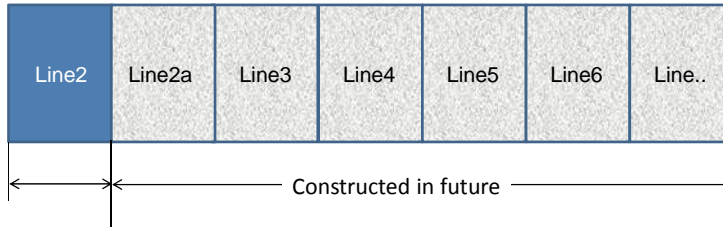
**Table 6.14 OCC Arrangement**

Stage	Integrated OCC	Non-Integrated OCC
1	-	Line-2A
2	-	Line-2A, Line 3
3	Line 2	Line-2A, Line 3
4	Line-2A and B	Line-2A, Line 3
Completed (Integration at the time of equipment replacement for Line-2A and 3)	Line-2A, Line 2, Line3, Line A & B	-

Source: JICA Study Team

(3) Construction of Integrated OCC

It's one option to build the Integrated OCC in advance of railway construction. However, since the opening date of the lines may vary, a partial building starting with Line 2 is also feasible, followed by others when they are ready as long as the building site is secured.



**Figure 6.8 Expansion Plan of Integrated OCC**

**6.6 Office IT System**

**6.6.1 Objectives**

The office IT system is basically an Enterprise Resource Planning (ERP) system that covers the technology and concepts for the integrated business management from the viewpoint of the effective use of the management resources, i.e. cash, human resources, assets etc. In order to meet the company's specific needs, a system that has been developed from scratch could be one of the solutions. However, such a system would be disadvantageous from the standpoint of mid- and long-term maintenance. Most companies, including those in the railway industry, tend to implement packaged systems in consideration of maintainability.



The O&M organization in Hanoi city needs management capability for the effective utilization of its resources as well. For example, accuracy is required for deposit control in an interoperable AFC system. Since the O&M company must develop those processes from zero, it is wise to utilize the proven practices incorporated in pre-packaged systems.

### 6.6.2 Function Overview

The functions to be developed in the O&M company are listed in the table below. The business management systems such as CMMS (Computerized Maintenance Management System) and WMS (Warehouse Management System) may be implemented by the construction projects. To avoid re-design work at the construction project side, re-inputting and/or file upload is used for the data-interface.

**Table 6. 15 Functional Overview of Office IT system**

Function		Description
Finance & Accounting	Budgeting & Controlling	- This function provides WBS code on projects for projects progress monitoring, and benefit/cost center code for managerial accounting. - These coding also enable company to set the cost allocation factors.
	Period Closing	- Financial closing (non-consolidated) including tax calculation. (Financial report must be prepared by ready-made application software for easy editing.)
	AR Management	- Client management through master database. - Account receivable recording and controlling
	AP Management	- Supplier management through master database. - Account payable recording and controlling
	Payment	- Bank account balance, payment check and foreign gain/loss. (FB data can be produced as future option.)
	Treasury	- Cash management and controlling linked to payment obligation and receivable.
	Fixed Assets	- Fixed assets management which has interface with procurement module and provides automatic depreciation calculation)
Procurement	Material Purchasing	- Parts management, purchasing and receiving
	Refurbishment & Modification	- Construction-in-progress management and interface with Fixed-asset for assets recognition.
	Inventory management *1	- Inventory management

HR	HR	-Staff management through HR master database. -Salary calculation based on HR master database. (Calculation of projected benefit obligation (PBO) is excluded.)
Revenue	Fare	- Revenue recognition
	Non-Fare	- Revenue recognition - Period distribution based on contract information.

Source: JICA Study Team

Note: \*1 : This is only for financial reporting, and not for physical inventory management.

### 6.6.3 Others

#### (1) Security

Since this system manages the financial information, it must be under security control. It is recommended to implement the security level described in “System Management Standard - Supplementary Edition (Guidance for IT Controls over Financial Reporting)” published by METI (Ministry of Economy, Trade and Industry).

#### (2) Internal Communication

Internal communication in a timely and appropriate manner is indispensable for company operation. An IT system is generally utilized to realize communication in such a manner. Company regulations can be shared on the intranet and the e-mail system can be used for daily communications. The Study Team recommends the implementation of servers with individual user interfaces for internal communication. Therefore, a PC (personal computer) is required for each employee in management in each department and at each station of the Operation Unit.

## 6.7 Transferring Line-2A to Hanoi City

### 6.7.1 Points to be Considered When Transferring Line-2A to Hanoi City

The following are the major points to be considered when transferring Line-2A to Hanoi City.

**Table 6.16 Major Points of Consideration When Transferring of Line-2A**

	VNRA's plan	SAPI's plan	Next Action
Company management	Before, management exclusive to 2A had been in the plan.	One management system for all lines.	Proceed with SAPI's plan.
	Structure of organization and their roles are defined	There is no big difference between SAPI's and VNRA's.	To be studied in TC project

The staff number in management division	211	Approx. 50	To be studied in TC project
Training outside Vietnam	- Engineering and Operation (10days) - Management (5 days) -Corporate Strategy and Culture (5 days)	Site training in Japan (2 months)	To be studied
Company regulations	To be developed by each department manager	To be developed based on draft in HCMC project.	To be studied in TC project
Repayment	O&M organization will repay loan for E&M assets	MOT/Hanoi city will repay loan for E&M assets	Proceed with SAPI's plan

Source: SAPI Study Team

### 6.7.2 Securing Safety after Line-2A Opening

The Line-2A project has been conducted by VNRA as the project owner. Hanoi City was never involved in this project. Regarding transferring Line-2A to the O&M organization, Hanoi City should develop the conditions for securing safety with VNRA. Safety securing measures by stage is expressed in the following table.

**Table 6. 17 Major Consideration Points in Securing Safety**

Stage	Item	Target	Description	
Preparation toward opening	1	Hardware condition	Infrastructure and E&M	As per Railway Law Article 40, the authority is required to examine design conformity to assets such as infrastructure, facility, rolling-stock etc. Upon completion of construction, the authority must review the conformity to assets.
	2	Training for direct operation staffs	Drivers	The training must be conducted by foreign trainers. Qualification standards, textbook and curriculum and training equipment are subject to VNRA approval. A qualified trainee receives a certificate issued by foreign organizations and then s qualified as an assistant driver. VNRA will hold an examination on the person who has the certificate and such experience (Railway Law Article 47)
			Other staff	Training must be conducted by foreign trainers. The trainer's experience, textbook and curriculum and training equipment are subject to VNRA approval.
After opening	1	Equipment failure	Equipment quality issue	For two years after opening, contractors should respond as directed by the warranty clause.
			Maintenance issue	See #2
	2	Human error	Low staff levels Insufficient training	One time training may not be sufficient for staff to obtain skills and knowledges. Periodical training

			Basic mistakes	after opening, annual and/or quarterly, should be considered.
	3	Trouble caused by complex factors	Root cause cannot be identified	For initial trouble shooting, up to one year after opening, the supplier should dispatch experts upon request from O&M organization.
			Root cause can be identified	See #1 and 2.
Incidents	1	Action against incident	Indemnity	As per Railway Law Article 62, the operator is to buy insurance.

Source: JICA Study team

### 6.7.3 Training for Opening

All training courses required for the opening of Line 2A are included in the EPC package. However, since the Management Control Division must cover not only Line-2A but also other lines, the training listed in the table below should be covered by all relevant projects. A major part of the training for Management Control Division will be on-the-job training through company-established activities.

**Table 6. 18 Parties Responsible for Training for Opening**

Staff	Responsibility	Remarks
Management Control Division (50 personnel)	JICA TC	-
Operation Management Office (Max. 10 personnel)	Construction Project	OMO is not required at the time of opening Line-2A opening because there are no other lines.
Managers and Supervisors at Stations and Depots	Construction Project	-

Source: JICA Study Team

## 6.8 Investment in the O&M organization

### 6.8.1 Investment Items and Fee in the O&M organization

The following investment in the O&M company needs to be added to the existing construction projects.

#### (1) Office IT Systems (1.5-2 Billion JPY)

This includes servers to maintain financial data (revenue and expenditure) and HR management data, as well as to manage the email system and intranet website. The number of users is assumed to be 60 people.

(2) Central server for interoperable AFC (1.5-2 Billion JPY)

This server is needed to collect fare data from the line servers for each of the respective lines and maintain them. This fare data is used to calculate total fare revenue as well as the revenue from each line.

(3) Construction of Integrated OCC and Building for Management Control Division (0.6 Billion JPY)

Two buildings are to be constructed inside the depot site for Line 2. One is the Integrated OCC building having enough space to house the Integrated OCC for eight lines. At the beginning stage, a building that will only be used for Line 2 will be constructed and then expanded for other lines upon demand), including the machine room. The total area would be approximately 2,000 m<sup>2</sup>, but the budget would not include equipment procurement costs. The other building would be for the office of the Management Control Division.

#### 6.8.2 Funding sources

The following items have to be considered when procuring the investment-related items mentioned above.

(1) Founding sources

(2) Obtaining funding is an urgent matter due to the time constraints with the opening of Line-2A as soon as 2015.

As a result of discussion with the relevant parties, Japan is going to support the funding of those investments as well as providing support to set-up the O&M company. Additional funding to the Line 2 project is also under consideration to facilitate the procurement.

## Chapter 7 Proposed Detailed Action Plan on Technical Cooperation

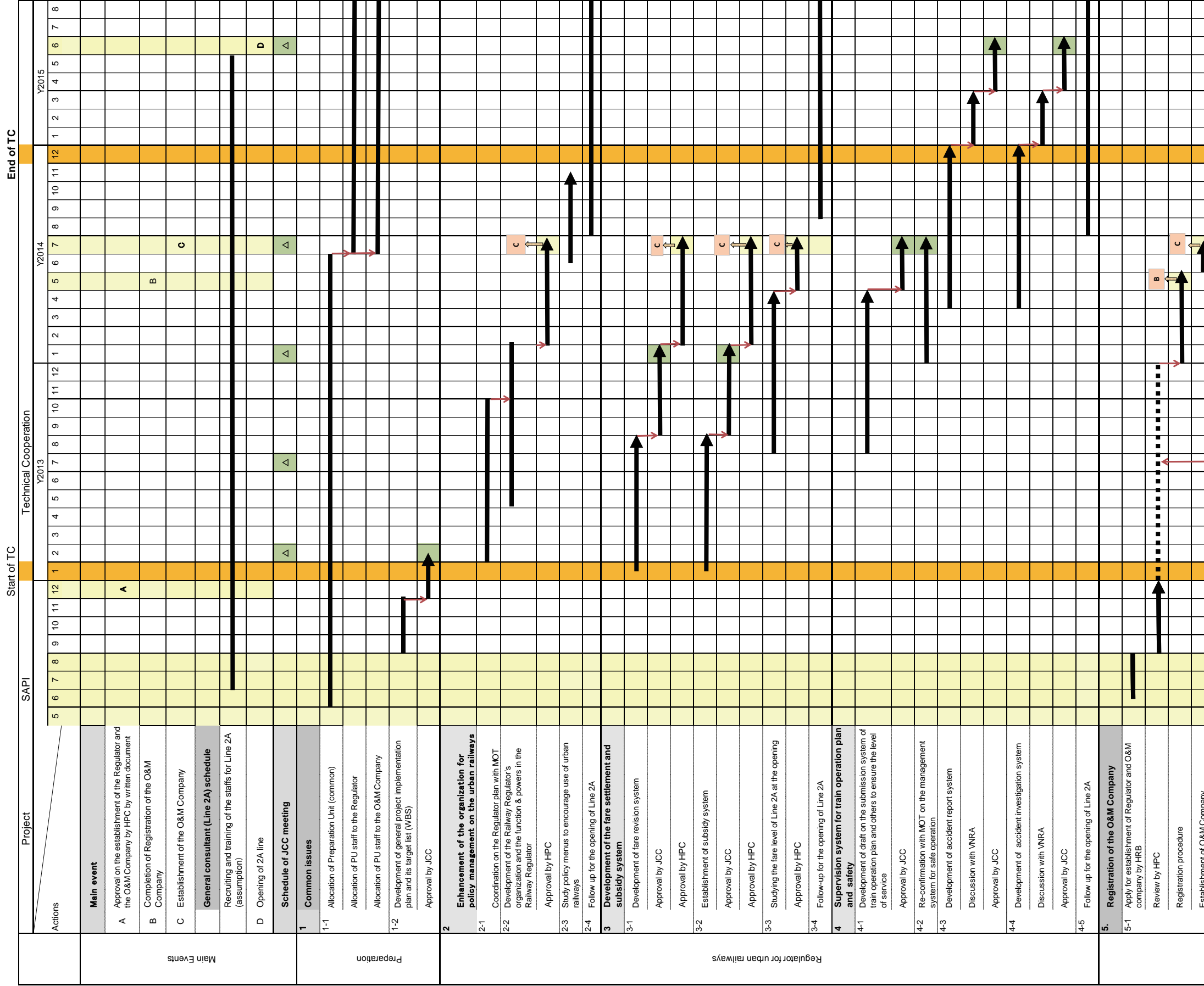
### 7.1 Plan of Operation

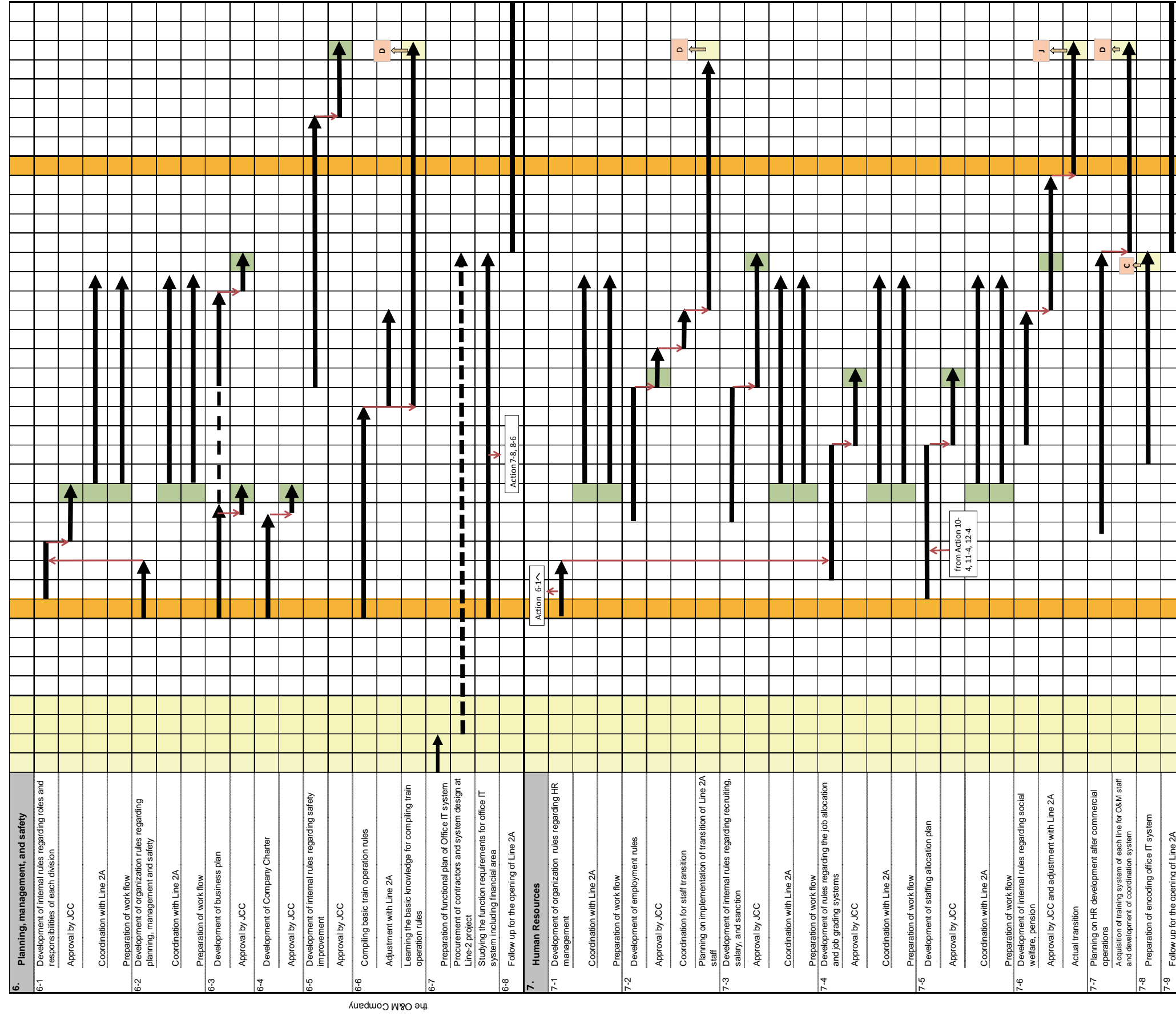
A Plan of Operation (PO) is proposed for establishing the O&M company and the Regulator for urban railways. This is subject to JICA's implementation of the Technical Cooperation agreement. The proposed PO is shown in Table 7.1.

Important points of this PO include:

- (1) The General Consultant has the responsibility for developing the organization for daily train operation under the EPC contract. The first line to be operated is assumed to be Line-2A, therefore this Plan of Operation is based on the assumed schedule for Line-2A, which is shown as being a "Main Event."
- (2) TC is to support PUC members in charge of establishing the organization serving as the Management Control Office (the HQ) for the O&M organization for urban railways by preparing the necessary rules and know-hows.
- (3) The actions required for the approval of the HPC out of the actions for the various internal rules prepared by PUC and TC team are Action 2, Action 3, Action 5 and Action 9-4.
- (4) The actions which RPMU on Line-2A needs to take working with TC are Action 6-1, Action 6-2, Action 6-6, Action 7-1, Action 7-2, Action 7-3, Action 7-4, Action 7-5, Action 7-6, Action 7-7, Action 8-1, Action 8-2, Action 8-3, Action 8-4, Action 9-1, Action 9-3, Action 9-6, Action 10-1, Action 11-1, Action 11-2, Action 11-5, Action 12-1, Action 12-2, and Action 12-5.
- (5) All tasks (actions) in TC such as the reports and approvals by HPC and JCC for each action for the Line-2A project, should be in accordance with the external factors ("Main Events"), and should be specified clearly in order to avoid any delay of the work.
- (6) The tasks on this table are considered to be necessary for establishing the O&M company and the Regulator for urban railways. It should be noted that there are some tasks that are not included clearly on the TOR of TC since they are common to the companies also in Vietnam and it does not need to consider the special features of urban railways to such tasks.

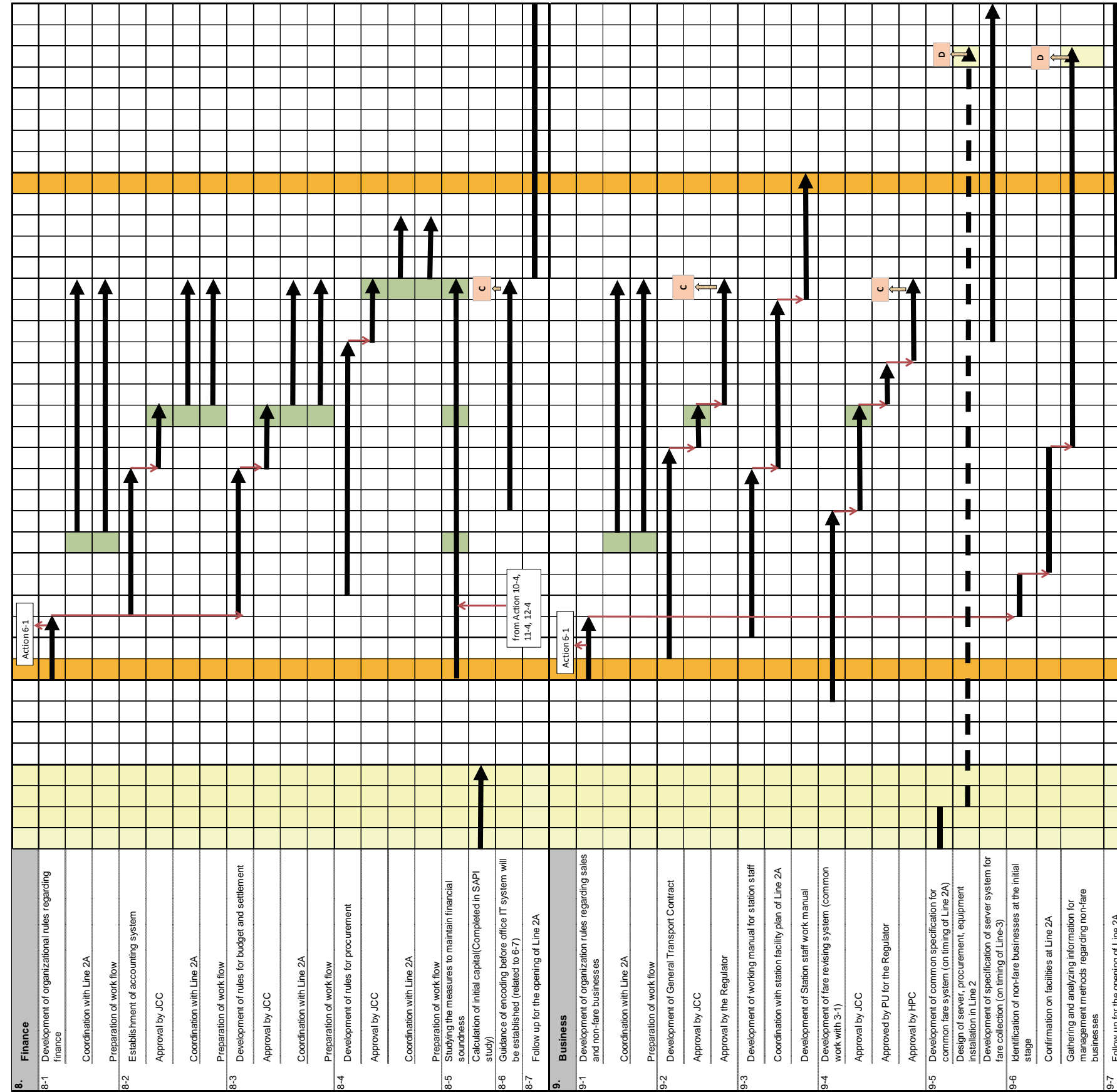
Table 7.1 Plan of Operation (Draft)

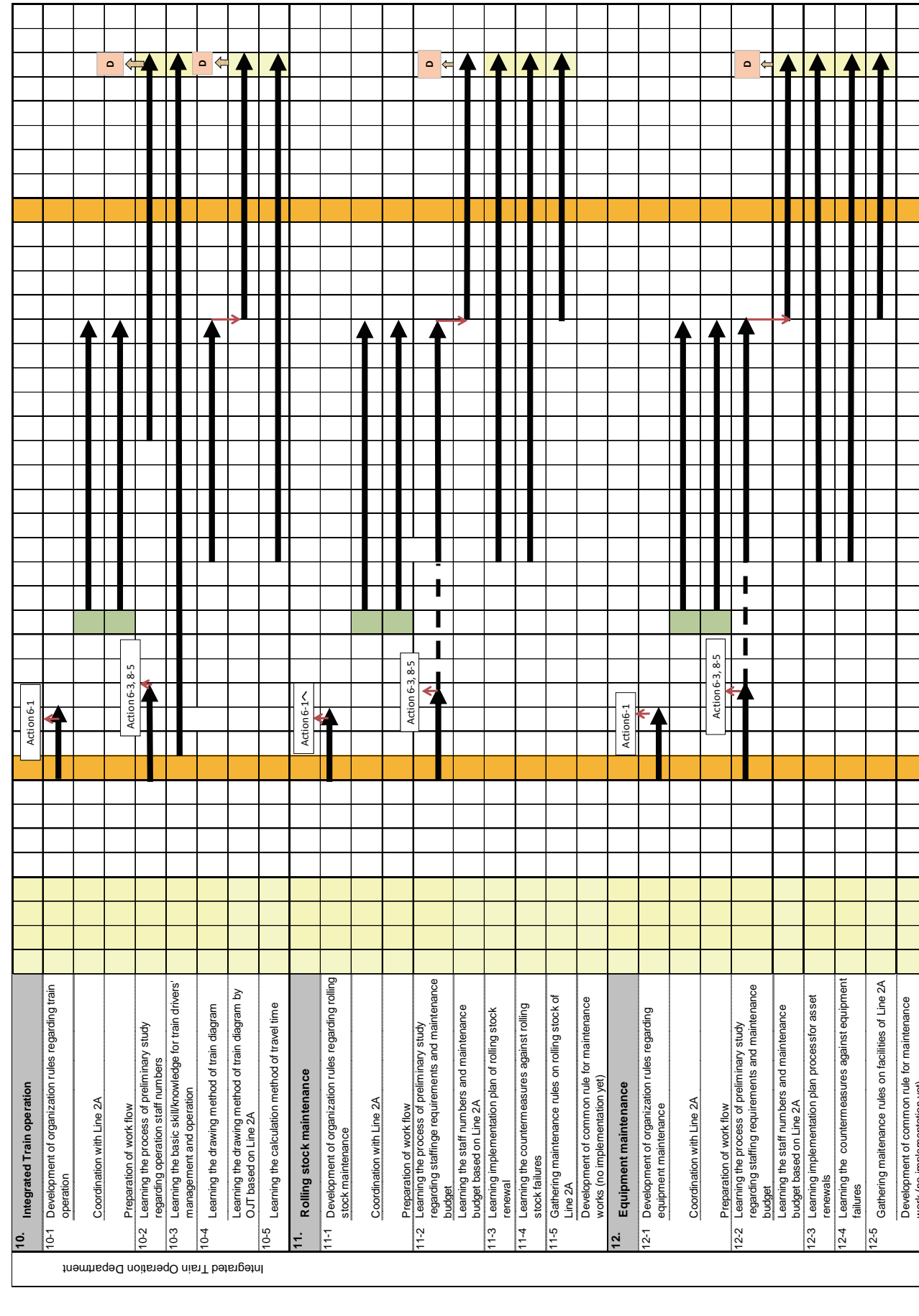




the O&M Company







The following sections are to explain the details of these actions. The numbers of these actions in the sections below correspond with the numbers in this PO.

## 7.2 Implementation Items for Establishment of the Regulator for Urban Railways

Items displayed in the following should be implemented for establishment of the Regulator for urban railways in Hanoi.

### 7.2.1 Enhancement of the organization capability for policy management on the urban railways

The roles of the Regulator for urban railways are described in Chapter 3. The first task will be obtaining the approval of HPC for setting up the Regulator for urban railways. The specific tasks of the Regulator for urban railways include the development of a framework for a policy for promoting the usage of the urban railways, the introduction of a fare/subsidy policy and the management of train operation and safety.

(1) Coordination on the Regulator for urban railways plan with MOT (Action 2-1)

- Approval by the HPC for setting up the Regulator for urban railways is required. In order to get this, it is necessary to propose a specific plan on the role and responsibility of the Regulator for urban railways and provide a schedule for its establishment and budget. The details are shown in the table below.

**Table 7.2 Objectives of the Regulator for urban railways**

Item	Details
Role and responsibility	(1)To materialize the policies on urban railways (mainly the ones for promoting the usage of urban railways). (2)To make a plan for fare setting and get approval by HPC. (3)To make a plan for subsidies and get approval by HPC. (4)To monitor the level of services of urban railways (by receiving operation reports from O&M companies and checking the result of operations). (5)To monitor the safety operation of urban railways (by receiving accident reports from O&M companies and conducting investigations if needed).
Organization	There are two options, namely an independent organization under HPC or one of the departments under MRB. [Advantage of independent organization under HPC] Easy to consolidate to PTA [Advantage of one department under MRB] Easy to manage urban railways totally
Budget	HPC is in charge of budgeting this.
Schedule of establishment	A year prior to the opening of the first urban line in Hanoi (July Y2014)

Source: JICA Study Team

- Under the Railway Law, the Provincial People’s Committee is in charge of managing urban railways in general, but the management for safety of railways is still done by the central government. However, there are some items that the provincial PC will manage because it is a daily job to operate an urban railway. In this regard, there is a need to have discussions about this with the central government, especially the MOT/VNRA, in order to determine the demarcation of the tasks of the Regulator for urban railways on urban railways.

**Table 7.3 Demarcation of the Tasks on Safety Management**

Agency	Tasks	Description
VNRA	<ul style="list-style-type: none"> <li>• To establish the institution for safety.</li> <li>• To implement the tasks that the VNRA have been assigned to directly conduct in the institution.</li> </ul>	It is necessary to establish an institution for safety on urban railways.
Regulator for urban railways under HPC	<ul style="list-style-type: none"> <li>• To implement the tasks defined in the institution to be assigned to the Provincial Peoples’ Committee.</li> </ul>	

Source: JICA Study Team

(2) Development of the Regulator for urban railways organization and the function and the powers within the Regulator for urban railways (Action2-2)

- The concrete organization, division of duties and mandates are to be drafted up. This draft will be approved by HPC after getting concurrence from JCC.

(3) Study policy topics for encouraging the use of urban railways (Action2-3)

It will be difficult to promote the modal shift from the motorbike to the urban railways until the network of urban railways is developed well enough. However, without such promotion, the urban railways that have been constructed with huge investment will be left unutilized.

In order for the urban railways, which are an investment of public funds, to be utilized by many passengers, effort by the urban railway companies and promotion policies by Hanoi City are required. The possible policies in this regard are as follows.

- Promoting a commuting allowance system and encouraging the establishment of an expense account that reduces the burden on the companies.
- Increasing the tax on motorbikes.
- Restricting cars from entering into the Central Business District (Road pricing).

In order to implement such policies, a task team should be established to work on them as there must be discussions with other authorities such as DOF and DOT. Some policies can be implemented soon and some others need to take some time for implementation. Therefore, the action to be taken now is listing every possible policy by 2015 when Line-2A is to be opened.

#### (4) Follow-up for Opening of Line-2A (Action2-4)

- The Regulator for urban railways will not be established only for Line-2A but it is most probable that this line would be the first urban railway which the Regulator for urban railways will manage. Therefore, the TC needs to keep supporting the Regulator for urban railways even after its establishment in order to deal with matters which may happen concerning the opening of Line-2A.

### 7.2.2 Development of the fare settlement and subsidy system

#### (1) Development of the fare revision system and its institution (Action 3-1)

- Demand may not be as forecasted for a while after the opening. Therefore, it is difficult to adopt the price-cap that will give railway operators the incentive to reduce the operation cost.
- Theoretically, the fare can be calculated by dividing the total operational cost with profit (excluding depreciation costs for the initial investment, since those are paid by the government) by the total number of passengers. However, this tends to be unreasonably low since depreciation costs are not included. Moreover, the actual number of passengers tends to be lower. Therefore, the unit fare at the initial stage would be based on the number presented by SAPI and adjusted by the inflation rate at that time. From the following year, the fare would be adjusted as shown in the table below.

**Table 7.4 Fare Revision System after Commencement**

Income after Opening	Actions
Below estimation (Actual demand is lower than estimated)	Option 1: The revision will be done based on the actual number.
	Option 2: In case Option 1 is not suitable, the financial support from HPC would be requested due to the lower actual demand.
Over estimation (Actual demand is higher than estimated)	No revision of fare level.

- As the fare revision itself is to be made after the opening of Line-2A, there is a need to develop the calculation method for the fare revision for the period prior to the opening, and to have it approved by HPC after JCC's review.

(2) Establishment of the subsidy system (Action 3-2)

- The following subsidy systems are proposed for urban railways in Hanoi
  - a. A subsidy for the interest on a loan.
  - b. A subsidy for the additional or replacement assets required at later stages if the amount is large and too heavy for the O&M company to shoulder.
- There is a need to develop this subsidy structure as a system of Hanoi City. As a loan may be required just after the establishment of the O&M company, this system needs to be developed by the time of commencement of the O&M company at the very latest.
- The revision of the fare itself would be done after opening of Line-2A, therefore the preparatory study and acquisition of the approval by HPC after JCC's review are needed.

(3) Studying the fare level of Line-2A at the opening (Action 3-3)

- The initial fare level has to be established a year before the opening of the first line. Line-2A is the first line in Hanoi and it will start its revenue service in the summer of 2015. Accordingly, the fare level has to be established by the summer of 2014.
- Usually the O&M company applies to the Regulator for urban railways for its approval of the initial fare level. However, since the institution of the O&M company is yet to be established at this stage, the members of the Regulator for urban railways and those of the O&M company in charge of the fare level will jointly study and review it. Considering the time taken for the procedure, the preparation has to be started at least a year prior to the decision of the fare level.
- The initial fare level is decided by the concept shown in (1), referring to the estimated costs, fare level of other modes of transportation and the inflation ratio.
- This issue needs to be approved by HPC after JCC's review after its completion of planning.

(4) Follow-up for opening of Line-2A (Action3-4)

- The Regulator for urban railways will not be established only for Line-2A but it is true that this line would be the first urban railway which the Regulator for urban railways will manage. Therefore, it is needed to support the Regulator for urban railways by TC even after its establishment in order to deal with expected problems on fare and subsidy arising from the opening of Line-2A.

### 7.2.3 Supervision system for train operation plan and safety

(1) Development of draft on the submission system of train operation plan with which Level of Service is confirmed (Action 4-1)

- This system is to be developed in order for the administrative agency to monitor if the transport service is being conducted properly in exchange for the fare that is paid by passengers.
- The major items to be supervised include the congestion ratio during the peak time period, operation service time period and the train delay. The urban railway operators are required to make this report once a year.
- Although it is unlikely, if the service level is judged as quite low, the Regulator for urban railways will advise the urban railway operator to improve their services and announce it to the public. This will be included in the institution of the Regulator for urban railways system.
- This system should be put into practice at the time of the start of commercial operation. Therefore, this system has to be ready by the summer of 2015 when Line-2A will start its revenue service.
- After drafted, the approval of JCC is required.

(2) Re-confirmation with MOT on the management system for safe operation (Action 4-2)

- An accident is a symptom of a systemic failure of the railway. In this regard, the O&M company should try to find the cause of each accident, even small ones. The Regulator for urban railways is in charge of observing factors for possible fatal accidents and establishing the system that will ensure O&M companies report even small errors, as these can lead to fatal accidents. .
- MOT (VNRA) is in charge of the management of safety operations. The management of the urban railways is consigned to Hanoi City. Therefore, the Regulator for urban railways will hold discussions with MOT (VNRA) and materialize the institutional framework for this work.

(3) Development of accident report system (Action 4-3)

- A study on the existing accident report system will be performed.
- Based on the accident report system developed by MOT, the accident report system for Hanoi will be determined so as not to bring about any conflict or misunderstanding with VNRA.

- One of the tasks for development of this system is to determine what the contents of the report will be by the accidents concerned. It is assumed that an additional system of quick report about a critical accident should be established.
- This system should be put into practice at the time of the start of commercial operation. Therefore, this system must be ready by the summer in 2015 when Line-2A will start its revenue service.
- After drafted, this system needs to be approved by JCC.

#### (4) Development of accident investigation system (Action 4-4)

- A thorough investigation of the cause of accident is very important when the accident occurs in order to prevent future accidents. No matter how small an accident is, there is always some kind of failure that causes the accident. It is essential to investigate the cause and get rid of the problem before it gets more serious.
- A study of other existing accident investigation systems will help the development of this system.
- It is often the case that the accident investigation cannot be concluded solely by the Regulator for urban railways. When a complex accident occurs, the Regulator for urban railways needs to work with the railway operator, researchers in universities, manufactures and other such experts.
- There is a need to discuss issues closely with VNRA which has been the regulator for VNR on safety management.
- After drafted, there is need to obtain the approval of JCC.

#### (5) Follow-up for opening of Line-2A (Action 4-5)

- Submission system of the train operation plan and accident reporting system can be studied, but they will not be well utilized under actual conditions. Moreover, at the beginning of operation of the railway line, many accidents are likely to happen due to the initial failures of equipment and inexperienced staff. Therefore, there is a need for TC to support the Regulator for urban railways even after the start of operations in order to deal with expected problems in train operation and safety management around the opening of Line-2A.



### 7.3 Implementation Items for Setting up the O&M organization

#### 7.3.1 Registration of the Company (Action 5-1)

- Registration of the company is not related to the tasks of each railway construction project. It should be in time for the opening of Line-2A, which is the first to start service.
- The items that need an approval from HPC (possibly the Prime Minister) are the name, address, telephone number, initial capital, business domains and structure of the organization. Basically the result of this SAPI study could be used for this.
- The items required for the registration of the company with a single representative are the company charter approved by HPC, the amount of the capital and the decision of HPC (in some cases, the decision of the Prime Minister is required), power of attorney from HPC and a copy of identification of the representative. In the case of a members' council, representatives' list written in a format designated by MPI is also required.
- There are two options for the time of establishment of the company, which are shown below.

**Table 7. 5 Two Options for the Timing of the Establishment of the Company and their Advantages**

Option	Option 1	Option 2
Time of establishment	The O&M company is established when the project starts	The O&M company is established in time for the opening of the initial Line.
Examples	Tsukuba EXPRESS in Japan Jakarta Metro, Delhi Metro, Bangkok Metro and so on. There are numerous actual cases of this.	HCMC O&M organization, and Hanoi O&M organization
Advantages	The establishment of an operation oriented design can be expected. The establishment of a network oriented plan can be expected. The organization of the company can be carefully prepared.	As the preparation can be started at later stage, it is advantageous when there are uncertainties in the institutional aspects. The expenditure for the opening may be smaller. (If Hanoi PC will shoulder this cost, there will not be difference between options.)

Source: JICA Study Team

- In Hanoi's case, some lines are under construction and there is no choice but establish the O&M company based on Option 2. In Hanoi, very few entities other than the SAPI team looks at the urban railway as a network in Hanoi so the viewpoint of Option 1 is important in Hanoi.
- The procedures and the time flow for the registration of the company are as shown below.

**Table 7.6 Procedures and Time Flow for the Registration of the Company and Commencement of Revenue Operation**

Time	Event
End of 2012	• Decision of HP
Middle of 2013	• Recruitment of operation staff
Middle of 2014	• Registration completed • Development of company rules and institution
First half of 2015	• Completion of Line-2A and transferring from MOT to HPC • Opening of Line-2A

Source: JICA Study Team

- The charter capital for the registration of the company is as follows (please refer to 6.2.1 and 6.2.2).

**Table 7.7 Charter Capital of the O&M Organization by Time Period**

Time	Establishment of the Company	When Transferring the Assets of Line-2A
Charter capital	The amount of funds required for the operation of the company at the initial stage (mainly the wages and power cost).	The charter capital at the establishment of the company plus the evaluated amount of the assets that are transferred to the O&M company.

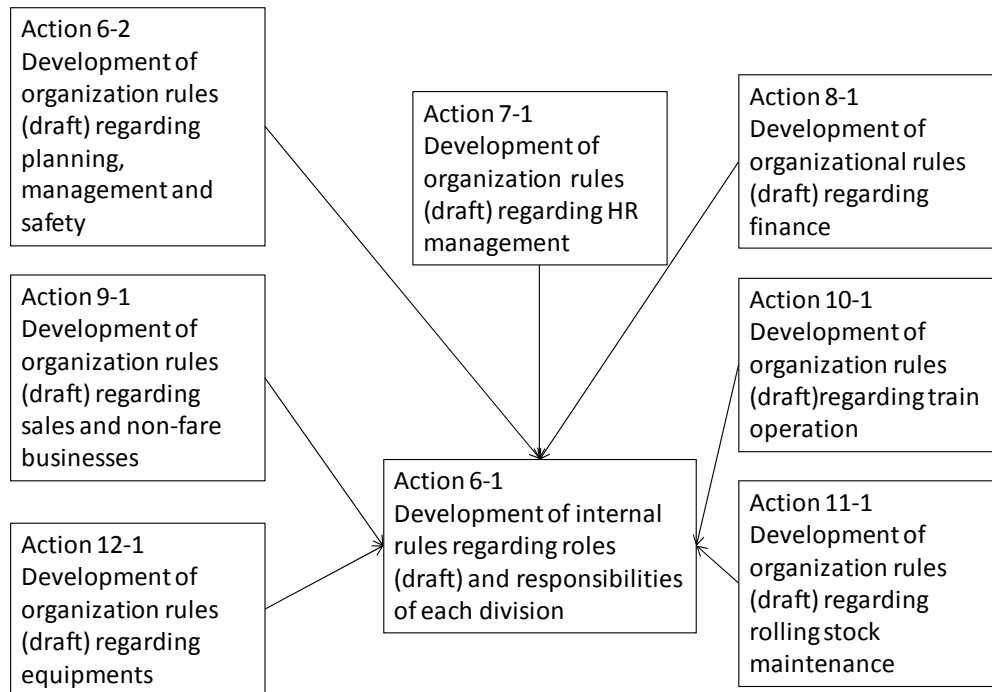
Source: JICA Study team

### 7.3.2 Planning, management and safety

(1) Development of internal rules regarding roles and responsibilities of each division (Action 6-1, 6-2, 7-1, 8-1, 9-1, 10-1, 11-1 and 12-1)

- Internal rules regarding the roles and responsibilities (Action 6-1) will be developed based on the result of studies for each department (Action 6-2, 7-1, 8-1, 9-1, 10-1, 11-1, 12-1) of Japanese railway companies and HCMC TC.
- After drafted, the approval of JCC is required.
- It should carefully be focused on the cooperation and coordination between the Management Control Division and working sites on Line-2A, which will be the first for an urban railway line in Hanoi.

- Business implementation flow processes among various tasks (flow of budgets, investment plan, decisions on personnel assignment and flow of the submission on the revision of fare level) should be developed.



**Figure 7.1 Roles and Responsibilities of Departments and How they Relate Each Other**

(2) Development of organization rules regarding planning, management and safety (Action 6-2)

- The main roles of Planning Department are to make a business plan as a company and an investment plan. The General Affairs Department will be in charge of secretarial jobs, documents management, public relationship, and legal affairs. The Safety Department is to provide guidance to the company for safety issues and serve as the safety coordinator for all departments and divisions. To further enhance safety, all departments in the Management Control Division have to be involved. Specifically, each department will make a plan for enhancing safety, implementing accident investigations, and managing safe operation.
- The coordination of Line-2A project with setting up of the O&M organization is aimed by checking the relationship among the work sites of Line-2A.
- Work flows of main tasks for each department will be developed and specific aspects on implementation way will be shared.

(3) Development of business plan (Action 6-3)

- The business plan is an essential document for explaining the company outline. The main purpose of this at the launch of PUC/TC project is to introduce the basic concepts and the general information about the company to the stakeholders. After the opening of the lines, the purpose is to report about business results and management issues.
- It is very hard to find a good example of business plans (company prospectus) before the commencement of revenue operations because most of them are not available to the public. The business plan made for the HCMC TC project could be used as a reference.
- After drafted, approval by JCC is required.

**Table 7.8 Table of Contents of Business Plan (Draft)**

1. Purpose of the O&M company	
2. Target of the train operation by the O&M company	
3. Domain of the O&M company	3-1 Outline of the urban railway network in Hanoi City 3-2 Outline of Line-2A
4. Financial basis of the O&M company	4-1 Capital 4-2 Fare level 4-3 Financial support from Hanoi city
5. Organization and staffing	5-1 Organization 5-2 Staff number at the initial stage
6. Operation policy of the O&M company for the initial five years	6-1 Safety policy 6-2 Quality of service and fare level 6-3 Policy on financial soundness
7. Financial forecast for the initial five years	7-1 Balance sheet 7-2 Profit and loss table 7-3 Cash flow statement
8. Actions to be taken prior to the opening	8-1 Grand schedule 8-2 Staff training plan 8-3 Demarcation of budget between construction project and the O&M company

Source: JICA Study Team

(4) Development of Company Charter (Action 6-4)

- The company charter is essential for company registration. This work can be started even before TC starts and it is targeted for completion by January 2013.
- The contents of a company charter are regulated in detail by the Enterprise Law of Vietnam.
- After drafted, approval by JCC is required.

(5) Development of internal rules regarding safety improvement (Action 6-5)

- One of the very important roles of railway companies is to ensure the safety by taking steps to prevent mistakes by the staff that operate and maintain the equipment. A system in which all members of the staff -- from top to bottom -- pay attention to safety should be developed. Regular meetings should be established to discuss the methods for enhancing safety, such as a system to completely examine every single mistake and to confirm fulfillment of action against it.
- Specifically, the following countermeasures should be considered from the standpoint of enhancing safety: 1) clarification of the responsibilities and the authority designated to each position and department, 2) implementation of daily action based on a “safety first” mindset, 3) development of a system of two-way communication between the Management Control Division and the work sites, 4) development of systems to collect, analyze, evaluate and correspond to the information of accidents and risks, 5) development for manuals on emergency, 6) observance of regulations and rules, 7) implementation of training for managers and staff, and 8) continuous checking and amending of the countermeasures and development of a system for mitigating potential risks.
- Based on the examples of Japanese urban railway companies, the PUC develops the rules and obtains the approval of JCC.
- Each construction project has the responsibility of explaining its safety system, which is required for obtaining safety certificates for infrastructures, rolling stock and equipment.

#### (6) Compiling basic train operation rules (Action6-6)

- The rules for train operation are to define the relationship between each unit of equipment and the person(s) who operate(s) it. Therefore, these rules must be developed by each construction project.
- The staff, including the drivers, may be shuffled among lines. Therefore the definitions of technical terms for train operation, the order of listing items, the style of wording in the train operational rules should be unified among the lines, so that all staff members can have mutual understanding and smooth communication. Accordingly, the TC team will draft the standard operational rules. (These will be completed 15 months after the commencement of TC.) The PUC/TC team will receive a report about the contents of the operating rules from the Line-2A project 18 months before operation. At that time, the unification of wording, etc., used among lines will be done based on the documents prepared by the TC team.
- The respective lines have the responsibility for developing their own train operation rules. However, maintaining train operation rules is a particular kind of work and the work load on

the maintenance of the rules will not be so high. Therefore, after respective lines are open, the Integrated Train Operation Division of the O&M company will be responsible for maintaining these rules. The Vietnamese staff in charge of this task will gain a minimal understanding of the operation rules from the standard and Line-2A's operational rules prepared by the TC team. (Note that in reality, a follow-up will be required.) And repetitive training of operational rules after obtaining the driving license will have to be performed by the O&M company.

(7) Office IT System (Action 6-7, 7-8, 8-6)

- The office IT system will be used mainly by the Human Resource and Finance Departments of the company and terminals provided at each operation site is connected to headquarters. The main functions of office IT system are as shown in Section 6.5.
- Two years are required to complete this office IT system once the supplier has been selected. This system will be needed from the beginning of the O&M company business, therefore, in consideration of the tendering processes, it needs to be arranged for well before the launch of the TC. Accordingly, a blueprint for the office IT system was prepared during this SAPI Study. More detail about it is provided in Section 6.5.2 and the Appendix.
- The procurement of the office IT system is considered to be a part of the Line-2 Project. The project will be in charge of the selection of the supplier and the procurement of the equipment. In order to keep the office IT system user friendly, the PUC/TC team has to participate in confirming the functions prepared by the supplier
- The office IT system must be completed one year before the opening of Line-2A, i.e., by the time of establishment of the O&M company, which is planned for July 2014. If a system cannot be completed by that time, manual input may be needed.

(8) Follow-up for opening of Line-2A (Action 6-8)

- After the establishment of the company, it must be made capable to function as one independent company with excellent coordination among all the departments by the time Line-2A is open. The General Affairs Department, which acts in accordance with the directives of the board of directors, should play a vital role in achieving this. Moreover, there will be extra tasks that cannot be covered in the work flow. Such follow-up tasks need to be a part of the TC project.
- There will be many initial problems caused by an inexperienced staff using unfamiliar equipment. Therefore, the most important task of the follow-up tasks is to study the causes of such errors and to take steps to prevent them from being repeated.

- If the development of the office IT system cannot be completed by the time of the opening of Line-2A, a manual coding system will have to be used. In this case, the transition of this manual system will become a follow-up task.

### 7.3.3 Human Resources

#### (1) Development of organization rules regarding HR management (Action 7-1)

- In the Operation Management Office in each Operation Unit, common sections such as HR will not be independently organized. The Management Control Division of the O&M company will handle the common sections of the organization, such as HR operations and financial management, from the beginning.
- It has been planned and coordinated that the operational staff for Line-2A that will have received training as a part of the EPC contract will be hired by the O&M company from the beginning.
- The basic work flow for human resource department and tasks related to human resource in other departments at the Management Control Division and work sites (for instance, personnel relocation and tasks that are not included in Action 7-2 to 7-6) will be developed.

#### (2) Development of employment rules (Action 7-2)

- The employment rules are the internal rules that define conditions and regulations for staff employed in the O&M company. Specifically, they include internal rules regarding recruiting, salary, and sanctions, which are defined in Action 7-3, and rules regarding the authority and responsibility for each job and the job ladder, which are defined in Action 7-4.
- Labor conditions are defined by each country. The labor conditions of this O&M company will be subject to the regulations in Vietnam. However, there are special conditions for urban railway operation, especially for drivers who need to change their working schedules on a daily basis. Therefore, the internal rules should be determined by taking the rules of the Japanese railway operator as well as those of the VNR into consideration.
- Rules of employment should be prepared by the time of employment. Employment of the operational staff for Line-2A will start early in 2013. It is impossible to complete the development of the internal rules for financial affairs, HR and safety by this time. Therefore, it is recommended that the employment conditions for Hanoi City be adopted for these staff members so as not to cause confusion with the employment regulations of the new O&M company during the transition following its establishment.

- The employment regulation should be developed 15 months before operation of Line-2A when its training for drivers would be starting. This requires approval from JCC.

### (3) Development of internal rules regarding recruiting, salary, and sanction (Action7-3)

- The employment conditions for the train operation staff are defined in the Railway Law in Vietnam. There is a need to develop the internal rules of the O&M company based on these regulations.
- Salary is defined based on the market price of similar jobs. It takes a long time to train staff members for train operation, so it's preferable to have the trained staff for long. Therefore, the wage level of the staff should be adjusted so that they will stay. There are many tourists in Hanoi and there will be a lot of passengers from foreign countries. Therefore, the station staff should be able to speak English. The drivers should have a basic knowledge of electrical and mechanical technology. It may be necessary to fix the wage level regardless of the wage level in HPC. An efficient working structure is required in order to achieve a higher level of wage without increasing the total amount of wages.
- When the staff members from Line-2A are moved to the O&M company, the working conditions should not be lower than they were before.
- A system of reward and punishment is to be established based on Vietnamese systems.
- The work flow will be established in order to understand clearly the steps for recruitment, reward, punishment, and adjustment of salaries.
- These internal rules are to be approved by JCC and need to be completed before the O&M company is established.

### (4) Development of rules regarding the job description and job ladder systems (Action7-4)

- The train operation will be conducted based on the schedule without prior meeting among the drivers, station staff and dispatchers at OCC. To achieve this, each of them should understand clearly what they have to do for daily operation. And it is important to display the relationship among the jobs clearly. This is to be defined in the internal rules as part of the job descriptions and job ladder systems.
- Proper and quick transaction of business is required of management of a company. Accordingly, it is necessary that the power of the business transactions that occur frequently, for example, management of staffs and expenditure execution of budget, should be delegated to each of the directors and managers of top management. When developing the job description and job ladders, these power



delegations should be included in the internal rules for job description and ladder system by referring the cases of private companies in Vietnam and Japan.

- Job description and job ladder systems railways are unique. Conventional intercity trains such as in VNR are controlled mainly from stations, but an urban railway requires an OCC and this difference necessitates different job description and job ladder systems. Therefore, the Japanese systems are provided as reference.
- These internal rules are to be approved by JCC and are needed before the O&M company is established.
- The training for the Line-2A staff is planned to be developed based on the one used by Beijing Metro. The planned number of staff members in Line-2A is comparatively larger than the other projects (please refer to 6.3). One of the reasons of this seems that the positions are subdivided and one person cannot do the work for another position. In the PUC/TC project, the adjustment to achieve efficient working structure will be done by requesting the Chinese side to train for multiple tasks.
- The work flow for “cooperation for train operation between several job categories”, “cooperation between stations, maintenance depot and OCC in case of failure of station equipment”, and “cooperation between maintenance and OCC staffs for maintenance works” will be arranged.

#### (5) Development of staff allocation plan (Action 7-5)

- The Human Resource Department should understand that the number of drivers will vary depending on the train numbers operated and that the number of station staff is to be adjusted based on the actual equipment of the stations and the actual train frequencies. HR department needs to know such figures.
- This is unique know-how to urban railways. The train operation department and the rolling stock management department in the Integrated Train Operation Division should have the ability to figure out the required staff numbers from gathered information (Action 10-5, 11-4, 12-4). Based on this, the Human Resource Department makes a plan for staff allocation. These actions are summarized in the work flow.
- The staff allocation at the beginning stage of Line-2A would be based upon the one for the EPC contractor proposal. The proposal of staff allocation in the Management Control Office (HQ) with Integrated Train Operation Division is to be approved by JCC. This should be completed six months before the establishment of the O&M organization.

#### (6) Development of internal rules regarding social welfare (Action 7-6)

- Typical institution for social welfare is the pension system. Both employees and the O&M company are supposed to pay contributions to the pension system, and the employee receives a pension after he or she retires. In this regard, it is important to manage the fund from both employees and the company. The current system in Vietnam can be utilized for the system of the O&M company. The result will be submitted for the approval of JCC.
- As the payment for the pension by the staff on Line-2A will already have been started, it too must be transferred to the O&M company. The system for transferring the pension from the previous one to those for the O&M company has to be developed by the time when the transfer of the staff is done.

(7) Planning on the training system after commencement of the commercial operations (Action7-7)

- Basically, as each line is the EPC package, the training for operation and maintenance is conducted by each line. There is no urban railway in Vietnam yet, therefore EPC contractor plans to provide trainings with a special approval of VNRA. However, the training on new staff after commencement is out of the EPC contract and there will be no preparations for it by each project.

**Table 7.9 Training Plans for Drivers in each Project**

	Line	Line-2A	Line 2	Line 3
Staffs for opening	Opening year	Y2015	Y2018	Y2017
	Theoretical training	EPC package	Supplier or Technical Cooperation	Supplier
	Practical training	EPC package	Supplier or Technical Cooperation	Supplier
	Supplemental training after opening	Not planned		
Staffs after opening	Theoretical training	Railway vocational college or the training center established by the O&M company		
	Practical training	Railway vocational college or the training center established by the O&M company + the O&M company		
	Repetitive training after initial trainings	The O&M company (the training center established by the O&M company)		

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- In Vietnam, there is a certain qualification for positions directly involved in train operation (please refer to No.38/2010/TT-BGTVT). This is a decision for national railways and VNRA is considering setting similar qualifications for urban railways taking into consideration of its

characteristics. The need to train the Vietnamese trainers/lectures under the EPC contract after opening is to be considered.

- The railway colleges have been teaching the students in positions directly related to train operations, even diesel locomotive operation. Therefore, these colleges should be expanded to include the training for EMU. The practical training would be conducted by the O&M company upon request from the colleges.
- Under the current regulations, there is no requirement for maintenance staff training. Therefore, it would be better to have “on the job training” for the maintenance staff at the O&M company
- The training plan for Line-2A has already been proposed by the Chinese contractor. However, there is no consideration about the training for trainers/lectures after opening.
- Considering the conditions mentioned above, the specific training plan for after opening will be developed through coordination with VNRA and the Line-2A project.

#### (8) Preparation for encoding office IT system (Action 7-8)

- Office IT system needs to be completed one year before the registration of the O&M company, which is planned for July 2014. If the system cannot be completed by that time, manual input may be needed.

#### (9) Follow-up for opening of Line-2A (Action 7-9)

- One of the biggest difficulties faced here is that a trained staff member who has been educated for a long time at great expense, suddenly resigns. There may need some backup staff in order to cope with this problem, however, they could be redundancy if trained staff don't resign. Otherwise, reassignment of the staff would be a solution with possible changes in staffing. In both approaches, much effort is needed.
- In this regard, many such issues can be expected to be raised just before and after opening. Therefore, TC will continue to follow up in handling such troubles even after developing the structure for the operation.

### 7.3.4 Finance

#### (1) Development of organization rules regarding finance (Action 8-1)

- In the Operation Management Office for each line, common sections such as financial affairs will not be organized. The Management Control Division (headquarters) of the O&M company will handle these common sections from the beginning.

- The training for Line-2A will have been conducted before the O&M company starts. This training is supported by the construction fund and financially its expenditures will not be transferred to the O&M company. The trainees would belong to O&M company from the beginning so that the employment cost can be included in the O&M company account as an initial cost (this cost should be shouldered by HPC, but coordination among stakeholders is needed).
- The basic work flow for finance department and related tasks for finance in other departments at the Management Control Division and work sites (tasks that are not included in Action 8-2 to 8-4) will be arranged.

#### (2) Establishment of accounting system (Action8-2)

- The requirements for accounting system are defined clearly in the accounting regulations and the Tax Laws in Vietnam. The accounting system and internal rules of the O&M company should be based on these related laws and regulations.
- The accounting system itself can be handled in the office by the IT system. The practical task for this is simply inputting the accurate data into the system after which the proper accounting treatment will be done automatically.
- The development of this system is conducted in conjunction with the development of the office IT system. As the approval of JCC is needed, this system should be completed before the establishment of the O&M company.
- The Line-2A project is a construction and the result of its activities will be transferred to the O&M company as assets. This construction project will include training of operational staff and this expense is borne as a component of the construction. There will be no transfer of employment cost because that staff will be hired for the O&M company from the beginning. While the accounting system used for Line-2A is not related directly to the O&M company, it should be discussed with the shareholders and confirmed by them.
- The basic work flow for accounting will be developed.

#### (3) Development of rules for budget and settlement (Action8-3)

- As shown in the table below, some expenses for railway operators are proportional to train operation-km and some are fixed. On the other hand, income is basically proportional to the number of passengers. Note that the number of passengers is not always proportional to the train operation-km. In case of railway sector, it should be noted that it is difficult to adjust the

expenses based on the number of passengers. In order to achieve sound management, it is important to examine the number of passengers and make a proper train operation plan.

**Table 7.10 Income and Expenses for Railway Operators**

Item		Description	Remarks
Expenses	HR Cost	Fixed	
	Power Cost	Proportional to train operation-km	
	Maintenance Cost (Spare parts)	Proportional to train operation-km but it can be adjusted by changing the maintenance schedule intentionally.	It is dangerous to prolong the period for maintenance because of the difficult financial situation.
	Depreciation Cost	Fixed	This can be lowered by prolonging the timing of renewal, but this will result in increased maintenance work volume.
Fare Income		Proportional to the number of passengers, not to train operation-km.	

Source: JICA Study Team

- There is a need to have a system for gathering information on the necessary amount of expenses from all departments. This system itself is common in the city office of Hanoi, but there are some factors that are unique to urban railways. This investigation is to be conducted by the Integrated Train Operation Division (Action 11-4, 12-4). The work flow will then be developed.
- Initially, the setup of O&M company for Line-2A was counted as a part of the EPC package, but that may be omitted based on the discussion between Line-2A project and MRB. In this regard, there is no direct coordination needed for the Line-2A project, but it should be discussed with the stakeholders and confirmed by them.
- It is desirable for this to be ready six months before the establishment of the O&M company and the approval of JCC is needed after completion.

#### (4) Development of rules for procurement (Action 8-4)

- The biggest share of the procurement for an urban railway is the spare parts for maintenance equipment. Among the railway operators in developing countries whose business performance are not so good, it is often observed that this procurement process is not so efficient. One reason is the lack of budget for maintenance and the other is procurement division is too strict about purchasing the necessary maintenance spare parts. A procurement system that will avoid such insufficiencies is needed.

- The equipment used for railways is mostly unique and therefore it takes a longer period for procurement. The procurement division should have a sufficient inventory against a long procurement period, but on the other hand, they should decrease their inventory as much as possible in order to decrease the maintenance cost. A work flow that indicates the relationship among work sites, procurement and stock division, would be developed.
- For procurement, the information from the technical departments that are actually using the equipment is important. The Train Operation Department and the Rolling Stock and Facility Maintenance Department in the Integrated Train Operation Division need to have know-how for establishing this. (Action 11-5, 12-4). The work flow related to acquiring estimates for such procurements will be developed.
- Inventory management is handled by the office IT system. The specification of the office IT system will be arranged by confirming the specifications of the system which the supplier will provide from the actual view point. The work flow related to manage inventory assets will be developed.
- For the relationship with Line-2A project, it should be focused on the spare parts procured with main equipment. They are regarded as inventory and the data of Line-2A project has to be transferred to the O&M company.
- It is desirable for this to be ready one year before the establishment of the O&M company and the approval by JCC is needed after completion.

(5) Studying the measures to maintain financial soundness (Action 8-5)

- An urban railway system is a part of the social benefit having a huge infrastructure and rolling stock capable of transporting large numbers of passengers at fares that are affordable to ordinary citizens. As mentioned earlier, it is very hard to reduce the number of rolling stock that have already been bought as well as reduce the size of the staff that has already been employed. The nature of the expenses for the O&M company shows a downward rigidity. On the other hand, the number of passengers depends on how many people have shifted from using other means of transport such as motorcycles and buses. Inflation may also affect the business. These are external factors that will continue to change, and therefore, the profit and loss will also continue to change depending on the circumstances. Therefore, occasional modification of the financial simulation is needed to enable the appropriate decisions to be made.

(6) Guidance of encoding before office IT system can be established (Action 8-6)

The office IT system must be completed by the time when the O&M organization is established, which is planned for July Y2014. If the system cannot be completed by that time, manual encoding to standalone personal computers may be needed.

(7) Follow-up for opening of Line-2A (Action 8-7)

- One of the hardest financial difficulties that a railway may face is that the actual number of passengers is lower than estimated.
- There are some promotion activities that can be used to attract people, such as trial-ride events. In Vietnam, the goal is to have people stop using motorbikes for transport and start using urban railways. Line-2A will be the very first urban railway in Hanoi and it can't be expected to provide a sufficient transportation network for commuting to work and consequently it may not be very comfortable for the people of Hanoi in the beginning.
- There can be promotional activities for persuading people to use the railway, such as by using the mass media, but the most effective countermeasure is to develop the following lines as soon as possible. Simply making the fare lower in order to increase ridership would be a short-sighted measure.
- There will be criticism from the mass media about the low usage of this infrastructure. The stakeholders should use care not to react emotionally and the TC will need to take follow-up action.

### 7.3.5 Business

(1) Development of organization rules for sales and non-fare businesses (Action 9-1)

- The Operation Management Office for each line will not have specific sections for handling common business affairs. The Management Control Division (headquarters) of the O&M company will conduct the business for passengers of each line from the beginning.
- The staff trained in the EPC package of Line-2A belongs to the O&M company from the beginning.
- The work flow indicating "Passenger action from buying their tickets, riding on their train and arriving at their destination" and "fare collection system from each station to Management Control Division" will be developed.

## (2) Development of General Transport Contract (Action 9-2)

- The General Transport Contract is a contract between the O&M company and the passengers. The one made in HCMC TC project can be used. Those of buses in Hanoi and VNR as well as The General Transport Contract used by Japanese railway operators can also be referred to.
- It should be noted that this contract is closely related to the station business, which is discussed in (3), and the fare system, which is discussed in (4).
- The common General Transport Contract is to be completed six months before the operation of Line-2A and submitted to the Regulator for urban railways after getting the approval of JCC.

## (3) Development of working manual for station staff (Action 9-3)

- Unified operation processes are required among the lines for common operations such as cash handling, AFC operation (collecting single journey tickets) and others.
- After preparation of draft by referring to a Japanese manual, the PUC/TC team should begin preparation of station work manual by investigating station equipment for Line-2A
- This task should be completed six months before the opening of Line-2A.

## (4) Development of fare revising system (Action 9-4)

- In the TC project, a fare level at the opening that is affordable to citizens will be proposed based on the estimation by the enquete survey and discussions with the PTA study team from the World Bank. While there are a numerous ways to establish the fare, such as a uniform fare system and a zone fare level, the distance-based fare system to be adopted in HCMC should be studied. According to this system, the fare is worked out by multiplying the boarding distance by the unit fare per kilometer plus the initial fare (rounded up to 1000VND). Discount fares and the discount ratio also have to be defined. In this case, it should be clarified if Hanoi City is to bear the loss incurred by the discount. Consensus building among stakeholders will be required.
- The inflation in Vietnam is extremely high. If the fare were to be fixed, it would certainly result in a business deficit. Therefore, the O&M company should be well aware of its profit and loss after opening, and try to calculate a proper fare level based on its financial statement and actual number of passengers.
- It is very important to adjust the fare based on the actual number of passengers at the beginning stage. Basically the adjustment of fare level will be requested by the O&M company, but the



Regulator for urban railways will also be preparing a proposal for the fare level adjustment system. The O&M company team and the Regulator for urban railways team will jointly submit the adjustment system plan of fare level to JCC for approval.

- The results of the study made together with the O& M company will be utilized when the O&M company submits a request for fare level adjustment to the Regulator for urban railways and that unit will submit the proposal to HPC for approval.
- In common practice, the fare would be set one year before the commencement of operation. In Hanoi it should be decided by July 2014 because the Line-2A is scheduled to start operation from June 2015. Therefore, the request from the O&M company should be submitted by January 2014.

(5) Development of a common specification for a common fare system (Action 9-5)

- AFC data for each line will be gathered by each line. However, there is a need to have a higher system for data collection in order to have each line balance out (i.e., clearing) as a company.
- If the data structure of the AFC and treatment method for single journey tickets is different on each line, it would make it impossible for the passengers to transfer without paying at the transfer station. Therefore, the minimum requirements should be standardized. The table below shows the minimum requirements.

**Table 7.11 Minimum Specification of AFC and AFC Servers (draft)**

Item	Specification	Remarks
Specification of Data Format of Cards	Detail will be determined later	Please refer to "Technical Paper: Interoperable AFC System".
Single Journey Tickets	Cards or token using Type-C	Deposit will not be charged. The passengers have to return their tickets by inserting them into the slot of AFC machine basically.
Stored Fare Cards	Cards using Type-C	Deposit will be charged. The passengers can "touch and go" at the station of destination.

Source: JICA Study Team

- Those common standards should be defined before the specifications for the AFC and Server of Line-2A are decided. In this regard, a supplementary report entitled "Interoperable AFC System" has been prepared and is attached to this report.
- Based on this specification, AFC for Line-2A will be developed.

- As a component of the next stage, the specification for the server system for the fare collection system for Line 3 will have to be prepared.

(6) Identification of non-fare businesses at the initial stage (Action 9-6)

- Non-fare businesses are very important for enhancing the sound operation of urban railways. Passengers can spend waiting time buying newspapers and other goods at KIOSKS at stations or watching advertisements at stations until their train comes. Thus, non-fare business is essential for creating user friendly urban railways.
- Urban development, especially the station vicinity development, is considered a good business as shown in 4.2.3(3) of Chapter 4. However, it requires the O&M company to procure land and is rather risky in some respects. Therefore, it is proposed that the development business be limited to utilization of the railway infrastructure at the beginning stage.
- Non-fare businesses include advertisements at stations and trains, rental of some parts of the stations for parking lots and KIOSKS. Providing use of the optical fiber that is installed along the track is another business opportunity.
- Knowing about the facilities in Line-2A is important because there is a need to know what facilities can actually be utilized for non-fare business when starting nonfare business inside railway premise. It is useful in selecting the non-fare businesses to be implemented.
- Most of these non-fare businesses already exist in Hanoi. Therefore, it is good to work with companies which have already knowledge and experience about their respective fields. In the PUC/TC project, the management procedure including the selection of such companies could be developed by obtaining know-how from experts.

(7) Follow-up for opening of Line-2A (Action 9-7)

- There will be many problems due to a lack of experience by the staff at the time of opening of Line-2A. It is very hard to cover every possible situation by training even though there will be practical drills for the station staff during the commissioning period. Therefore, arrangements should be made to have the contractor provide follow-up during this vital period. There should also be a plan for follow-up by the Management Control Division (HQ) for the staff in positions such as handling money.

### 7.3.6 Train Operation

#### (1) Development of organization rules regarding train operation (Action10-1)

- Regarding the train operation, the Management Control Division (HQ) of the O&M organization is in charge of planning and inter-line relationships.
- Train operation department of Management Control Division (HQ) is in charge of the Integrated OCC. However, at the opening stage of Line-2A, the dedicated OCC for Line-2A will be used and the integrated OCC will not be in use at that time.
- There will not be Operation Management Office at the opening stage of Line-2A and the Train Operation Division of the Management Control Division will be in charge of the train operation for Line-2A at that time. When Line-3 is opened, Operation Management Units for each line will be established and a few staffs for train operation from the Management Control Division (HQ) will serve as a bridge between HQ and the work sites. These staff members will also be responsible for station management.
- The train diagram will be based on the number of passengers in each time period, capacity of the trains, available number of train-sets and signal constraints. After this train diagram is fixed, the drivers and work volumes for inspection of rolling stock will be fixed too. The work flow for establishing train operation tasks will be developed.
- The work flow for the OCC staff to conduct train operation guidance will be developed.

#### (2) Learning the process for determining the size of the operation staff (Action10-2)

- The smooth and most efficient way for development of the drivers' operation is obtained by on-the-job training based on the Line-2A Project. The result of this study will be utilized for an estimation of the required size of the staff.

#### (3) Learning the basic skill/knowledge for train drivers' management and operation (Action 10-3)

- Training of drivers is conducted by each project since it is included in the EPC package. However, the training of drivers is not done exclusively for obtaining the driver's license. Drivers have to respond to emergencies without reading manuals. Checking their knowledge by paper test, watching the duty behavior by patrolling and repetitive training are indispensable in training them to keep this ability. Therefore, it is important to plan how to conduct the training of drivers after the opening.

- Regarding the repetitive training after opening, it may be effective to consign it to a supplier in charge of EPC package for a year after opening.
- Drivers have to take meals on the way and have to take a rest after long driving. For the early trains, some drivers have to come to work early in the morning. On the contrary, in the peak hour of the morning and evening, required train number may increase in response to the passengers' number. Accordingly the required number of drivers in the morning and evening is large. Duty shift plan of drivers is developed from the combination of drivers' operation with train diagram. Basic operation of drivers is learnt by taking an example of drivers' operation for Line-2A.

#### (4) Learning how to draw train diagrams (Action 10-4)

- A train diagram is more than just a diagram. It contains not only various objective information surrounding railway operation, such as headway between trains, but also other crucial information such as the work schedules for the drivers and other operation staff, on a single sheet of paper. Therefore, developing a train diagram is a complicated task and normally the train diagram for the opening is provided by the suppliers.
- Since preparing the train diagram is specialized work, it should be handled by the Integrated Train Operation Division after commencement.
- In the PUC/TC project, the plan is to train the Vietnamese staff in train diagram development by using the Line-2A train diagram. There is a need for the Line-2A project to provide specific data to the PUC/TC team, such as the time interval between the arrival and departure times at the terminal stations.

#### (5) Learning how to calculate travel time (Action 10-5)

- Travel time is calculated based on the specifications of the trains, the track layout and the specifications of the rail tracks. In common practice, a special computer program is used to perform this calculation.
- In this PUC/TC project, the basic methods used for calculations will be learned and the operation of the computer program will be studied.

### 7.3.7 Rolling Stock Maintenance

#### (1) Development of organization rules regarding rolling stock maintenance (Action11-1)

- Maintenance Department of the Management Control Division (HQ) of the O&M company is in charge of planning and inter-line relationships out of the rolling stock maintenance.
- There will not be an Operation Management Office for Line-2A at the opening stage and the Maintenance Department of the Management Control Division will be in charge of the maintenance works for Line-2A at that time. When Line-3 opens, the Operation Management Units for each line will be established and there will be one or two staff members from the Maintenance Department of Management Control Division (HQ) to serve as a bridge between the HQ and the work sites.
- The work flow for securing maintenance budgets, estimating staff requirements, planning preventive maintenance and scheduling rolling stock renewal work will be developed.

#### (2) Learning the process of preliminary study regarding staff numbers and maintenance budget (Action11-2)

- The budget for rolling stock maintenance can be estimated by the scheduled number of rolling stock for periodic check-up and the spare parts needed for this. The number of rolling stock requiring periodical check-ups depends on the operation vehicle-km, therefore, the data from the maintenance site can be used for this. There are some spare parts that are needed at every periodical check-up and the other parts can be estimated from the resulting data. Both of these can be predicted based on the information from the site.
- The number of maintenance staff can be determined by the scheduled number of rolling stock undergoing a periodical check-up and required staff number for each check-up. However, if the number that has been just calculated by using the maintenance schedule is used for the estimation, an excessive number of staff members will be required for peak hours. Therefore, the work volume should be equalized as much as possible by adjusting the train operation plan with the information from the Train Operation Division in order to realize cost-efficient staffing.
- These tasks require experience. Japanese experts who have a lot of experience in doing these tasks can train the Vietnamese staff by using Line-2A as an example. Some advanced works are conducted in SAPI as preparation for the training plan.

#### (3) Learning about process for implementation plan of rolling stock renewal (Action11-3)

- Regarding rolling stock and equipment, the relationship between maintenance and replacement is

trade-off. For replacement, since a large amount of money is required, it should be planned from a long term viewpoint.

- The technology of rolling stock and equipment improves year by year, so when a unit of rolling stock or equipment is going to be replaced, steps should be taken to identify what technology will best contribute to the overall management of the railway.
- TC expert will introduce what discussions are made before equipment or rolling stock is replaced in a Japanese urban railway company.

#### (4) Learning about countermeasures against rolling stock failures (Action11-4)

- It is important to take proper action against repetitive failures and to identify the root cause of serious failures in order to maintain safe operation. This is know-how based and it cannot be discussed uniformly.
- Taking the identification of a failure of rolling stock as an example, an engineer from a supplier and an engineer from a railway company are said to have a different way of identifying the root cause of a failure. An engineer from a supplier will try to find the root cause methodically based on the manner of occurrence, but a railway engineer will hypothesize several root causes from the current failure based on their experience.
- The engineer from the supplier takes time to methodically find the true cause of the failure. The engineer from the railway company is interested in finding the cause as quickly as possible.
- TC expert will introduce examples how Japanese railways establish countermeasures against failures in Japan.

#### (5) Development of common rule for maintenance works (Action11-5)

- In consideration that staff may be transferred among lines, it is best to unify the terminology, order of descriptions, explanations, etc., used for rolling stock maintenance.
- The internal rules for rolling stock maintenance and the technical standards are closely related to the specifications of rolling stock. Therefore each line project has to prepare its internal rules at the beginning stages of the line. The Line-2A Project will report to PUC regarding these internal rules as they are prepared.
- During the initial stage when the supplier will be in charge of maintenance for the technology transfer after the opening of the line, the Operation Management Office of Operation Unit for

each line will manage these internal rules with the support of their contractor. In case of Line-2A, however, the Operation Management Office will not be established, so the maintenance division of Management Control Division (HQs) will be in charge.

- Development of the common rules for maintenance work and specifications for rolling stock should be done after all work is done by the Vietnamese staff. In the case of Hanoi, various technologies from several donor countries will be adopted so it is important to manage all these technologies comprehensively. To clarify the importance of these tasks, there is a proposal for setting up a technology and planning group under the auspices of the Rolling Stock Maintenance Department.

### 7.3.8 Equipment maintenance

#### (1) Development of organization rules regarding equipment (Action12-1)

- Maintenance Department of the Management Control Division (HQ) of the O&M company is in charge of planning and the inter-line relationships for the equipment maintenance.
- There will not be an Operation Management Office in Operation Unit for Line-2A at the opening stage and the Maintenance Department of the Management Control Division will be in charge of the maintenance work for Line-2A at that time. When Line-3 is to be opened, the Operation Management Units for each line will be established and there will be one staff from each category of the Maintenance Department of the Integrated Train Operation Division (HQ), civil engineering, architecture, power supply and signal/telecom, to be a bridge between HQs and work sites.
- The work flow for securing maintenance budgets, estimating maintenance staff numbers and making a plan for equipment renewal and preventing failures will be arranged.

#### (2) Learning the process of preliminary study regarding staffing requirements and maintenance budget (Action 12-2)

- The budget for equipment maintenance cost can be estimated by the scheduled renewal and needed spare parts for this. The timing of renewal depends on marginal deterioration and abrasion provided from suppliers. In duplicated system, the needed equipment for the next year can be estimated from the actual number of this year.
- The number of maintenance staffs can be determined by the scheduled number of equipment renewal works and the required staffs per work. However, if the number that has been simply

calculated by using the maintenance schedule is used for the estimation, excessive staffing will occur at peak times. Hence the work volume should be equalized as much as possible by modifying the maintenance works within the marginal period for replacement of spare part or equipment in order to keep the staff number at an optimum level.

- These tasks require experience. Japanese experts who have a lot of experience in doing these tasks can train the Vietnamese staff by using Line-2A as an example. Some of the advanced tasks will be conducted in SAPI in order to estimate the number of trainees.

#### (3) Learning implementation plan of equipment renewal (Action12-3)

- The relationship between the maintenance cost and the overhaul/replacement of equipment is a trade-off. Moreover, overhaul/replacement requires a lot of money so it should be planned well and be based on a long-term point of view.
- The technology for equipment is progressing year by year, so the timing for overhaul/replacement should be carefully considered from the viewpoint of efficient management.
- The Japanese examples can be introduced for discussion.

#### (4) Learning about countermeasures against equipment failures (Action12-4)

- It is very important to take the proper countermeasures against frequent failures and to find the root causes of the failure in order to ensure safe operation. Extensive experience is needed for these activities as they cannot be described easily.
- Serious failures such as bending of rail track or breakage of overhead catenary, etc., can usually be avoided by periodical check-up normally.
- The signaling and telecommunication system, which uses lots of computers, have a redundant system. When one system has a failure, a back-up system will immediately take over for the system with the failure in order to avoid a failure of the whole system.
- Failure of equipment frequently happens during overhaul or construction for improvement. Therefore, when performing overhauls or other such work it is important to have countermeasures for preventing the misconnection of cables.
- Japanese examples on prevention of errors can be introduced.

#### (5) Development of common rule for maintenance works (Action12-5)



- In consideration that staff may be transferred among lines, it is best to unify the terminology, order of descriptions, explanations, etc., used for equipment maintenance.
- The internal rules for equipment maintenance and the technical standards are closely related to the specifications of equipment. Therefore each line project has to prepare its internal rules at the beginning stages of the line. The Line-2A Project will report to PUC regarding these internal rules as they are prepared.
- During the initial stage when the supplier will be in charge of maintenance for the technology transfer after opening, the Operation Management Office for each line will manage these internal rules. However, there will not be an Operation Management Office for Line-2A at the opening stage, so the Maintenance Department of the Integrated Train Operation Division (HQ) will be in charge on the maintenance works for Line-2A at that time.
- Development of the common rules for maintenance work and management of equipment specifications should be done after all work is done by the Vietnamese staff. In the case of Hanoi, various technologies from several donor countries will be adopted so it is important to manage all these technologies comprehensively. To clarify the importance of these tasks, there is a proposal for setting up a technology and planning group under the auspices of the Maintenance Department.

## 7.4 Tasks of Experts until TC Starts Operation

### 7.4.1 Extension of SAPI Study

TC/PUC is requested to establish the O&M company within a very limited amount of time. Therefore, it is imperative that the PUC/TC team be fully functional from the beginning. On the other hand, the launch of the TC project may be delayed from the original plan of September 2012 to December 2012. The following are the tasks to be done by the time the TC is established by extending the schedule of SAPI study.

### 7.4.2 Expansion of current SAPI activities

- Assistance in obtaining approval of the SAPI proposal from HPC

HPC already issued a letter (3617/UBND-QHXDGT) to acknowledge the contents of the SAPI study basically and another letter (925/QD-UBND) suggesting the reorganization of HRB (Hanoi Metropolitan Rail Transport Project Board) to MRB (Hanoi Metropolitan Railway Management Board) which is in charge of managing urban railways after operation as the Regulator for urban railways. Approval from HPC based on the SAPI proposal is expected. However, the

follow-up is very important so as not to miss the last step.

- Promoting understanding on SAPI study by donors

WB has recently selected a consulting company for providing the technical assistance for establishing the PTA and their work has just started. On the other hand, the function of the Regulator for the urban railways has just been assigned to MRB, as mentioned above. The functions of the Regulator for urban railways and the PTA are somehow overlapping, so coordination between WB and its consultant is essential. Continued dialog with the consultant is needed.

- Promoting understanding of the Interoperable AFC system

The SAPI team has dispatched an AFC/IC card expert to Hanoi who has so far drafted the supplementary report “Interoperable AFC Systems” and held technical workshops. Since not only Vietnamese stakeholders, but also donors have strong interest in this issue, continued explanation to the stakeholders is required.

#### 7.4.3 Advanced Actions of the TC Project

It has been decided that the O&M company should be established by the middle of 2014, while the launch of TC project will be delayed. In order to make the TC project efficient, it is preferable to have advanced action of the TC project during the SAPI extension period. There are six persons in MRB assigned for PUC/TC, though they are not fully designated to the PUC/TC project. The TC team will conduct the activities shown below using these six members.

- (1) Support for the summarization of conditions for the safe transferring of Line-2A

The support for this issue has already been started in the SAPI study. Continuous support will be provided until a final agreement between the two parties is made.

- (2) Support for the development of rules among PUC entities

It will take a few years to fully understand the tasks of the Management Control Division and Integrated Train Operation Division (HQ) since all hidden aspects need to be understood for this position. There is a lot of confidential information in headquarters, so it is impossible to study at the headquarters of a foreign railway company.

In this regard, it has been proposed that PUC members will conduct the more practical aspects of the work with the support of experts in Vietnam until the O&M company can conduct its

business fully on its own. PUC members will learn these practical aspects as OJT.

It is important to clarify that PUC's position in the organization and their powers and responsibility will be developed by the time the TC project starts. The experts will provide support for this.

## 7.5 Preparations to be Completed by the Vietnam Side

(1) To set up the Preparation Unit for establishment of the Regulator for urban railways and the O&M organization

At present, the MRB is assumed to be in charge of the following tasks, as a minimum.

- To assign one dedicated personnel
- To prepare documentation that defines the concrete position and distinct responsibilities of the Preparation Unit for setting up the Regulator for urban railways and the O&M company, and to obtain the required approval from Hanoi City
- To identify the necessary staffing at the time when the Preparation Unit starts. It is recommended that all of the staff shown in the table below be assigned by September 2012. The number of staff members will be increased accordingly.

**Table 7. 12 Staffing Size and Assignments at the Beginning Stage**

#	Organization	Positions	Assigned tasks
1	Regulator	Leader	
2		Fare policy	Action 2
3		Urban railway policy	Action 3
4		Supervision of transport planning and Safety affaires	Action4
5	The O&M organization	Leader	
6		Planning	Action5
7		General Affairs / Safety	Action 6
8		Human Resources	Action 7
9		Finance Affairs	Action 8

#	Organization	Positions	Assigned tasks
10		Business	Action 9
11		Train Operation	Action10
12		Rolling Stock Maintenance	Action11
13		Equipment maintenance	Action12

Source; JICA Study Team

### (2) Preparation of office

- Office space and office equipment including furniture and internet facilities should be prepared for the PUC/TC team.

### (3) Preparation of Vietnamese -English translation system for documentations

- Vietnam side shall arrange for Vietnamese-English translators, so that experts can review the documentation prepared by Vietnamese staff. The TC team will also provide Vietnamese-English /Japanese translators for close communication between Vietnamese staffs and the experts.

## 7.6 Preparation of TOR

### 7.6.1 Approach for Project Implementation

#### (1) Reference resources

- Laws, regulations, and other legal documents in Vietnam
- Internal rules developed in Japanese railway companies
- Internal rules applied in similar business areas in Vietnam, such as Hanoi buses, VNR, and the drafts of HCMC O&M company

#### (2) Assistance from local management consultants

It is rather difficult for foreigners to have good understanding of Vietnamese institutions. Thus TC

team should employ experts regarding Vietnamese business management, so that the expert can take a role of mediator between the foreign experts and Vietnamese PUC members.

### 7.6.2 The terms of TOR

Followings are the tentative terms of TOR.

**Table 7.13 Tentative TOR for TC**

Area	Theme	Term	
Common		Preparatory study (Management training course and study tour in Japan)	
		Development of general project implementation plan and its target list (WBS)	
		The follow-up work for Line-2A operation	
The Regulator for urban railways	Establishment of the Regulator for Urban railways	Coordination on the Regulator plan with MOT	
		Development of the Regulator for urban railways organization and the function & powers in the Regulator for urban railways	
		Study policy menus to encourage use of urban railways	
	Development of the fare settlement and subsidy system	Development of fare revision system	
		Establishment of subsidy system	
		Studying the fare level of Line-2A at the opening	
	Supervision system for train operation plan and safety	Development of draft on the submission system of train operation plan and others to ensure the level of service	
		Re-confirmation with MOT on the management system for safe operation	
		Development of accident report system	
		Development of accident investigation system	
The O&M company	Planning, management and safety	Registration of the O&M company	
		Development of internal rules regarding roles and responsibilities of each division	
		Development of organization rules regarding planning, management and safety	
		Development of business plan	
		Development of company charter	
		Development of internal rules regarding safety improvement	
		Compiling basic train operation rules	
		Preparation of functional plan of office IT system	
		Human Resources	Development of organization rules regarding HR management
			Development of employment rules
	Development of internal rules regarding recruiting, salary, and sanction		
	Development of rules regarding the job allocation and job grading systems		
	Development of staffing allocation plan		
	Development of internal rules regarding social welfare and pension		
	Planning on HR development after commercial operations		
	Finance	Preparation of encoding office IT system	
		Development of organization rules regarding finance	
		Establishment of accounting system	
			Development of rules for budget and settlement

Area	Theme	Term	
		Development of rules for procurement	
		Studying the measures to maintain financial soundness	
		Guidance of encoding before office IT system will be established	
	Business		Development of organization rules regarding sales and non-fare businesses
			Development of general transport contract
			Development of working manual for station staff
			Development of fare revising system (common work with the regulator division)
			Development of common specification for common fare system (on timing of Line-2A)
			Identification of non-fare businesses at the initial stage
			Train operation
	Learning the process of preliminary study regarding operation staff numbers		
	Learning the basic skill/knowledge for train drivers' management and operation		
	Learning the drawing method of train diagram		
	Learning the calculation method of travel time		
	Rolling stock maintenance		Development of organization rules regarding rolling stock maintenance
			Learning the process of preliminary study regarding staffing requirements and maintenance budget
			Learning implementation plan of rolling stock renewal
			Learning the countermeasures against rolling stock failures
			Gathering maintenance rules on rolling stock of Line-2A
	Equipment maintenance		Development of organization rules regarding equipment maintenance
			Learning the process of preliminary study regarding staffing requirements and maintenance budget
			Learning implementation plan processor for asset renewals
			Learning the countermeasures against equipment failures
			Gathering maintenance rules of facilities of Line-2A

Source: JICA Study Team

## 7.7 Expert Configuration

The Plan of Operation is displayed in Table 7.1. The expert assignment plan will be developed based on this table. It is recommended that the expert assignment plan be developed based on the following ideas.

(1) Since commercial operation of Line-2A will start in mid 2015, there is a need to establish the Regulator for urban railways and the O&M company early enough to make the preparations for the line opening. The project period for establishing the two institutes is two years from December 2012, and tentative staff configuration is based on the condition that the O&M company starts its operation

by the middle of 2014 and Line-2A starts its revenue operation in the summer of 2015.

(2) In this project, the Vietnamese staff in the PUC is assumed to prepare the contents for TOR proactively, based on advice and information from the experts.

(3) The role of the experts is to provide Vietnamese staff with the information necessary for their study and to validate the appropriateness of the draft they prepare.

(4) Common language between the experts and Vietnamese staff should be English. Both sides are to prepare documentation and discuss in English, but they may exchange their ideas on a daily basis by using a Vietnamese /Japanese translator.

(5) Based on our observations, Vietnam side does not have much experience on urban railways. In addition they also have a limited understanding of the framework of a “company” since they are basically public servants. Therefore, it is needed to send as many experts as possible.

(6) It is desirable that the experts involved in this TC have management experience in railway companies.





## APPENDIX 1

### Case Study of the Urban Railways in South East Asian Cities

#### 1. Introduction and Current Status in Each City

##### 1.1 Bangkok Transit System Company (BTSC)

There are three urban railway operators and four urban railway lines in Bangkok. Their operation performance is basically good. However, their financial conditions are not so good. BTSC went bankrupt once and BMCL is currently experiencing financial hardship. The Airport Link recently opened, but its financial status has not yet been made public.

It should be noted that the financial burden of BTSC was changed to capital in kind after it went bankrupt and since then BTSC has been conducting a financially sound operation. From these cases, it can be seen that the sound operation of an urban railway depends upon its ability to mitigate the burden of the initial investment. Once the burden of the initial investment has been removed, an urban railway can enjoy sound operation. The Bangkok case serves as a good example for studying the dynamics of a bad financial situation.

### Current Status

Bangkok is served by three BTSC (lower left), BMCL (upper Right) and Airport Link (lower Right)



**Figure A1.1 Urban Railways in Bangkok**

### 1.2 Light Rail Transit Authority in Manila

Currently three lines are being operated by two organizations in Manila. Line-1 and Line-2 are operated by LRTA, which is a public entity. Line-3 is operated by DOTC (Department of Transport), but it issues a financial report. On Line-1, the trains are very crowded and enhancement of transport capacity is required. Modification of fare levels has not been approved for a long time and, accordingly, LRTA suffers from a deficit. This case also teaches us that mitigation of the burden of the initial investment that has been shouldered by the operator is an important factor in the sound operation of urban railways.

In Manila, some train-sets are left unrepaired due to lack of spare parts. Generally, poor maintenance can be traced to the lack of an adequate budget and an inappropriate management mindset.



**Figure A1. 2 Urban Railways in Manila**

### 1.3 PT.KA (formerly Indonesian National Railways) in Jakarta

In Jakarta, EMU commuter trains have been operated by PT.KA for more than 20 years. While the fare is set to be very low, subsidies from the government are insufficient. Train operation is not punctual because the management neglects to allocate a sufficient budget in an effective manner. As a result, its profit-loss statement shows a deficit. The urban railway in Jakarta also provides good lessons about the importance of management capability in effective and efficient operation of the railway. .

#### Current Status



Because of the poor management controls, passengers who actually could afford to pay the fare do not want to ride on these cars (See picture at left)

PT.KA recently solved its transport capacity problem by importing second-hand rolling stock



**Figure A1.3 Urban Railways in Jakarta**

#### 1.4 Delhi Metro Company Limited in Delhi

DMCL opened its first line in 2002. Since then, it has extended that line and opened five more lines. The construction of the first line was completed as scheduled, which is unusual in India where most projects are finished behind schedule. Such delays generally cause an increase in staff and other such costs. The reason why this project was completed on schedule is that DMCL had been given complete control and managed the construction and operation from the beginning of the project.

In order to conduct a financially sustainable operation, the government provided a subsidy as well as real estate rights to DMCL so that it could run the business in a financially sound manner right from the beginning. Their operational performance is fine.

DMCL is a successful case that contains good lessons.

### Current Status

By prompt decision making, this project was completed within schedule. It is said that this success is largely attributed by Chairman of Delhi Metro



**Figure A1.4 Urban Railway in Delhi**

## 1.5 Singapore Mass Rapid Transit in Singapore

There are two railway operators in Singapore. They were established under a policy of the Singapore government with the intent of introducing competition to the urban railway business. Here the original one was introduced.

It is well known that the financial and operational performance of SMRT to be good. This is the result of the Singapore government's policy, which is explained in below.

At the beginning of the operation, all assets were lent from the government for a small lease charge. When the operation became stable, these assets, except for the infrastructure, were purchased by SMRT. A budget for this was partially granted by the Singapore government. The government and SMRT have established a transparent system for fare modification. The government has adopted various policies related to transportation that are aimed at shifting people away from using private cars and encouraging them to use urban railways. Figure A1.5 shows scenes from the residential area along the urban railways. This is also a result of the government policies to shift people away from using private cars and guiding them towards using urban railways.

### Current Status

Singapore, has four lines in service (Right)

Serving using light vehicle transit system has been developed in the suburbs and residential areas



**Figure A1.5 Urban Railway in Singapore**

## 2. Setting Fare at the Proper Level

The table in Figure A.6 shows the comparison of the initial fare for each railway by applying the Purchase Power Parity (PPP) USD concept. The concept of PPP is described in Figure A.6. In the figure, three urban railways including Delhi Metro are shown to be experiencing a deficit. Their initial fares are around 0.5 PPP USD or less. The initial fares of two metros in Bangkok and Singapore are around 1 PPP USD, and they are profitable. It should be noted that Bangkok Metro went bankrupt once, but is profitable now. This fact suggests that if the initial fare price is around 1 PPPUSD and the operating company does not have the burden of initial investment, the company can be profitable.

### The initial fare of unprofitable railways is low

Railways	Initial fare price		Financial management
	Local currency	PPP USD	
Manila Line1 and 2	12 Peso	0.55	Not sound
Bangkok Metro Co.	16 Thai Baht	1.00	Sound after bankrupted
Jakarta railways	1,000 Indonesian Rupee	0.25	Sound but operation is poor
Delhi Metro	6 Indian Rupee	0.41	Sound but
Singapore Metro	1 Singapore Dollar	0.93	Sound

PPP(Purchase Power Parity); a measure of long-term equilibrium exchange rates based on relative price levels of two countries The concept is founded on the law of one price, the idea that in absence of transaction costs and official barriers to trade, identical goods will have the same price in different markets when the prices are expressed in terms of one currency

**Figure A1. 6 Comparison of Initial Fare Price**

In Jakarta, rolling stock cannot be renewed because of a budget shortfall caused by the fare price being suppressed to a low level. As introduced in Figure A1.3, PT.KA imported second-hand Electric Multiple Units (EMUs) from Japan recently as a means of coping with the budget shortfall. However, generally speaking, it may be unrealistic that all rolling stock needs can be covered by second-hand EMUs. Therefore, the fare level should take into consideration the budget required for rolling stock renewal. When cost of this renewal is reflected in the calculation, the appropriate fare would be 1.6 times that of the current fare level. (Figure A1.7) Renewal of the old EMUs is also required in Jakarta, where the urban railway is required to increase its transportation capacity in order to solve the road congestion. If the procurement cost for all EMUs is to be covered by the fare revenue, the fare level has to be increased 3.6 times. It is clear that the fare level in Jakarta is too low.

**[Jakarta; PT.KA]**

Fare has to be enhanced by 1.6 times to enable replacement of old rolling stock

Alternatives		1	2	3
Nature of fund	ODA from KfW	Born by Gov.	Born by Gov.	Born by Gov.
	For replacement of old rolling stock	Bank loan	Bank loan	Bank loan
	To increase fleet size	Born by Gov.	Japanese ODA	Bank loan
Ratio of fare increase required to meet needs		1.6	2.4	3.4
Alternatives		4	5	6
Nature of fund	ODA from KfW	Bank loan	Bank loan	Bank loan
	For replacement of old rolling stock	Bank loan	Bank loan	Bank loan
	To increase fleet size	Born by Gov.	Japanese ODA	Bank loan
Ratio of fare increase required to meet needs		1.8	2.6	3.6

Interest of Japanese ODA loan is assumed as 0.3%, Interest of bank loan and KfW is assumed as 7.5%

**Figure A1. 7 Enhancement Ratio of Fare Level of PT.KA in Jakarta**

It is obvious in the case of Jakarta that securing the proper fare level is absolutely necessary for the urban railway operators. When setting a proper fare level, it is important to establish a transparent system for fare adjustment in order maintain the proper fare level. Singapore has established the following fare adjustment system that corresponds to changes in the Consumer Price Index and the increase in worker income. Japan has established a fare adjustment system based on a comparison of the expenditures of the railway operators.

[Singapore; SMRT] They have established  
transparent fare adjustment system

### Maximum Fare Adjustment

$0.5 \text{ CPI} + 0.5 \text{ WI} - 1.5\%$

CPI refers to the change in Consumer Price Index over the preceding years and WI refers to the change in Average Monthly Earnings (Annual National Average) over the preceding year, adjusted to account for any change in the employer's Central Provident Fund contribution rate. The productivity extraction of 1.5% is half of the public transport operators' average productivity gains achieved for the period from 2003 to 2007, which was 3.0% per annum.

**Figure A1. 8 Transparent Fare Adjustment System in Singapore**

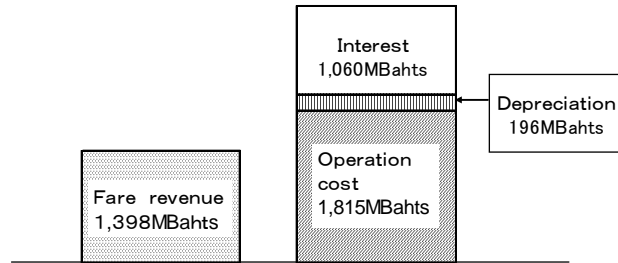
### 3. Burden of the Initial Investment

In Figure A1.9, the financial results of BMCL in Bangkok are shown. It can be seen that its operating costs exceed its fare revenue. Furthermore, when it is understood that the interest for the initial investment and depreciation costs are also included in its expenditures, it is obvious that the burden of the initial investment is too heavy for this railway operator. BMCL is in the red every year.



## [Bangkok BMCL]

Interest is huge and operation cost exceeds the fare revenue



•Source: BMCL Annual Report 2006

	2004	2005	2006	2007	2008
Total revenues	445.9	1,046.0	1,398.9	1,445.8	1,578.7
Total expenses	1,045.5	1,960.7	2,012.4	1,981.3	2,078.8
Loss before finance cost and corporate income tax	-599.6	-914.6	-613.4	-535.5	-500.1
Finance cost	-375.9	-811.0	-1,061.0	-946.6	-953.6
Corporate income tax of a subsidiary	0.0	0.0	2.9	2.9	3.3
Net loss for the year	-975.5	-1,725.6	-1,677.3	-1,485.0	-1,457.0
Amortization of project costs	125.0	171.7	156.6	194.3	218.8

**Figure A1. 9 Financial Results of BMCL in Bangkok**

Figure A1.10 introduces a cause of deficit that was explained by an officer of MRTA (Mass Rapid Transit Authority), the concessionaire of the BMCL line. He said that the station premise is so wide that the power cost for air conditioning becomes a huge expenditure. This is due to the design of the station premise which followed the NFPA (National Fire Protection Association) standard. From this it can be seen that structures on the line can also adversely affect the finances of the operator.

## [Bangkok; BMCL]

### Large station structures is a major factor in deficit

MRTA in BKK(the authority for BMCL) reported that one of the major causes of deficit is the huge power cost for operating the AC in its underground stations. Note that these structure were designed to conform to **National Fire Protection Association** standard



**Figure A1. 10 Huge Power Costs for AC Resulted in Deficit for BMCL in Bangkok**

In Figure A1.11, some of the major causes of the BMCL bankruptcy are described. Here it can be seen that the actual demand and the actual fare price are much lower than the estimated ones, and the actual construction cost and operation costs are higher than the estimated ones. It is obvious that the overly optimistic demand forecast and the overrun of the construction cost estimation are major causes of the deficit in the operational stage.

**[Bangkok; BMCL]**

Overly optimistic demand forecast and overrun of the construction cost estimate are major causes for the deficit

Comparison items	Ratio(%)	Remarks
Construction cost(Actual/ Estimated )	128	
Demand (Actual/ Estimated )	32	Y2004-2009
Fare (Actual/ Estimated )	66	Y2004-2009
Operation cost (Actual/ Estimated )	147	Y2005-2009

Note; As real figure, the average from 2004 to Y2009 is used

Source; Financial study of the Blue Line 1997MRTA and MRTA Annual report

**Figure A1. 11 Comparison of Actual and Estimated Costs for BMCL in Bangkok**

LRTA in Manila has a big deficit because of its low fare level. In Figure A1.12, it can be seen that the result can be drastically improved if the cost for depreciation and interest for assets are not included. In Manila, strong support from the government was necessary for the initial investment.

**[Manila; LRTA]**

The financial result can be dramatically improved when depreciation and interest costs are set to zero

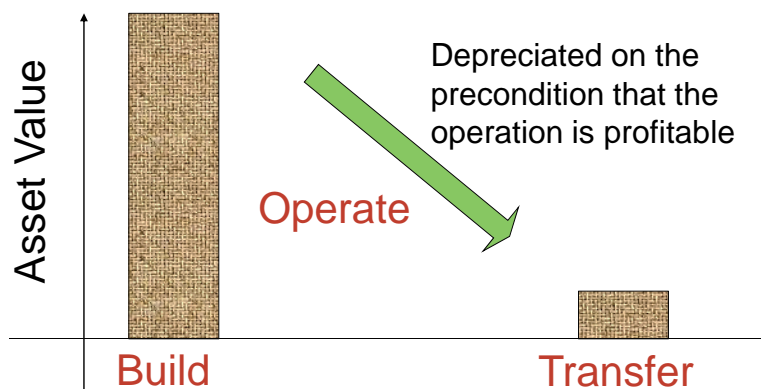
Year		2009	2008
RAIL REVENUE	A	2,940,779,754	2,769,801,140
Direct operating cost	B	2,324,870,912	2,082,670,674
Depreciation	C	1,078,831,076	1,332,029,244
Bad debts	D	271,656	13,023,111
	E=SUM(A;E)	3,403,973,644	3,427,723,029
OPERATING LOSS	F=A-E	-463,193,890	-657,921,889
OTHER INCOME ( EXPENSES)			
Foreign exchange gain(loss)	G	1,002,978,808	-10,257,526,980
Interest/bank charges	H	-1,758,240,404	-1,621,043,844
Subsidy from the Government	I	223,777,798	559,910,693
Rental income	J	60,109,642	55,638,550
Interest income	K	32,283,396	30,246,665
Gain on disposal of assets	L	2,111,460	-
Miscellaneous	M	5,910,092	8,393,084
	N=SUM(G;M)	-431,069,208	-11,224,381,832
NET LOSS	P=F+N	-894,263,098	-11,882,303,721

Source; LRTA Annual Auditors' Report

**Figure A1. 12 Burden of Initial Investment of the LRTA in Manila**

Basically, the Build-Operate-Transfer (BOT) scheme was established based on the assumption that the railway operation business will be profitable. When this is true, the asset value will be reduced during the concession period. After the concession period is finished, the asset value becomes small because the yearly depreciation is accumulated. After this, the government can obtain the railway asset at a lower price. But the realities are that the operation cost is high and the fare level is suppressed because of the low affordability of the passengers or for political reasons. Frankly speaking, the Build-Operate-Transfer scheme is an illusion and a simple BOT scheme cannot be adopted with the intent of saving money for the government. If a BOT scheme is adopted, special arrangements such as utilization of land owned by the government should be provided. Bangkok and Manila cases are unsuccessful examples because they adopted a simple BOT scheme. Profit without effort should not be expected. When it appears that a profitable way has been found, it is best to carefully scrutinize every aspect of its mechanisms and its preconditions.

### The illusion of Build-Operate-Transfer



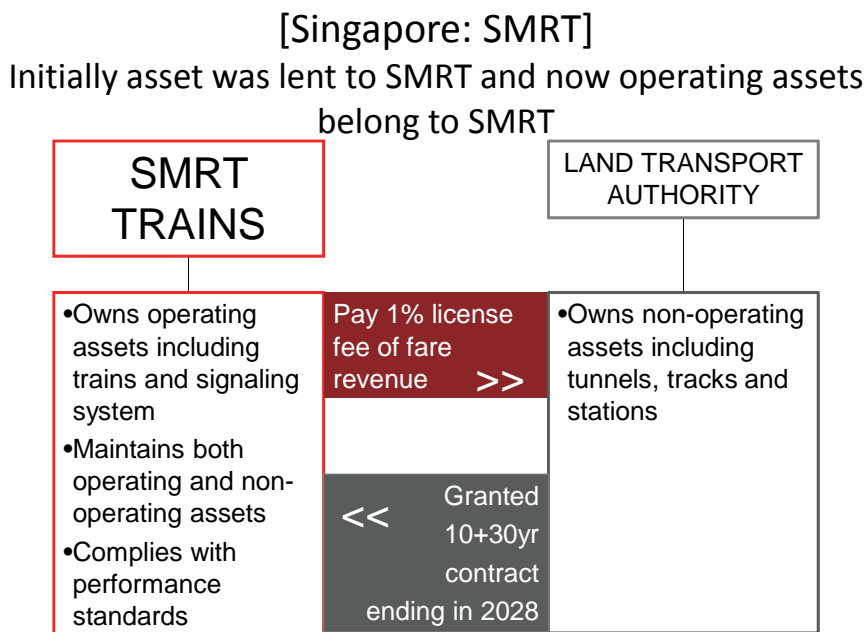
In reality the operation is not profitable and the O&M Company cannot bear the amortization and interest costs

**Figure A1. 13 The Illusion of Build-Operate-Transfer**

It is said that Delhi Metro is an example of a successful BOT because it used government-granted land. A part of initial investment is borne by Delhi Metro and their fare level is quite low, as already explained. This was an excellent solution. However, once there is no more land available for rendering in this manner, further revenue cannot be expected. Its financial situation may be in

decline and there is no guarantee that Delhi Metro can continue to manage well with such a low fare level in the future.

It is obvious from the two slides (Figure A1.14 and 15) that the Singapore government has adopted a strategy to protect SMRT from heavy financial burden. When operation first started, the government owned all the assets. Several years later when the number of passengers reached a certain stable level, the government granted some money to SMRT to be used as the funds for procuring these assets and then sold the operating assets, including the rolling stock, to SMRT. SMRT remained in charge of maintenance of the railways. The government understood that the number of passengers would be small at the beginning of operation and that SMRT would not be able to bear the cost of the repaying the principal and interest on the loans for these assets using fare revenue at that time.



**Figure A1. 14 Asset Management of SMRT in Singapore**

## [Singapore: SMRT]

Time	Actions taken
August 1987	SMRT was established Granted license for North-South and East-West lines from Singapore's Land Transport Authority for 10 years and was later extended to March 1998
April 1998	Granted license for 30 years Purchased operating assets from LTA for approximately \$1.2 billion LTA provided asset related grant of \$480 million License fee for the initial five years was 0.5% of fare revenue.
July 2000	Listed on the mainboard of the Singapore Exchange Securities Trading Limited
May 2009	The license for Circle line was granted for 10 years with lease charge of 0.5% The operating asset has to be purchased with 2019

**Figure A1. 15 Corporate History of SMRT in Singapore**

#### 4. Poor Operation/Maintenance Due to Insufficient Budget

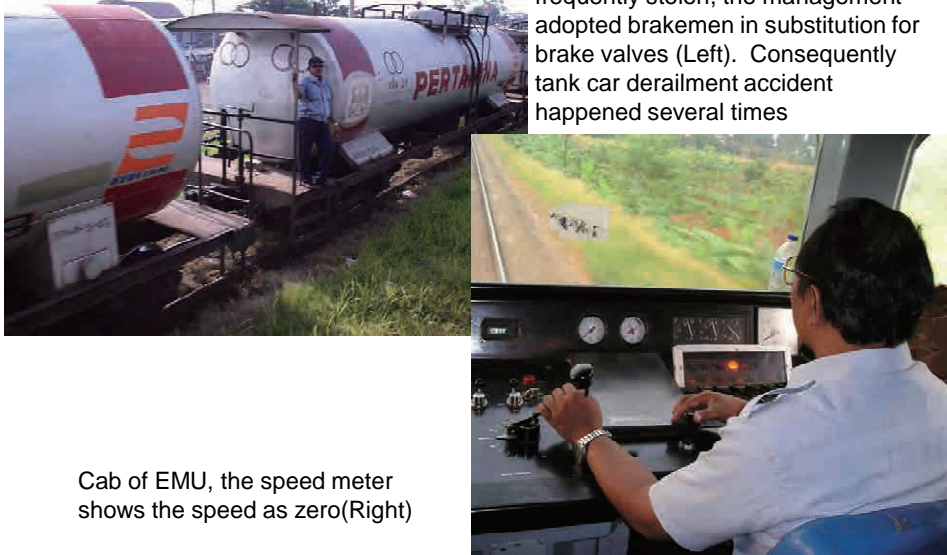
The poor operation and maintenance that is brought about by having an insufficient budget is another topic. This section underscores the significance of having a sound financial operation. The pictures shown in Figure A1.16 are of an intercity railway operating in Indonesia. The details are described in the slide.

In Jakarta, the speed meter in the cab does not work properly on most of EMU even though the cost of a replacement speedometer is relatively low. This kind of poor maintenance is the result of profit-oriented management.

## [Jakarta; PT.KA]

## Poor maintenance is brought about by poor management

As brake valves of tank cars were frequently stolen, the management adopted brakemen in substitution for brake valves (Left). Consequently tank car derailment accident happened several times



Cab of EMU, the speed meter shows the speed as zero(Right)

**Figure A1. 16 Examples of Poor Maintenance in PT.KA in Jakarta**

In Manila, the fare of Line-2 has not been revised since Y2003 because citizen support for the needed revision could not be obtained at open conferences. However, commodity prices increased by 160% between Y2003 and Y2010. As a result, the railway could not afford to purchase spare parts and now 4 out of the 18 train-sets are not operated due to lack of spare parts. It is said that officers in charge of storage do not readily provide the maintenance staff with spare parts because they want to save money. Basically poor maintenance can be traced to the lack of a sufficient maintenance budget and the lack of a proper management mindset. The same could also be said about Jakarta.

## 5. Support from the Government

The last topic is about importance of support from the government.

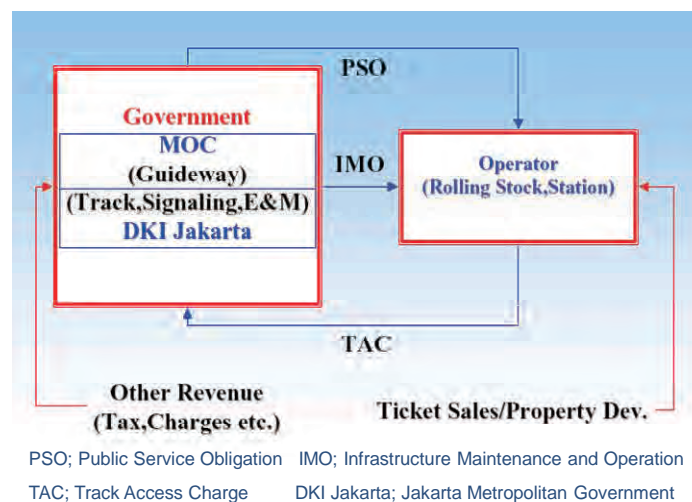
As described in Section 3, 34% of the income of the Delhi Metro comes from the real estate business using land granted by the government.

Delhi Metro receives the deposit money paid at the commencement of leasing this real estate. Since the cost of the land is very small, this real estate business is very profitable. But the land is limited, and sooner or later, no land will be available for further leasing. Therefore, the supporting system of its revenue does not seem to be perfect.

The government support system described below was adopted in Jakarta. There the government owns the assets and the operator maintains them. The government pays a maintenance fee, which is called IMO (Infrastructure Maintenance and Operation), to the railway operator. The operator pays the TAC (Track Access Charge), which is the same amount as the IMO, to the government. Even if the railway operator owns these assets, it still has to bear the maintenance cost. Hence this system is fair and good. Regarding the PSO (Public Service Obligation), the government pays a subsidy for each economy class passenger to the operator since the fare level is suppressed so that transportation can be made available to lower class citizens. The scheme looks fine, but the government has never fully paid the calculated amount of the PSO and the railway operator suffers from lack of money. In response, the operator has tried to increase its income by raising only the fares for express trains or business-class trains. Raising these fares does not require government approval, so the operators can set them as high as they want.

### [Jakarta: PT.KA]

Scheme looks fine, but the government has never fully paid their portion



**Figure A1. 17 Government Support System in Jakarta**

The Singapore government has adopted a variety of policies for promoting the use of public transport. The Singapore government suppresses the total number of automobiles by using a vehicle quota system. The owner of a car needs a Certificate of Enrollment. To obtain it, the owner has to join in an open bid system. In Singapore the import tax is also high. It is said that the owner of the car has to pay four or five times of the open market price for the right to own a car. These policies appear to contribute to suppressing the number of cars in Singapore.



Electric Road Pricing (ERP) is also one of these policies. The picture below describes the ERP system. The ERP system was introduced to suppress the number of cars coming into the central business district. The owner of a car is obliged to equip it with the In-vehicle Unit (IU) and when the car passes an ERP gate, it withdraws the charge from the account of the IU. If ERP cannot withdraw the required charge from the IU unit, or if the car is not equipped with an IU, a picture of the license plate is taken by a surveillance camera and the owner of the vehicle is assessed a fine. Please see the following slide showing a scene around an ERP checkpoint.

### [Singapore; SMRT]

Electronic Road Pricing (ERP) was established to suppress road traffic and encourage people to use public transportation



**Figure A1. 18 ERP Established in Singapore**

## 6. Conclusion

The following lessons can be learned from these case studies.

- (1) Since the affordability of citizens is low and sufficient fare revenue cannot be expected during the beginning stage, payment of the amortization and interest for the initial assets may be difficult for the O&M organization.
- (2) To insure sound operation and maintenance, a certain fare level needs to be secured by considering both the affordability of citizens and the budget needed for sustaining operations.
- (3) To insure sound management, the government has to support the O&M organization as much as possible.