

National Economic and Social Development Board  
The Kingdom of Thailand

**The Study on Financial Frameworks  
in Mass Transit System Project  
in Thailand**

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August 2010

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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## LIST OF ABBREVIATIONS

ADB	Asian Development Bank	
AFC	Automatic Fare Collection	
ARL	Airport Rail Link	Thailand
ATP	Automatic Train Protection	
BLO	Build-Lease-Operation	
BLT	Build-Lease-Transfer	
BMA	Bangkok Metropolitan Administration	Thailand
BMC	Bangkok Metropolitan Council	Thailand
BMCL	Bangkok Metro Public Company Limited	Thailand
BMR	Bangkok Metropolitan Region	Thailand
BLT	Build- Lease- Transfer	
BOO	Build- Owned- Operate	
BOT	Build- Operate- Transfer	
BRT	Bus Rapid Transit	
B/S	Balance Sheet	
BTO	Build-Transfer-Operation	
BTSC	Bangkok Mass Transit System Public Company Limited	Thailand
CA	Concession Agreement	
CAT	City Air Terminal	
CDRC	Corporate Debt Restructuring Committee	Malaysia
CMLT	Commission for the Management of Land Traffic	Thailand
DfT	Department for Transport	U.K.
DMRC	Delhi Metro Rail Corporation	India
DOTC	Department of Transport and Communications	The Philippines
DSCR	Debt Service Coverage Ratio	
DTCP	Department of Town and Country Planning	Thailand
EDSA	Epifanio de los Santos Avenue	The Philippines
EIA	Environmental Impact Assessment	
ERL	Express Rail Link	Malaysia
ERP	Electric Road Pricing	
E&M	Electrical and Mechanical Equipment	
FCDU	Foreign Currency Deposit Unit	The Philippines
FY	Fiscal Year	
GDP	Gross Domestic Product	
GOT	Government of Thailand	Thailand
GTZ	German Technical Agency for Cooperation	Germany
ICR	Inception Report	
IFC	International Finance Corporation	
IMTI	Integrated Multi-Modal Travel Information System	
Infracos	Infrastructure Companies	U.K.
ISC	Infrastructure Service Charge	U.K.
ITR	Interim Report	
JBIC	Japan Bank for International Cooperation	Japan
JRTT	Japan Railway Construction, Transport and Technology Agency	Japan
KfW	Kreditanstalt für Wiederaufbau	Germany
KLIA	Kuala Lumpur International Airport	Malaysia
KPI	Key Performance Indicator	
KTM	Keretapi Tanah Melayu (Malayan Railways)	Malaysia
LIBOR	London Inter-Bank Offered Rate	
LRT	Light Rail Transit	Singapore
LRT	Light Rail Transit	
LRTA	Light Rail Transit Authority	The Philippines
LTA	Land Transport Authority	Singapore

LTCB	Land Transport Control Board	Thailand
LUL	London Underground Limited	U.K.
MAS	MRT Assessment Standardization	Thailand
MIR	Metropolitan Intercity Railway Company	Japan
MLITT	Ministry of Land, Infrastructure, Transport and Tourism	Japan
MLR	Minimum Lending rate (of Bangkok Bank)	Thailand
MOI	Ministry of Interior	Thailand
MOT	Ministry of Transport	Thailand
MPC	Monetary Policy Committee	Thailand
MRT	Mass Rapid Transit	
MRT	Metro Rapid Transit	The Philippines
MRTA	Mass Rapid Transit Authority of Thailand	Thailand
MRTC	Mass Rapid Transit Corporation	Singapore
MRTC	Metro Rail Transit Corporation	The Philippines
MTR	MTR Corporation Limited	Hong Kong
NESDB	Office of the National Economic and Social Development Board	Thailand
NPL	Non-performing Loan	
NPV	Net Present Value	
O&M	Operation and Maintenance	
OCC	Operations Control Centre	
OCMLT	Office of the Commission for the Management of Land Traffic	Thailand
ODA	Official Development Aid	
OTP	Office of Transport and Traffic Policy and Planning	Thailand
PDMO	Public Debt Management Office of Ministry of Finance	Thailand
PGS	Parking Guide System	
P/L	Profit and Loss Statement	
PPP	Public Private Partnership	
PSC	Public Sector Comparator	
PSO	Public Service Obligation	Thailand
PTC	Public Transport Council	Singapore
PUTRA	Projek Usahasama Transit Ringan Automatik	Malaysia
RAfid	Radio Frequency Identification	
RapidKL	Rangkaian Pengangkutan Integrasi Deras Sdn Bhd	Malaysia
ROE	Return on Equity	
SARL	Suvarnabhumi Airport Rail Link	Thailand
SOE	State-Owned Enterprise	
SEPO	State Enterprise Policy Office, Ministry of Finance	Thailand
SMRT	SMRT Corporation	Singapore
SPAD	Signal Passing Accident Danger	
SPNB	Syarikat Prasarana Negara Berhad	Malaysia
SRT	State Railways of Thailand	Thailand
STAR	Sistem Transit Aliran Ringan Sdn Bhd	Malaysia
TA	Technical Assistance	
TfL	Transport for London	U.K.
TOD	Transit Oriented Development	
TOR	Terms of Reference	
URMAP	Urban Rail Master Plan	Thailand
VfM	Value for Money	



## **CHAPTER 1 INTRODUCTION**

### **1.1 Background of the Study**

Bangkok metropolitan area has the registered population of 6.7 million and the daytime population reaches over 11 million, about 18% of the entire population in the country. Bangkok is the political and economic center of Thailand as it accounts for about 50% of national GDP. In Bangkok, currently more than 90% of transportation depends on road transport and there has been a rapid increase in the number of motor vehicles. Despite the development of road-related infrastructures in the last three decades, serious traffic congestion has remained as a bottleneck of physical distribution and logistics within the city.

To address this problem, the Cabinet approved a plan of mass rapid transit (MRT) Projects in Bangkok in November, 2006. The plan identified 5 priority lines of a total length of 118km. At present, there are two mass transit lines in operation and one under construction in Bangkok. The Green Line from Mo Chit to On Nut (16.4 km) and from National Stadium to Saphan Taksin (6.5 km) opened in 1999, the Blue Line from Bang Sue to Hua Lamphong (19.7 km) opened in 2004 and the Airport Rail Link (ARL) from Suvarnabhumi International Airport to Makkasan and Phaya Thai Area (28.5km) is expected to complete in the third quarter of 2009. The existing lines currently serve in total of more than 500,000 passengers a day. MRT projects have been one of the top priorities of the Government in terms of mitigating the traffic related problems as well as stimulating the national economy.

In general, MRT project requires relatively large capital investment and long-term construction period, leaving a significant financial burden to project owners. In this connection, public private partnership (PPP) scheme has been considered to achieve an effective mobilization of public and private capitals. The PPP scheme was adopted for the existing Green Line and the Blue Line, but the experiences shows that there is still a large room for improvement in PPP scheme for MRT projects. More knowledge and experiences should be accumulated for sound financial framework of MRT projects. Since Japanese ODA loan will be a strong potential financial source for future MRT projects in Thailand, it is useful to study various financial framework of MRT project in the light of utilizing Japanese ODA loan.

### **1.2 Objectives of the Study**

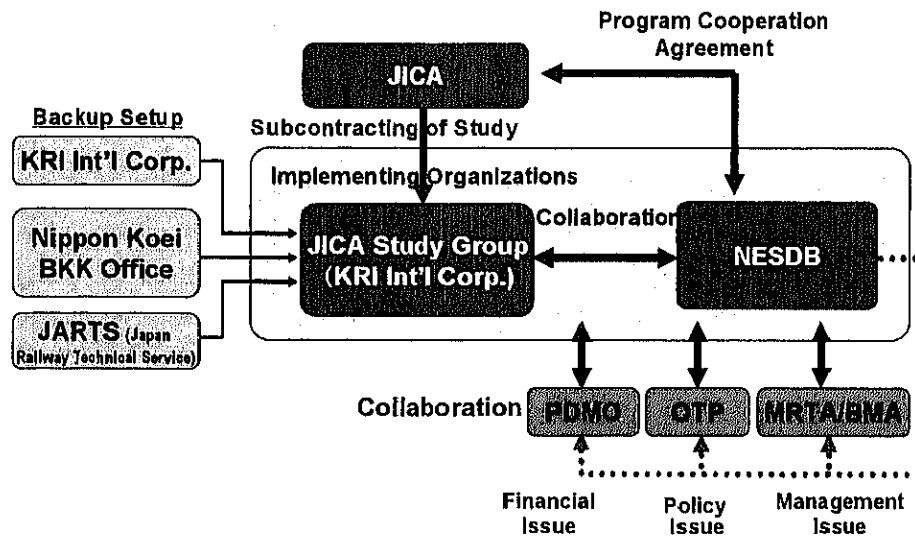
Based on the above mentioned background, the objectives of the Study were set as follows:

- a) To review various financial frameworks of MRT project, in the forms of PPP scheme and operation-by-state scheme, and to identify advantages and disadvantages of these financial frameworks from the viewpoints of financial burden and how to realize efficient, effective and sustainable construction & operation of MRT projects in Thailand; and
- b) In particular, to clarify advantages and disadvantages of each financial framework for new MRT projects in Thailand using potential Japanese ODA loan as a case study and to provide useful information for the consideration of MRT projects (including PPP scheme) financed by Japanese ODA loan.

## 1.3 Study Framework

### 1.3.1 Executing Agency

The counterpart agency to the Study is the National Economic and Social Development Board (NESDB). NESDB makes necessary coordination with related organizations, the Public Debt Management Office (PDMO) in the Ministry of Finance, the Office of Transport and Traffic Policy and Planning (OTP) in the Ministry of Transportation, MRTA Mass Rapid Transit Authority of Thailand (MRTA), and Bangkok Metropolitan Administration (BMA), for the implementation of the Study.



Source: Study Team

Figure 1.3-1: Study Implementation Structure

### 1.3.2 Study Area

The Study has been conducted in Bangkok, Thailand.

## 1.4 Scope of Study

### 1.4.1 Original Implementation Methods

To achieve the objectives, following 12 work modules were designed and proposed in the Inception Report (ICR) at the start of the Study.

- Module A: Reviewing a financial framework for urban railway systems in other countries
- Module B: Reviewing performance of existing urban railway systems in other countries
- Module C: Differentiation and comparison of the proposed project implementation frameworks
- Module D: Financial analysis of existing yen loan financed urban railway project
- Module E: Comparative analysis of implementation framework of the MRT project
- Module F: Analyzing other issues on PPP in MRT project



Module G: Detail analysis of financial framework of the existing urban railway systems in Bangkok

Module H: Survey of service performance of existing MRT projects in Bangkok

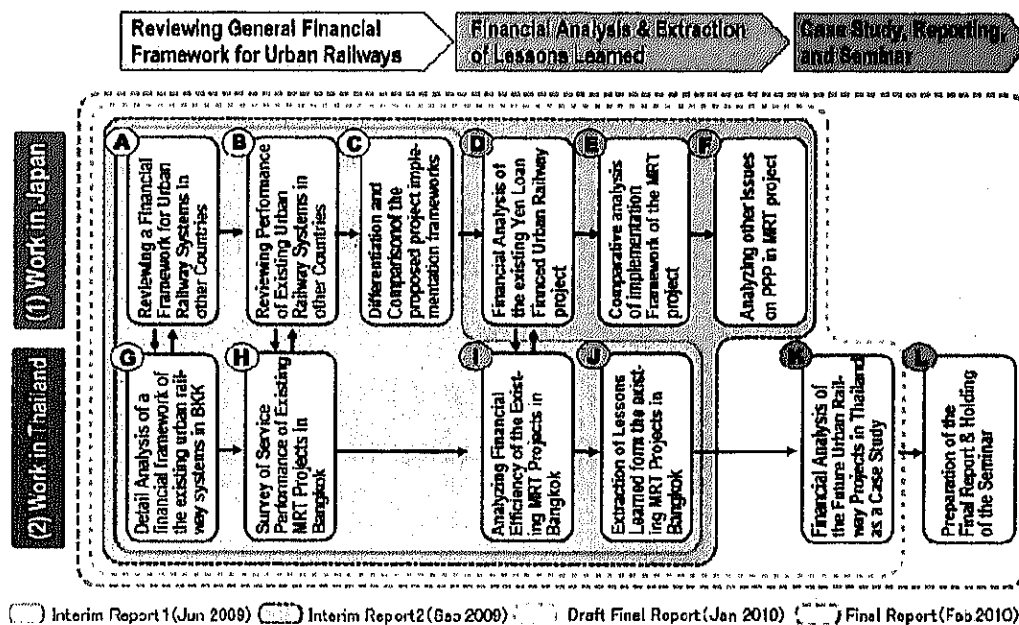
Module I: Analyzing financial efficiency of the existing MRT projects in Bangkok

Module J: Extraction of lessons learned from existing MRT projects in Bangkok

Module K: Financial analysis of the future urban railway projects in Thailand as a case study

Module L: Preparation of the final report and holding of seminar

Modules A~F were designed for study activities in Japan and modules G~L were designed for study activities in Bangkok.



Source: Study Team

Figure 1.4-1: Original Study Flow and Activity Modules from ICR

### 1.4.2 Revised Implementation Methods

The Study Team visited Bangkok in May 2009 to discuss current issues of financial framework of MRT projects. Based on discussions with stakeholders such as NESDB, OTP, PDMO, MRTA, BMA, BMCL, BTS, SRT and private financial institutions, it became quite apparent that issues of project implementation scheme of MRT are far broader than financial framework. More specifically, the following three-tiered issue structure was identified.

Tier1: Issues regarding mass transit sector, including sector vision, governance, law and regulation

Tier2: Issues regarding integrated MRT masterplan, including integration with city planning, integration with multi-modal transport planning and network integration

Tier3: Issues regarding each MRT line, which is about each line's implementation scheme

The Study Team places governance and legal issues of MRT project in Tier 1 because these issues

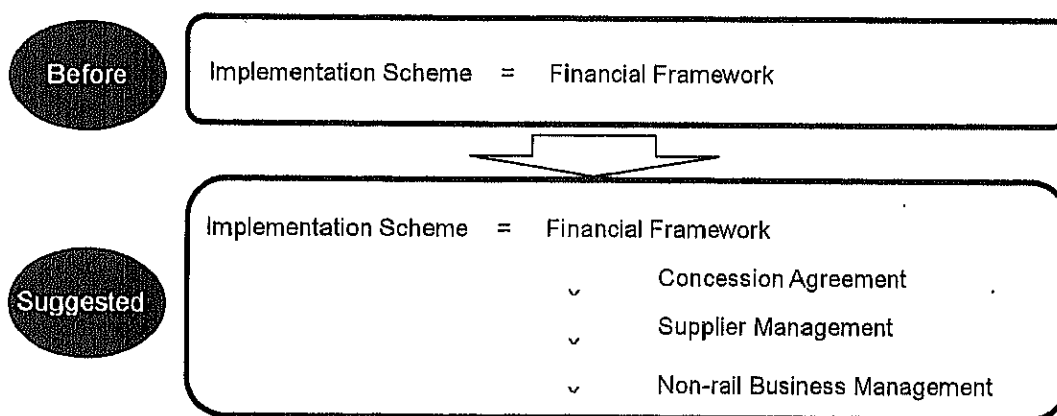
concern all MRT projects. Issues regarding linkage with city planning and urban transportation planning, which are mentioned in “other related issues” in the original scope, compose Tier 2 because these issues are important in integrating all MRT lines. Such issues as concession management, suppliers management and non-rail business, in addition to financial framework, consist of Tier 3. The Study Team considers that success of each line (Tier 3) is dependent on how mass transit sector is governed and developed as a sector (Tier1) and overall network planning (Tier2).

	Key Issues	Category
<b>Tier 1</b> Mass Transit Sector <hr/> <b>Tier 2</b> Integrated MRT Master Plan <hr/> <b>Tier 3</b> Each MRT Line Implementation	<ul style="list-style-type: none"> <li>• Policy &amp; Planning, Regulator, Contract Agency, Operator are not clearly separate</li> </ul>	<ul style="list-style-type: none"> <li>• Sector Vision</li> <li>• Governance</li> <li>• Law and Regulation</li> </ul>
	<ul style="list-style-type: none"> <li>• MRT specific regulation still limited</li> <li>• Too much political intervention</li> <li>• Ridership risk too high for private due to network schedule delays</li> <li>• Lack of system compatibility planning may jeopardize cost efficiency and user convenience (e.g. AFC system, Signaling system)</li> </ul>	<ul style="list-style-type: none"> <li>• Integrated Bangkok City TOD Plan</li> <li>• Integrated Multi-modal Plan</li> <li>• MRT Network Integration</li> </ul>
	<ul style="list-style-type: none"> <li>• Clarifying merits and demerits of financial framework (e.g. net vs gross, gov't vs private)</li> <li>• Tender process did not sufficiently address network private skill requirements (e.g. private consortium experience)</li> <li>• Lack of contract depth and flexibility (e.g. no revision clause, lack KPI details, limited cost breakdown)</li> <li>• Unclear guidelines on supplier requirements (e.g. line extension consideration, information disclosure)</li> <li>• Revenue stream from non-rail still limited</li> </ul>	<ul style="list-style-type: none"> <li>• Financial Framework</li> <li>• Concession Agreement</li> <li>• Supplier Management</li> <li>• Non-rail Business Management</li> </ul>

Source: Study Team

Figure 1.4-2: Three-tiered Issue Structure of MRT in Thailand

In addition, even within Tier3, the following redefinition of implementation scheme was proposed.



Source: Study Team

Figure 1.4-3: Redefinition of Implementation Scheme (Tier3)

It is important to note that, under the new definition, financial framework is positioned as one element of the implementation scheme. In other words, changes in financial framework will not

ensure success unless concession agreement, supplier management and non-rail business management are packaged together as one scheme.

These key findings were shared with Thai MRT stakeholders during the visit in May 2009, which further led to suggestions on refinement of study scope. Thereafter, the study team agreed with JICA to refine the study scope which is summarized as follows:

ICR Scope		Refined Scope	
Module A	- Reviewing a financial framework for urban railway systems in other countries	▶	Same (covered in ITR1)
Module B	- Reviewing performance of existing urban railway systems in other countries	▶	Same (covered in ITR1 and ITR2)
Module C	- Differentiation and comparison of the proposed project implementation frameworks (scheme)	▶	- Financial framework patterns will follow MAS study patterns. Cannot generalize quantified differentiation. NPV gap and gap-fill target sensitivities will be quantified. (covered in ITR1)
Module D	- Financial analysis of existing yen loan financed urban railway project	▶	- Financial analysis of planned Purple Line (covered in ITR1)
Module E	- Comparative analysis of implementation framework of the MRT project	▶	- Advantages and disadvantages of various implementation scheme patterns will be synthesized based on redefinition( not only financial framework but also concession agreement, supplier management and non-rail business management) (covered in ITR2 and final report)
Module F	- Analyzing other issues on PPP in MRT project	▶	- Tier1 (mass transit sector governance, laws and regulation), Tier2 (Integrated MRT masterplan) related case analysis will be the focus (covered in ITR2)
Module G	- Detail analysis of financial framework of existing urban railway systems in BKK	▶	- Current issues will be analyzed for Tier1, Tier2, Tier3 issues and not just on financial framework
Module H	- Survey of service performance of existing MRT projects in BKK	▶	- Same (covered in ITR1 and ITR2)
Module I	- Analyzing financial efficiency of existing MRT projects in BKK	▶	- Same (covered in ITR1 and ITR2)
Module J	- Extraction of lessons learned from existing MRT projects in BKK	▶	- Lessons will be drawn from Tier1, Tier2, Tier3 issues (to be covered in final report)
Module K	- Financial analysis of future urban railway projects in Thailand as a case study	▶	- Refined method of MAS study will be used to conduct simulation of future line (to be covered in final report)
Module L	- Preparation of final report and holding of seminar	▶	- Same (to be completed in March2010)

Source: Study Team

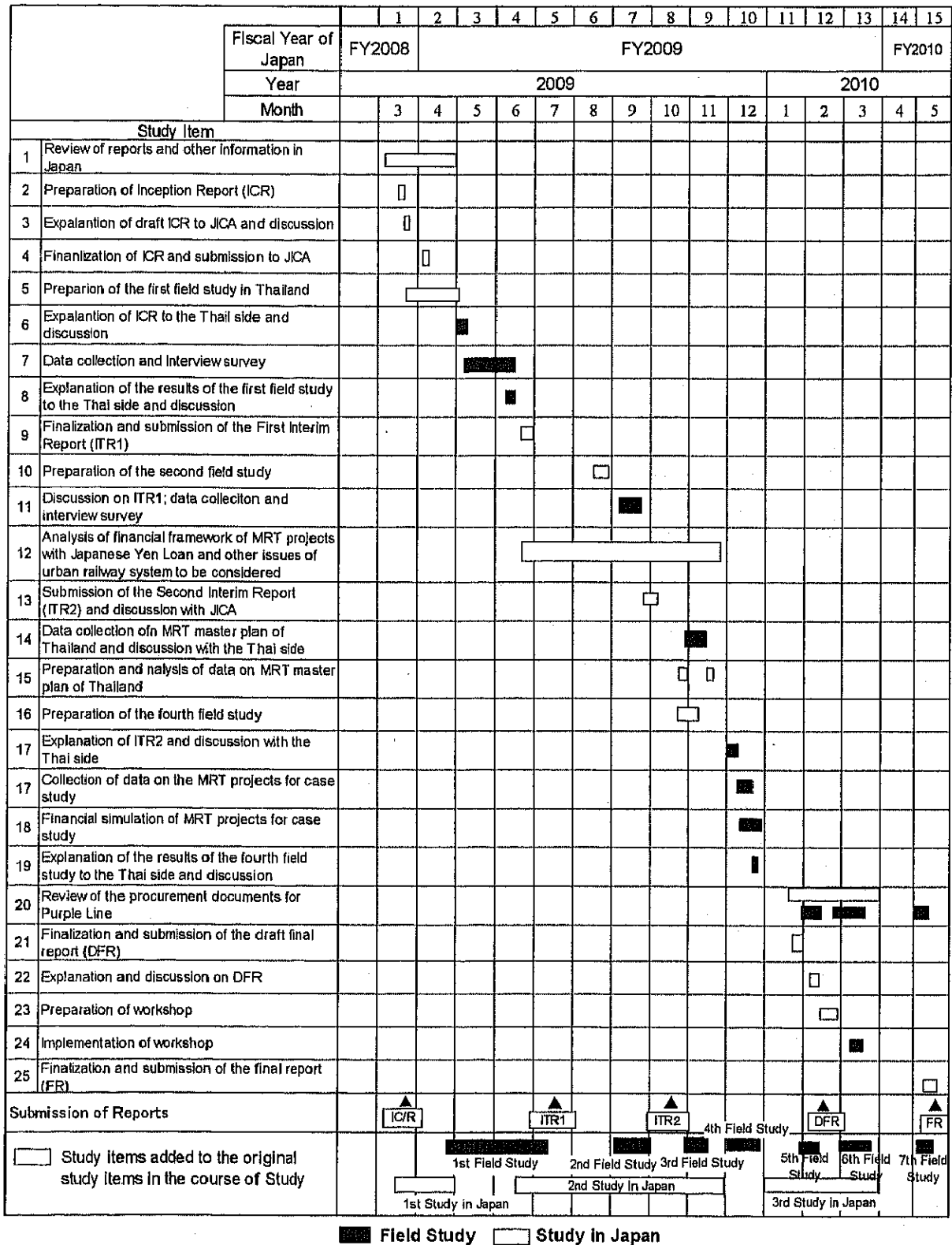
Figure 1.4-4: Comparison of Activity Modules

Based on these changes, the study team developed and communicated the interim report in September 2009. During this second visit, additional topics regarding the details of MRT master plan and Purple Line tender preparation were raised by stakeholders. As a result, together with JICA's request, two study items were added to the original terms of reference (TOR) for the Study. They are:

- Collection of data & information on MRT master plan in Thailand and analysis of issues of MRT master plan (added in October, 2009)
- Review of tender documents for the Purple Line (added in January, 2010)

### 1.5 Study Schedule

The study is implemented according to the following time schedule:



Source: Study Team

Figure 1.5-1: Schedule of the Study

## 1.6 Member of Study Team

The Study Team consists of the following members:

Name	Assignment
Makoto SUNAGAWA	Team Leader/ PPP (1)
Kazuo MISHIMA	Sub-Team Leader/ Financial Analysis (1)
Atsushi HASHIMOTO	PPP (2)
Makoto OZAWA	MRT Management
Takeshi YAMASHITA	Financial Analysis (2)
Tetsuro AIKAWA	MRT Planning
Futoshi MITSUHATA	Urban Planning





## **CHAPTER 2 REVIEW OF URBAN RAILWAY SYSTEMS IN THAILAND**

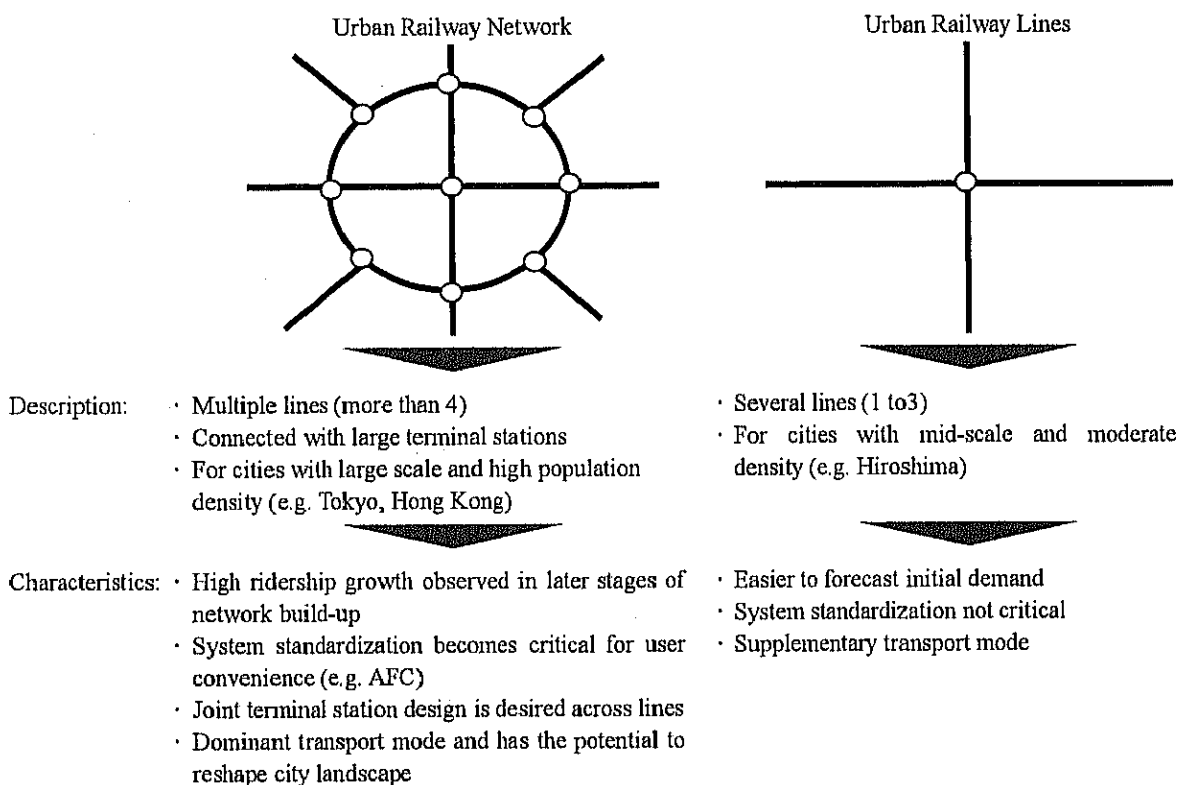
### **2.1 Basic Characteristics of Urban Railway Development**

For this study activity, the Study Team was mindful of the need to tailor our analysis and recommendations to meet the unique characteristics of “Urban Railway Development”, “Thailand” and “PPP”. Therefore, in this chapter, the Study Team explained these characteristics to establish a common view on the underlying thinking behind research analysis and recommendations. The business characteristics of urban railway development in general are explained in 2.1.1 and how Thailand’s attempt to build urban railway infrastructure is unique and different from other countries is described in 2.1.2. Lastly, in 2.1.3, the unique characteristics of PPP application in urban railway development are described.

#### **2.1.1 Business Characteristics of Urban Railway Development**

Characteristics of urban railway development will be significantly different depending on the scale and density of the city. As described in Figure 2.1.1, cities with large scale and population density will likely choose to build up an “urban railway network”, consisting of multiple lines (typically more than 4 lines) that are inter-connected at several large terminal stations. Bangkok is clearly in this league. For cities planning to build this type of network, the following characteristics are notably important:

- Ridership forecast for line nodes in early stages of network building will be quite a difficult task. This is because the schedules of other network node build-up will significantly affect ridership. In other words, each line node’s ridership is heavily dependent on other line node’s ridership. An inter-linked network characteristics.
- System standardization will become key to success. Take AFC system as an example. Users will want one card. That is the prevailing mode for successful network. Simple but difficult to implement if each line node is implemented by different entities. Government (or the contracting agency) will need to lead and drive the standardization effort.
- Terminal station will need to be large, accommodating multi-modal transport. Convenient access across MRT lines, LRT lines, feeder bus and other transport will need to be embedded into the station design. Also, this terminal station has the potential to become the destination for commercial complex, with station building skyscrapers including hotels, office space, department stores, residential condominium, etc.
- City planning could be re-shaped according to plans for urban railway network. City sub-centre functions could be designed around multiple terminal stations and residential districts could be developed along railway extension alignment.



Source: JICA Study Team

**Figure 2.1-1: Comparison of Urban Railway Characteristics**

On the other hand, cities of mid-scale and moderate density will most likely develop only several urban railway lines (1 to 3). In this case, above network characteristics will not need to be taken into considerations. Perhaps, cities outside Bangkok would fall under this league.

In addition to characteristics described by city types, the following financial characteristics are also important to take into consideration:

- Capital intensive industry: Upfront cash flow investment for civil and M&E systems with positive cash flow to be gained only several years after operation. Ramp-up speed of ridership can be slow, especially in the early stages of network build-up. Therefore, government needs to design how to financially support the operating company especially in the early stages.
- Operational efficiency cost difference is not significant once the infrastructure is installed. This is because labor requirements are not large and relatively fixed regardless of the operator. Also, the electricity cost is not controllable.
- Maintenance cost requires lifecycle point of view. Cheap equipment could lead to large maintenance costs later on. Government needs to decide M&E systems with this in mind.
- Successful urban railway operations are typically supported by non-rail revenue source. Without sufficient non-rail revenue, it is typically difficult to justify financial sustainability just from ridership revenues.

## 2.1.2 Characteristics of Urban Railway Development in Thailand

As described above, Urban Railway system in Bangkok definitely belongs to Urban Railway Network because of its size and population density. In this connection, JICA study team observed following characteristics of Bangkok.

i) Sharp population increase and strong demand for mass transit system

Population in Bangkok and vicinities has grown sharply in the last two decade, from 8.6 million in 1990 and 12.0 million in 2008 resulting in heavy density. Naturally, road congestion has become serious giving adverse affects in various aspects particularly in environment. The government has put the highest priority on the construction of mass transit system.

ii) Tight Budget

Despite putting its highest priority on the development of urban transport, the Government faces budget constraints. The capital expenditure of the budget has been planned basically by domestic revenue supplemented by donors' assistance. This is not sufficient to fulfill the capital expenditure requirements. Therefore, the government decided to adopt PPP system in its financial framework to secure additional financing capacity from private sector.

iii) Three public agencies joined mass transit system

In Bangkok, three public agencies have joined in its Urban Railway development, namely Bangkok City(BMA), National Railway(SRT) and newly organized MRTA. These three agencies have developed and planned different MRT lines separately with limited coordination. This has led to issues of network integration (e.g, no common ticketing), which will be described in Chapter 3.

iv) Heavy dependence on foreign suppliers

Except portions of civil work, concerned technology needed in developing MRT systems were not available in Thailand. Therefore, it was necessary to depend on foreign suppliers.. However, after more than ten years, there is still an over-dependence on foreign suppliers. This is due to lack of effective technical transfer, information disclosure and intent.

v) Lack of integration with city planning

Urban railway is to be built for the citizens and for city development. It is found out, however, that serious consideration has not been paid to ensure integration with city planning.

## 2.1.3 Characteristics of PPP, particularly in Thailand

PPP, which was originated in the form of PFI in late 80's in UK, has been popularized in infrastructure construction in the last two decades over the world. In Asia, it became familiar since mid 90's. In this section, characteristics of PPP will be reviewed, especially with regards to Bangkok urban transport system.

**1) A country which suffers budget deficit tends to adopt PPP for its infrastructure development**

The main objective to adopt PPP in infrastructure construction is to get a part of necessary capital in the investment from private sector and also to induce management skill in its operation. The concept of VfM is also often adopted as a justification to use PPP system for the specific sector investment. The most important characteristic is to clarify roles and duties necessary for the operation of a concerned project in the form of the agreement among public and private at equal partnership basis. While PPP has become familiar in developing countries, in terms of infrastructure development, real success cases are fewer than expected.

**2) Government Support and Legal Framework is quite important**

To succeed in the PPP project, government policy and legal framework to support PPP are quite important. In this connection, it is also essential to set up independent regulatory body. In Thailand these are generally insufficient.

**3) Sector-wide observation**

Among infrastructures, the familiar sectors with PPP are, firstly telecommunication, secondly power, and thirdly road, water and others depending on the countries. But it is difficult to find urban railway in the higher rankings. Reasons for this, together with overseas failure and success cases, will be described in Chapter5.

**4) Vertical separation method is utilized in PPP projects under ODA loan.**

ODA loan provision is limited legally to only Government of the recipient country; therefore it will be provided for a specified construction portion to which the government is responsible, e.g. civil works of MRT construction, while private sector will finance M&E system portion..

## **2.2 Legal Framework and Government Policy Concerning MRT Projects in Thailand**

### **2.2.1 Legal Framework of Government Agencies Related to MRT System**

**(1) Government Agencies Related to MRT System**

The following government agencies and state enterprises are related to policies and projects of urban railway system in Thailand.

The Office of Transport and Traffic Policy and Planning (OTP) under the Ministry of Transportation is responsible for formulating transport and traffic plans and working out transport safety measures along with the national transport and traffic policy. OTP submits its opinions to the National Transport Policy Board on the formulation and amendment of the law on the national land transport and legislation for transport and traffic management.

The Commission for the Management of Land Traffic (CMLT), which consists of key Ministers and the Governor of Bangkok as members and OTP as secretariat, provides advises



and makes plans for integrated transportation system. CMLT was an independent office in MOT, but it was transferred under OTP.

The Mass Rapid Transit Authority of Thailand (MRTA) is a state enterprise which oversees MRT projects. MRTA used to be under the Prime Minister's Office, but was recently transferred to MOT. According to the Mass Rapid Transit Authority of Thailand Act B.E. 2543 (2000) (MRTA Act), MRTA is authorized to operate Mass Rapid Transit Systems within the Greater Bangkok Area and other provinces, or between the provinces and to run business related to the MRT enterprise<sup>1</sup>. MRTA granted a concession of the first MRT line in Bangkok, Blue Line, to the Bangkok Metro Public Company Limited (BMCL). MRTA holds a 20% share of BMCL.

The Bangkok Metropolitan Administration (BMA) is the local city government of Bangkok Province. BMA granted a concession of the Bangkok Mass Transit System to the Bangkok Mass Transit System Public Company Limited (BTSC).

The National Economic and Social Development Board (NESDB), under the Office of Prime Minister, is responsible for formulating a five-year development plan, formulating policies and strategies for key development issues, analyzing budget proposals from state enterprises and related agencies, etc. As for a PPP project involving new assets, a feasibility study report should be submitted to NESDB.

The Public Debt Management Office (PDMO), under the Ministry of Finance, is responsible for general affairs of public debt management policy and supervision.

The State Railway of Thailand (SRT) is a state enterprise operating the national railway network under the Ministry of Transportation.

In 2006, the MRT committee was established by the Ministry of Transportation to oversee construction works of MRT lines and to confirm the form of MRT operating concessions and how they would be financed. Under this committee, a subcommittee focusing on finance and operations of MRT lines, which was chaired by PDMO, was also established to integrate and standardize the approaches of the three government agencies responsible for MRT concessioning, i.e., MRTA, SRT and BMA. The Policy and Management Committee for MRT in the Bangkok Metropolitan Region was established in July 2007. This is a high-level policy committee chaired by the Prime Minister and includes such members as Minister of Finance, Minister of Transport, Governor of BMA, Secretary General of NESDB, Secretary General of State Council, and so on<sup>2</sup>.

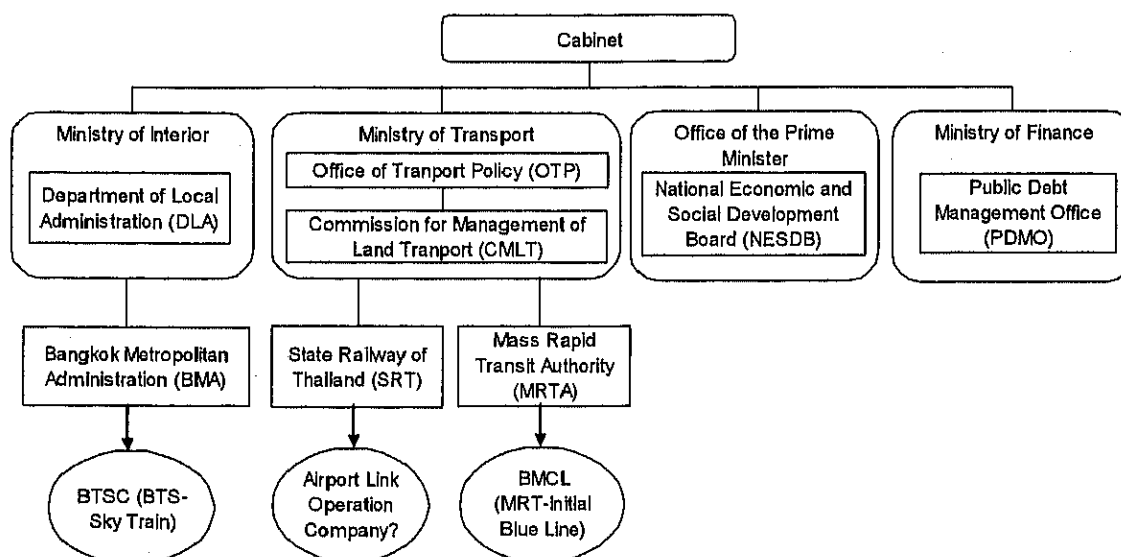
BMA, MRTA, and SRT are public agencies responsible for managements of BTSC (SkyTrain), MRT, Airport Link, and Red Line respectively.

Organization chart of the governmental agencies related to MRT System is as shown in the following figure.

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<sup>1</sup> Home page of MRTA ([http://www.mrta.co.th/eng/about\\_mrta.htm](http://www.mrta.co.th/eng/about_mrta.htm)).

<sup>2</sup> P. Sayeg, D. Bray, G. Ellis, S. Manibhandu, and H. Na Pombajra, "Project Number: 40138 Thailand: Infrastructure Investment Advisory Assistance (Phase II)," Asian Development Bank, July 2007.



Source: JICA Study Team

Figure 2.2-1: Governmental Agencies Related to MRT System in Thailand

(2) Laws and Regulations Regarding Thai Railway Sector

SRT has 150 years’ history and was legally established according to SRT Act B.E. 2494 (1951). Prior to SRT Act, Railway and Highway Act B.E. 2464 (1921) was issued. These laws are legal bases to construct and operate the railway in Thailand.

MRTA was established on the basis of MRTA Act in 2000. This Act consists of 93 sections of 8 chapters. Following the definition of the terms in the Act, Chapter I and II stipulate the organizational arrangement: capital, board of directors. Chapter III lays down how MRTA constructs, operates and maintains MRT System. Chapter IV stipulates that MRTA can grant its right to the private sector in the form of concession. Chapter V lays down passengers’ responsibility and MRTA’s responsibility to the passengers. Chapters from VI to VIII set down organizational matters such as financing and auditing, supervision, and penalties.

(3) Responsibilities of Public Agencies

The responsibilities of public agencies for MRT development range from the planning stage to the operation stage. The responsible public agencies by stage are shown in the following table. MRTA regulates most of matters in the downstream including concession agreements with the private sector. In the case of BTSC-Sky Train, BMA plays the same role as MRTA.

Table 2.2-1: Tasks and Responsible Public Agencies

Subject	Task	Responsible Public Agency
(a) Inter-modal Master Plan	Transportation network of multi-modal: bus, car, and MRT System	- OTP
(b) MRT System Master Plan	Network development plan of MRT System; prioritization of implementation	- OTP
(c) Implementation Framework	Application for PPP Act, internal and external borrowing	- NESDB, PDMO, BMA*
(d) Design	Design works, bidding procedure, evaluation	- MRTA (Blue Line & Purple Line) - BMA (BTSC) - SRT (Airport Rail Link & Red Line)

Subject	Task	Responsible Public Agency
(e) Procurement	- Land acquisition	- MRTA (Blue Line & Purple Line) - BMA (BTSC) - SRT (Airport Rail Link & Red Line)
	- Civil construction	- MRTA (Blue Line & Purple Line) - SRT (Airport Rail Link & Red Line)
	- Electrical & mechanical works - Rolling stock	- SRT (Airport Rail Link & Red Line)
	- Operator	- MRTA (Blue Line & Purple Line) - BMA (BTSC) - SRT (Airport Rail Link & Red Line)
(f) Operation & Maintenance	- Establishment of operation company - Operation rules - Operation plan - Safety standard - Maintenance routine	- SRT (Airport Rail Link & Red Line)
(g) Fare	- Fare structure	- MRTA (Blue Line & Purple Line) through the concession agreement with operator - BMA (BTSC) through the concession agreement with operator - SRT (Airport Rail Link & Red Line)

Note: \* BMA had decided implementation framework for BTSC, before MRTA Act was established.

Source: JICA Study Team

## 2.2.2 Legal Framework for PPP Projects

### (1) Thai PPP Act

The Act on Private Participation in State Undertaking B.E. 2535 (1992) (PPP Act) is the legal basis to utilize private investment, financing, operation and management know-how to implement the project that would be undertaken by the Government. The PPP Act consists of 25 sections (articles) in 5 chapters. The important chapters are: Chapter 2, 3 and 4 which stipulate the submission of the project, project Implementation, and project monitoring.

### (2) Procedures of PPP Project According to the PPP Act

The Act on Private Participation in State Undertaking B.E. 2535 (1992), or PPP Act, stipulates the framework and government procedures of PPP projects of which the funds or assets are 1 billion baht or more (Section 5 of the Act). According to the PPP Act, the procedures of PPP project are as follows:

#### a. Approval of Project

A government agency which desires to implement a PPP project should submit a detailed result of study and project analysis to the responsible ministry. When a project fund or assets exceeds 5 billion baht, the agency should hire a consultant to prepare a separate report. The responsible ministry submits the result of study and project analysis to the Office of the National Economic and Social Development Board for consideration for new projects and to the Ministry of Finance for projects with existing assets (Section 8 of the Act).

If the Office of the National Economic and Social Development Board or the Ministry of Finance agrees with the project, the project is submitted to the Council of Ministers for approval in principle

The Office of NESDB or the Ministry of Finance should finish the consideration of the project within 60 days as from the date of its receipt. If such period expires, the Office of NESDB and the Ministry of Finance shall be deemed to agree with the project.

If the Office of the NESDB or Ministry of Finance disagrees with the project, the project agency shall submit the opinion or additional explanations through the responsible minister to the Council of Ministers for decision.

b. Implementation of Project

After the Council of Ministers has already approved any project, the project agency prepare an invitation for private participation and the project scope and essential terms and conditions to be included in an agreement for private participation.

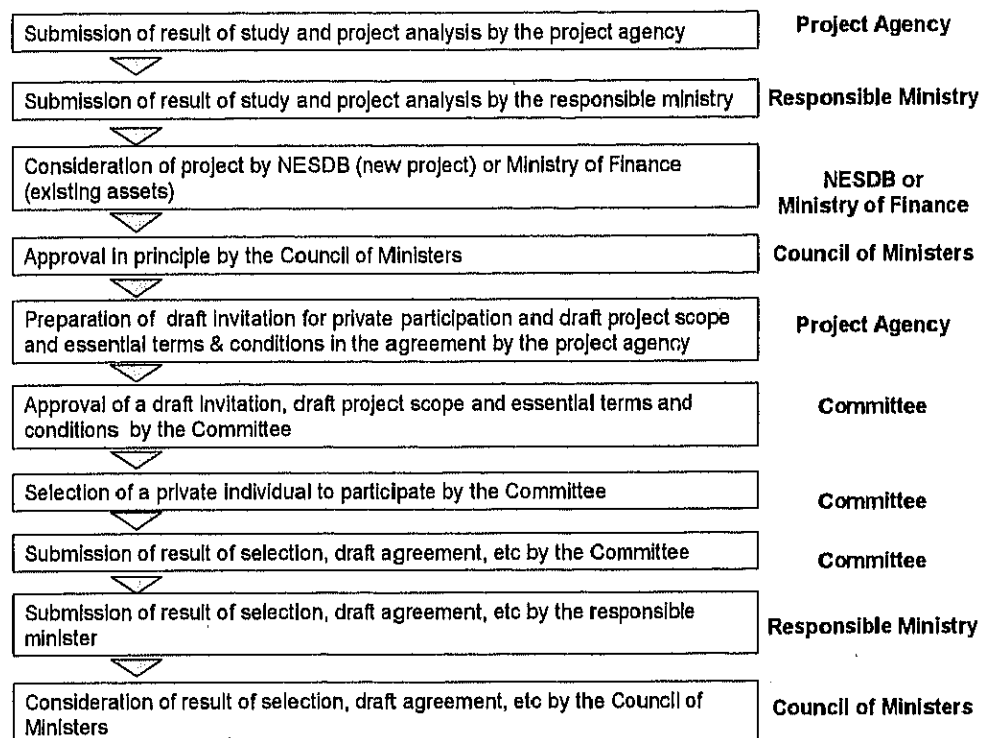
The project agency appoints a Committee consisting of representative of the responsible ministry (representative from state enterprise, state agency or local administration office) as a Chairman, representative of the Ministry of Finance, representative of the Office of the Attorney-General, representative of the Office of NESDB, representative of the Bureau of the Budget, a representative each other two Ministries, and not more than three qualified persons as members. A representative of the project agency shall be a member and secretary.

The Committee have the powers and duties to i) give approval for a draft invitation for private participation, draft project scope and essential terms and conditions to be included in the agreement for the private participation, ii) determine the bid security and performance security, iii) select a private individual to participate, etc.

The decision of the meeting on the selection of proposals and the bargaining negotiation should be made by the votes of not less than two-thirds of the number of the members present (at least three-fourth of the total members). The Office of the Attorney-General examines the draft agreement for private participation before signing.

The Committee submits the result of selection together with the justification, the issues negotiated and bargained on the interest of the State, draft agreement and all other documents through the Responsible Minister to the Council of Ministers for consideration within 90 days after the decision.

If the Council of Ministers disagrees with the result, the matters should be returned to the Committee for revision, and the result of revision is submitted to the Council of Ministers for final decision.



Source: Compiled by Study Team based on the PPP Act.

Figure 2.2-2: Flow of PPP Project Approval

## 2.2.3 Situation of MRT Plan, Other Public Transport Plan and Related City Plan

### (1) Current Situation of Urban Railway in the Bangkok Metropolitan Region

Since the 1970s, the Thai government and Bangkok Metropolitan Administration (BMA) made and promoted a plan of developing MRT lines in the Bangkok Metropolitan area with the purpose of solving the traffic congestion and environmental issues in this area.

Two urban rail lines are currently operating and one urban rail line is to be open in 2010. The first urban rail line in Bangkok, Bangkok Transit System (BTS), which is also called as the SkyTrain or the initial Green Line, was officially opened in December 1999. The BTSC was wholly privately financed. The Bangkok Transit System Corporation (BTSC) operates the Sky Train under a concession agreement with the Bangkok Metropolitan Administration (BMA). The second MRT line, the Blue Line, was opened in August 2004. The Blue line was financed jointly by the public sector and the private sector. The national government funded the civil works and a private consortium, the Bangkok Metro Company Ltd (BMCL), provided electrical & mechanical equipment (E & M) and rolling stock. BMCL operates the line under the concession agreement with the Mass Rapid Transit Authority (MRTA)<sup>3</sup>. The Suvarnabhumi Airport Rail Link (ARL) linking from the Suvarnabhumi Airport to urban area of Bangkok, which is to be owned and operated by the State Railway of Thailand (SRT), is planned to start operation in 2009.

<sup>3</sup> NESDB, World Bank, "Thailand Infrastructure Annual Report 2008," 2008

## **(2) History of Development of Urban Railway Master Plan for the Bangkok Metropolitan Region**

The first urban railway master plan for Bangkok Metropolitan Region (BMR), "Conceptual Mass Rapid Transit Implementation Master Plan Project (CMIP)", was formulated by OCMLT in 1996

CMIP and "Additional Feeder Routes Plans under the Mass Transit Feeder System Study" were integrated under the Urban Rail Transportation Master Plan (URMAP 1) by OCMLT in 2001. URMAP 1 plan provided a framework for subsequent planning and engineering studies and implementation of individual projects and programs. URMAP 1 sought to make best use of existing rail lines and facilities as part of an optimum urban railway system for BMR.

In September, 2004, OTP formulated the succeeding master plan "URAMP 2" based on URMAP 1, and then, the Government approved this new master plan. After the refinement works, Cabinet approved a revised master plan in June, 2005. The plan aimed to develop 7 lines, namely the extension of BTSC Skytrain and blue line, and new development of the dark green, red north-south, red east-west (Airport Rail Link), orange and purple lines, with total length of 277 km by 2012. Out of 277 km, 138 km of line was expected to be developed by SRT, 94 km by MRTA, and 45 km by BMA. The total estimated cost envisaged under URMAP 2 was 556 billion baht (equivalent to US\$ 14 billion). While investment cost for civil work was supposed to be wholly financed by the government, investment cost for E&M and rolling stock was planned to be jointly financed by the government and private concessionaires. At the time, private concessionaires to operate these lines were not specified yet.

Under the plan, high priority was given to upgrading of the rail link connecting central Bangkok and the newly developed Suvarnabhumi Airport located in Bangkok's eastern suburbs (Airport Rail Link: 28.0 km) as well as the existing Don Muang International Airport located in city's northern suburbs (Red Line: 21.0 km). In addition, the completion of ring-shaped blue line in central Bangkok, and the extension to the North-west (Purple Line) and South-west (Red Line) were expected to form the backbone of the MRT network in BMR.

Currently, OTP has prepared the latest master plan following URMAP 2, which is called M-MAP (mass transit master plan).

Table 2.2-2: Current Situation of Urban Railway System Development Plan in Bangkok

Project owner	Lines	Specifications		Operator	Availability of FS	Status			
		Mode	Gauge etc			Finance/ cabinet approval	Construction works		
Red	Airport link	MRT	1435mm, catenaries	Subsidiary company of SRT	Yes		Soon opening		
	West				Yes	Govt. approved Finance fixed	Contractors selected for civil works		
		North	MRT, Intercity trains	1000mm, catenaries	Subsidiary company of SRT	Yes	Govt. approved, Japanese ODA fixed for all assets	Not yet	
		Missing Link				Preliminary design completed	Not yet	Not yet	
	East				Not yet	Not yet	Not yet		
BMA	Green	MRT	1435mm, third rail	BTSC	Yes	Private finance	Opened		
					Yes(Thai version)	Govt. approved	Partially opened, the rest under construction		
					Not fixed	Govt. approved	Not yet		
BMA/MRTA	Dark Green 1				?	Not yet	Not yet		
	Dark Green 2					Not yet	Not yet		
	Blue	MRT	1435mm, third rail	BMCL	Yes	Infra, ODA, E & M, PPP	Opened		
		Extension		Not fixed	Yes	Cabinet approved on civil works	Not yet		
	Purple	North		MRT	Not fixed	Yes	Cabinet approved ODA loan fixed for civil works	Contractors selected for some civil works	
					Not fixed	Not yet	Not yet		
	Orange	Brown		MRT	Depot for Orange Line common with that for Blue	Not fixed	Yes	Not yet	Not yet
					Not fixed	Soon FS Completed	Not yet	Not yet	
Pink	Violet feeder Extension	Monorail	Not fixed	Not fixed	Soon FS Completed	Not yet	Not yet		
			Not fixed	Not fixed	Not yet	Not yet			
Yellow	Dark section Light	MRT(LRT)	1435mm, catenaries	Not fixed	Soon FS	Not yet	Not yet		
				Not fixed	Completed	Not yet	Not yet		

Source: Compiled by JICA Study Team based on the interview survey in the First Field Study in Thailand.

### (3) Current Situation of the Latest Urban Railway Master Plan

According to the latest related document on URMAPP3 as of October 2009, the succeeding MRT master plan includes the followings:

- a) Urban Development Directions: By reviewing the urban development-related plans and projects in Bangkok and surrounding areas such as 12-Year Bangkok Development Vision, comprehensive plans for Bangkok and other related provinces, Bangkok and Vicinities Regional Plan Project and IMAC Project, the rail routes are planned to mainly cover CBDs or commercial centers and are extended to pass the commercial sub-centers to urban community sub-centers. The intermodal facilities and feeder systems are planned in low-density suburbs to allow the convenient access to the trunk routes.
- b) Overview of Mass Transit Network: The mass transit network is classified into three categories, namely, major trunk routes, minor trunk routes and feeder lines. Different type of systems are planned to each network category, i.e. heavy rail systems for major trunk routes, LRT or BRT for minor trunk routes and bus or van for feeder routes. To encourage the use of mass transit system, it is recommended to construct the intermodal transfer facilities at each terminal and significant station including the public transport interchange with feeder bus system and park & ride facility. The common ticket system and the same fare structure are also recommended to the complete coverage of network.
- c) Network of Rail Mass Transit Routes: The rail mass transit network comprises 12 routes with a total distance of 490km, eight of which are major trunk routes and four are minor trunk routes. The eight major trunk routes are composed with three Commuter Train (CT) lines

operated by SRT (Dark Red Line, Light Red Line and Airport Rail Link) and five MRT lines (Dark Green Line, Light Green Line, Blue Line, Purple Line and Orange Line). The route alignments are developed in compliance with the principal concept of the previous master plan or the radial and circumferential pattern.

- d) **Development Plan:** Above mentioned 12 routes excluding the ongoing three sections are divided into 21 sections and classified into three categories from the development priority viewpoint, namely, Urgent Plan (within 2016), First 10-year Plan (within 2019) and Second 10-year Plan (within 2029). Urgent Plan includes five lines and seven sections of network for a distance of 145km mainly consist of CT and MRT. First 10-year Plan includes eight sections with a total distance of 146.2km which are extension of MRT system and new LRT system. Finally, Second 10-year Plan includes remaining six sections with a total distance of 107.4km.
- e) **Demand Forecast:** In 2008, the amount of MRT passenger is 0.6 million trips per day which is equal to 3.9% of the total travel demand in Bangkok and Metropolitan area. The future MRT passenger demand is projected as 1.8 million trips per day in 2014, 4.4 million trips per day in 2019, and 7.7 million trips per day in 2029, which are equal to 15%, 28% and 35% of total travel demand in Bangkok and Metropolitan area in 2014, 2019 and 2029 respectively.
- f) **Cost Estimation:** The total construction cost for 12 routes with a total distance of 404.6km is estimated at 794 billion Baht in 2009 current price which includes expropriation works, civil works, E&M works, rolling stock, track works, facilities infrastructure, detailed design and construction supervision fee and depot.
- g) **Economic Analysis:** EIRR of each development plan is estimated at 22.83% for Urgent Plan, 20.64% for First 10-year Plan and 20.77% for Second 10-year plan with an assumption that all 12 routes will be operated in 2019.
- h) **Financial Analysis:** From the financial feasibility viewpoint, all routes are unfeasible if the Government invests both civil and E&M works. To make the project feasible, the Government financial burdens must be reduced by applying PPP scheme as mentioned in the Government policy.
- i) **Environmental Impact and Public Participation:** According to the Initial Environmental Evaluation (IEE) for 12 routes, the construction and operation of mass transit system will affect environmental issues in more or less level depending on the type of train system. The series of public participation procedure such as Public Information (PI), Public Consultation (PC) and Public Survey has been implemented during the preparation of URMAPP3
- j) **Implementation Plan:** Mass Rapid Transit Commission (MRTC) which is responsible for developing and planning rail transit projects, funding, setting investment scheme, issuing fare policy, managing fare revenues and regulating standards of construction, safety and level of services is proposed for the smooth achievement of the planned mass rapid transit network. MRTC consists of three subunits, namely, mass transit development unit, financial support unit and public transport regulatory unit with participation from the Ministry of Transport, the Ministry of Finance, part of MRTA and local administration.



### **(3) Current Situation of Integration with City Planning**

As for the mass transit system coverage area, the Bangkok Metropolitan Administration (BMA) and the Department of Public Works and Country Planning, Ministry of Interior are responsible in developing the city planning of Bangkok Metropolitan Region and its surrounding area respectively. Those agencies prepared the policy plans such as land use plan of their responsible area; however, they have not prepared any implementation program which drives the policy planning into realization. Against this situation, BMA is implementing the pilot project on the new city development at Klong Dan Station area (3.2 km<sup>2</sup>) where the Light Green Line will be extended in the future. According to the information of BMA, it is necessary to set up the City Planning Act to get the budget for the construction of public facilities in the new developing city.

From the viewpoint of the integration between city planning and MRT planning, city planning agencies consider about the city sub-center development surrounding MRT terminal station in preparing policy plan. However, any coordination works with relevant railway agencies have not been made in the process of developing their plan.

From the viewpoint of MRT operator, BTS has much interest in developing the area surrounding the station. However, those agencies do not have legal authority in planning the station plaza which includes public facilities. In addition, there is any scheme or law which supports the joint real estate development between public sector and private sector.

In 2005, OTP implemented the Intermodal Service Integration for the Improvement of Mobility, Accessibility, Sustainability and Livelihood for Bangkok Metropolitan Region and Surrounding Area (IMAC). In this study, the conceptual designs of the development of the areas surrounding ten major stations were prepared by following the MRT planning. As for the institutional aspect, it is recommended to set up the Urban Development Authority (UDA) which is responsible for developing the city sub-center. However, at present, UDA has not been established yet.

### **(4) Current Situation of Integration with Other Transport Modes**

To achieve the public transport based city, the well-coordination between mass transit systems and other transport modes is essential. The current situation of the integration between MRT plan and other transport modes is as follows:

- a) Feeder Bus System: Well organized feeder bus system between station and residential area is one of the most important issues to shift the passengers from private vehicle to public transport. The study on the feeder bus system is currently ongoing and almost complete sponsored by OTP.
- b) Buss Rapid Transit (BRT): BRT is an effective system in supplementing the mass transit network without huge investment. The BRT network is initiated by BMA and mentioned in the IMAC Study. However, according to the information of OTP, it seems that any close coordination for MRT plan is not made.

- c) **Park and Ride Facility:** At present, there are several park and ride facilities along BTSC and MRT stations such as Mo Chit Terminal and Lat Phrao Station. BMA proposes another park and ride facility along the extended BTSC Line, but the capacity is quite limited. Capacity requirement should be discussed between railway operator and city planning agency.
- d) **Tariff Policy:** As Bangkok will shift to the public transport-based city, well-coordinated tariff structure should be developed so that the modal shift to the public transport will be smoothly implemented. At present, any policy on this issue has not developed yet.
- e) **Transportation Demand Management (TDM):** Road pricing is one of the effective methods to reduce the vehicle within the central city area and shift passengers to the public transport. OTP has made a study on road pricing, and it is waiting for the development of mass transit network as an alternative transport for private vehicle users.

## 2.3 PPP Models of MRT Projects in Thailand

### 2.3.1 PPP Models of Current MRT Projects

The general characteristics of PPP models of current two lines are as shown in the following table<sup>4</sup>.

**Table 2.3-1: PPP Models of Current MRT Projects**

Feature	Bangkok Transit System (BTSC Green Line)	MRTA Initial System Project (Blue Line - East)
Start of Operation	December 1999	July 2003
Type of concession	- BTO for civil works - BOT for E & M	- Civil works transferred from MRTA to BMCL for use - BOT for E& M
Government agency which provide a concession	Bangkok Metropolitan Authority (BMA)	Metropolitan Rapid Transit Authority (MRTA)
Concessionaire	Bangkok Mass Transit System PCL (BTSC)	Bangkok Metro Co. Ltd. (BMCL)
Concession period	30 years from first day of the commercial operation	25 years after construction period
Revenue sharing	No revenue sharing	Revenue sharing between MRTA and BMCL
Ridership Risk	Concessionaire	Concessionaire
Performance	Not referred	Indications of carrying capacity, train performance, and safety
Cooperation with Other Transit System	Not referred	Cooperation for common ticketing and other forms of passenger movement is mentioned. Sharing of depot with other extension operator is referred.
Concession extension	To be notified by BTSC between 3-5 yrs before expiration	Not referred
Line extension/system expansion	BTSC has the first refusal right to negotiate with BMA for new routes	"to be practical for ease of expansion and interfacing between the projects" (Annex VII, Part 2, 2)

Source: JICA Study Team

<sup>4</sup> The financial framework and concession conditions of current two lines are described in Chapter 5.

General remarks of the current PPP models are as follows:

- Concessionaires chosen were land developer/construction companies which had no experiences in railway business;
- It has been observed that ridership risk is too large to keep a MRT business sustainable. Under the current net cost concession model, a concessionaire holds a ridership risk. In other words, most of risks except land acquisition are allocated to the concessionaire; while the concessionaire is granted passenger's fare revenue and other sources of revenue which are vulnerable to mis-prediction of ridership and economic slump;
- The risk concerning civil construction is under the concessionaires;
- There is no amendment or revision clause/section in concession agreement. No amendment of the concession agreement has been made yet for neither BTSC nor BMCL;
- There is no clause regarding an extension of concession period is given to BMCL. Limited concession period without an extension clause may discourage the concessionaires to improve service;
- Land development right provided to concessionaires is limited;
- The right of contractors (project owners) to control technical specifications such as signals, rolling stock, AFC, etc. was not included in the concessionaire agreements;
- The clause which decides the minimum performance level or gives contractors authority to monitor the performance of concessionaires is not included in the concessionaire agreements; and
- Future cooperation/coordination with other operators is not clearly described in detail in the concessionaire agreements.

### 2.3.2 PPP Concession Models Recommended by ADB Technical Assistance

#### (1) Outline of ADB's Technical Assistance (TA)

The Asian Development Bank (ADB) provided a technical assistance (TA 4904: THA for Infrastructure Investment Advisory Assistance - Phase II) with the purpose of supporting successful delivery and integration of the new rail MRT and associated wider public transport system in Thailand. The TA was provided through the MRT implementation committee and its finance and operations sub-committee. More generally, the TA provided analytical and advisory support to PDMO and OTP. The TA aimed at structuring private concessions for the operations and maintenance of new rail lines and integrating the rail MRT network through the introduction of a single ticketing system<sup>5</sup>.

In this TA, four options of concession models for MRT projects were analyzed and evaluated. Other major outputs of TA were:

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<sup>5</sup> P. Sayeg, D. Bray, G. Ellis, S. Manibhandu, and H. Na Pombejra, "Project Number: 40138 Thailand: Infrastructure Investment Advisory Assistance (Phase II)," Asian Development Bank, July 2007.

- Preparation of a standardization requirements paper for all MRT studies under the PPP Act;
- Development of a new concession contract template based on the review of legal requirements and standardization of concessioning approach;
- Identification of integrated ticketing needs in Bangkok;
- Procurement options for ticketing: evaluation of options;
- Action plan for implementing integrated ticketing system, concessions and related matters for the rail MRT system, etc.

## (2) Evaluation of Concession Models

The Sub-Committee for MRT Finance and Operations specified three different types of concessions (Net Cost, Gross Cost and Partial Gross Cost) for the study. A revised net cost model was added for comparison.

The definitions of four concession models are as shown in the following table.

**Table 2.3-2: Definition of Concession Model**

Model	Definition
Current Net Cost Concession	The government manages civil infrastructure delivery using private sector contractors; government engages the private sector to provide electrical and mechanical (E&M) assets and trains and to undertake operation and maintenance (O&M) through a concession; government leases civil infrastructure to the concessionaire; government sets safety standards and fare structure; the concessionaire determines services to be provided and retains fare and other revenue, in which; and additional payments may need to be made by the government to the concessionaire to cover revenue shortfall, or the reverse if revenue exceeds costs.
Revised net cost concession (with enforced integration)	The same as for the current net cost concession other than conditions that can improve network integration (e.g., integrated ticketing) are specified at the time of tendering and incorporated into the concession.
Simple gross cost concession (with no risk transfer)	The government manages civil infrastructure delivery using private sector contractors; government engages the private sector to provide E&M and trains and to undertake O&M through a concession; government sets safety and service standards, service levels, and fare structure and level; government pays the concessionaire an amount equal to the costs the concessionaire incurs in providing agreed services as established through a competitive, quality-based tender; and government retains all fare revenue.
Modified Gross Cost Concession (with some risk transfer)	The same as for the simple gross cost concession model other than part of the payment to the concessionaire is linked to the number of passengers carried with a corresponding lesser need for monitoring of the quality of service that is provided.

Source: P. Sayeg, D. Bray, G. Ellis, S. Manibhandu, and H. Na Pombjra, "Project Number: 40138 Thailand: Infrastructure Investment Advisory Assistance (Phase II)," Asian Development Bank, July 2007

The major features of the four concession models and the need of supervision by the public sector are as shown in the following tables.

**Table 2.3-3: Comparison of Net Cost and Gross Cost Concession Models**

	Net Cost	Gross Cost
Infrastructure	Government provides civil infrastructure and some other infrastructure. Concessionaire provides trains and related assets.	
Risk Sharing	Concessionaire assumes all ridership risk, and shares extra profits (if any) with the government	Risk is shared between the government and concessionaire. Optimum sharing of risk will minimize the concession cost
Revenue	Concessionaire keeps revenue	Fare revenue is given to the government
Services	Concessionaire determines services to be provided on the basis of profitability	Government sets service standards and the concessionaire determines services based on these Standards
Payments	Concessionaire meets costs from its own revenue	Government pays the concessionaire for services provided according to rates set on the basis of competitive tendering and quantity/quality of service provided
Government Role	Government invites tenders & establishes a concession; has only a small role thereafter; difficult to vary contract conditions.	Government invites tenders and establishes a concession; has a continuing major role in managing the concession agreement; can vary conditions when needed.

Source: P. Sayeg, D. Bray, G. Ellis, S. Manibhandu, and H. Na Pombjra, "Project Number: 40138 Thailand: Infrastructure Investment Advisory Assistance (Phase II)," Asian Development Bank, July 2007

**Table 2.3-4: Needs of Supervision by the Public by Model**

	Form of Concession		
	Net cost (current)	Gross cost (with some transfer of risk)	Gross cost (with no transfer of risk)
Extent of Risk Transfer			
Need for concession management			
<b>Supervision needed as a condition of payment(1)</b>			
Quantity of service (eg car-km of service)	Not needed	Essential	Essential
Quality of services (eg maximum load, comfort)	Not needed	Limited need	Essential
Number of passengers	Not needed	Essential	Not needed
<b>Additional supervision needed for general contractual oversight</b>			
Quantity of service	Not needed	Not needed	Limited need
Quality of services	Limited need	Limited need	Limited need
Number of passengers	Limited need	Not needed	Limited need

Source: P. Sayeg, D. Bray, G. Ellis, S. Manibhandu, and H. Na Pombjra, "Project Number: 40138 Thailand: Infrastructure Investment Advisory Assistance (Phase II)," Asian Development Bank, July 2007

The conclusions of the study provided under the TA were as follows<sup>6</sup>:

- A net cost form of concession, even with modifications to improve MRT integration, will still have substantial limitations, because the need to give the concessionaire a high level of certainty over the circumstances of their commensurate system with the substantial risk transferred to them either restricts government flexibility with regard to future MRT development and policy change, or requires the government to renegotiate concession agreements to take account of changes that occur;

<sup>6</sup> P. Sayeg, D. Bray, G. Ellis, S. Manibhandu, and H. Na Pombjra, "Project Number: 40138 Thailand: Infrastructure Investment Advisory Assistance (Phase II)," Asian Development Bank, July 2007.

- A gross cost form of concession is needed to give the government the capacity to deliver fully integrated MRT in Bangkok that can also adapt to changing circumstances over time, acknowledging that it is not possible to identify in advance all such changes that could occur over a typical 30 year concession duration;
- There still needs to be some transfer of risk to concessionaires with a gross cost concession to ensure costs are minimized, good performance by concessionaires is encouraged and concession supervision requirements are minimized; and
- Concession supervision should focus on key factors that will ensure the government achieves value-for-money.

As the result of TA, the Thai government recognized that the gross cost model applied in a standardized way irrespective of the implementing agency is essential to achieve an integrated future MRT network at the least possible cost. The Ministry of Finance and Ministry of Transport decided in June 2007 to adopt the gross cost concession model for all MRT concessions in future.

The Thai government has adopted "Draft Standardization Directive" included in the report of this TA, as guidelines for their project evaluation of MRT line. The Draft Standardization Directive is attached in Appendix 2. The Draft Standardization Directive mentions that the following options should be considered as financial modeling of PPP options:

Investment and Operations:

- Public Sector Comparator (PSC): A private sector concessionaire undertakes only O&M, with the Government financing all infrastructures
- Public Private Partnership (PPP): A private sector concessionaire finances all E&M and rolling stock investment and undertakes O&M, with the Government financing other infrastructure investment.

Concessionaire Payment Options:

- Net Cost (current method)
- Gross Cost
- Modified Gross Cost (with partial demand risk transfer)

**Table 2.3-5: PPP Option Matrix for the Evaluation of MRT Project**

		Capital Cost Sharing				Payment Option		
		Civil Work	E & M	Rolling stock	O & M	Net Cost (Current Method)	Gross Cost	Modified Gross Cost
Investment & Operation Option	Public Sector Comparator (PSC)	Public	Public	Public	Private			
	Public Private Partnership (PPP)	Public	Private	Private	Private			

Source: P. Sayeg, D. Bray, G. Ellis, S. Manibhandu, and H. Na Pombejra, "Project Number: 40138 Thailand: Infrastructure Investment Advisory Assistance

## 2.4 Financial and Fiscal Situation of Thailand

The financial framework for the future MRT projects in Thailand will be affected by the financial and fiscal conditions. For example, the government borrowing for a project will face the ceiling of public debt regulated in the Public Debt Management Act and the Fiscal Sustainability Framework. The fund raising by a private participant will be influenced by the financial market conditions. In this section, the financial and fiscal situations in Thailand are analyzed from these perspectives.

### 2.4.1 Financial Situation in Thailand

#### (1) Economic Situation

The Thai economy has shown a downturn trend since the third quarter of 2008 as the result of exposure to the global financial crisis as shown in Figure 2.3-1. The real growth rate (year on year) of GDP on an expenditure basis dropped to -4.2% in the fourth quarter of 2008 and further dropped to -6.9% in the first quarter of 2009. In the fourth quarter of 2008, the gross fixed capital formation and net exports recorded a decrease (year on year) although the Thai economy was supported by a rather stable private consumption and an increase in inventories. In the first quarter of 2009, economic stagnation became more pronounced. Both the growth of private consumption and gross capital formation turned to negative. In the second and third quarters, the growth of GDP (year-on-year base) was still negative. Economic contraction was due to drop in gross capital formation and imports and inventories.

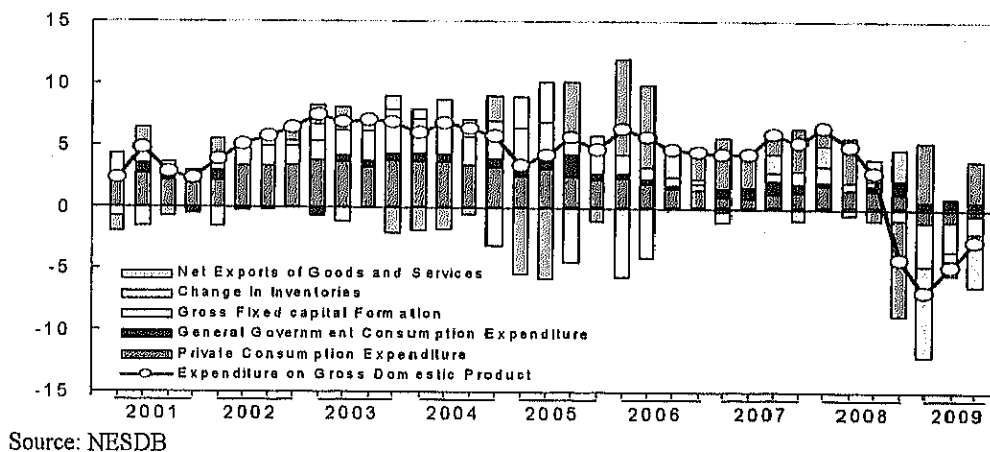


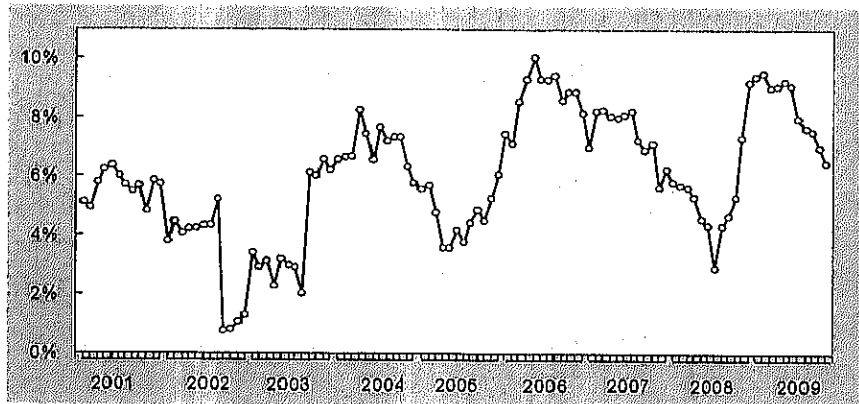
Figure 2.4-1: Trend of GDP in Thailand

#### (2) Money Supply

The growth rate of broad money in Thailand is as shown in Figure 2.4-2.

The acceleration of broad money growth experienced since the second half of 2005 was due to a successive increase in deposit rates. However, the growth rate (on a year-on-year basis) of broad money turned to a decreasing trend in the middle of 2006. The Bank of Thailand pointed out that major reasons for this trend were stabilized interest rates and slowdown in private credits. In 2007, in addition to the downward deposit interest rates, issuance of bills of exchange by commercial banks in stead of conventional deposits also gave a negative impact to the broad money growth.

Since the second half of 2008, broad money has tended to expand because investors have redirected their funds to deposits under the uncertainty of economy. There is another reason for this expansion. The definition of broad money was changed to include bills of exchange, money market mutual funds, and deposits at saving cooperatives to accord with international standards<sup>7</sup> Since July 2009, the growth of broad money has tended to drop. In November 2009, the growth rate of broad money was 6.5% on a year-on-year basis.



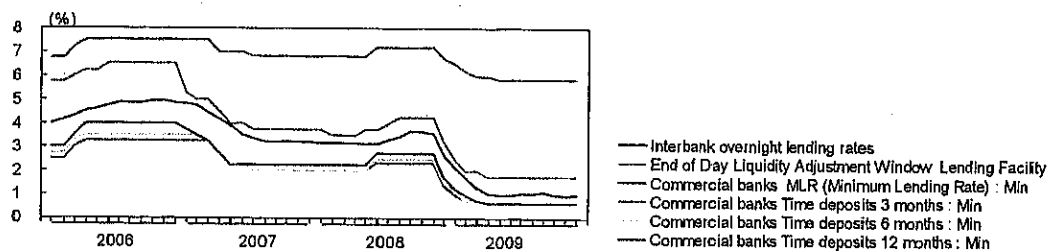
Source: Bank of Thailand

Figure 2.4-2: Growth Rate of Broad Money (Year-on-Year Basis)

During the first half of 2007, the Monetary Policy Committee (MPC) decreased the policy interest rate five times from 5.0% per annum at the end of December 2006 to 3.25% per annum at the end of July 2007 as a stimulus to domestic demand. The MPC maintained the policy interest rate at 3.25% per annum during the first half of 2008. However, the policy rate was increased to 3.75 percent per in July 2008 with the assessment of inflation risk. The MPC lowered the policy interest rate to 2.75% in December 2008 responding the negative impact of global financial crisis and weakened confidence of investors. The policy interest rate was further decreased to 2.00% on January 14, 2009, to 1.50% on February 15, and to 1.25% on April 8.

The average short-term money market rates in 2008 declined from the previous year in tandem with the policy interest rate. The one-day inter-bank rate averaged at 3.35% per annum in 2008, against 3.79% annum in 2007.

The reference interest rates of commercial banks, both deposit rates and loan rates, moved in line with the policy interest rate.



Note: Commercial banks rates are quoted by the 5 commercial banks.

Source: Bank of Thailand

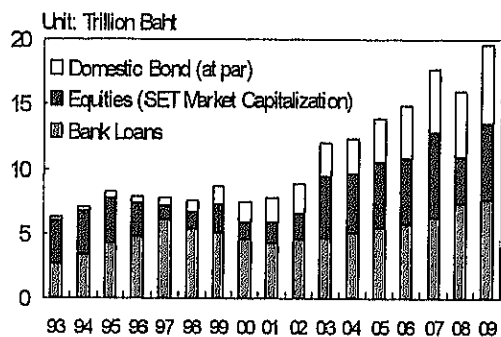
Figure 2.4-3: Trend of Key Interest Rates

<sup>7</sup> Monetary Policy Group, "Thailand's Economic and Monetary Conditions in 2008," March 2009, Bank of Thailand



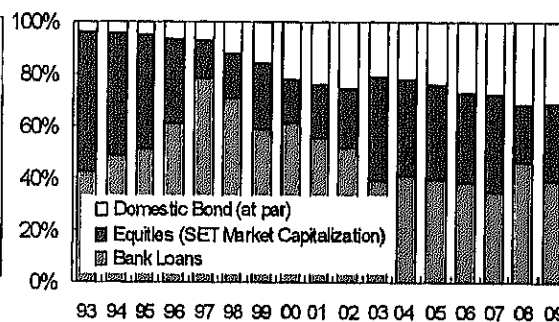
### (3) Financial Market

The financial system of Thailand consists of commercial banks, government-owned specialized financial system, capital markets, and non-bank financial intermediaries. The size of finance tended to expand during the 2000s with a favorable growth of the Stock Exchange of Thailand and issuance of bonds. The share of bank loans has remained at around 40%.



Source: Thai Bond Market Association

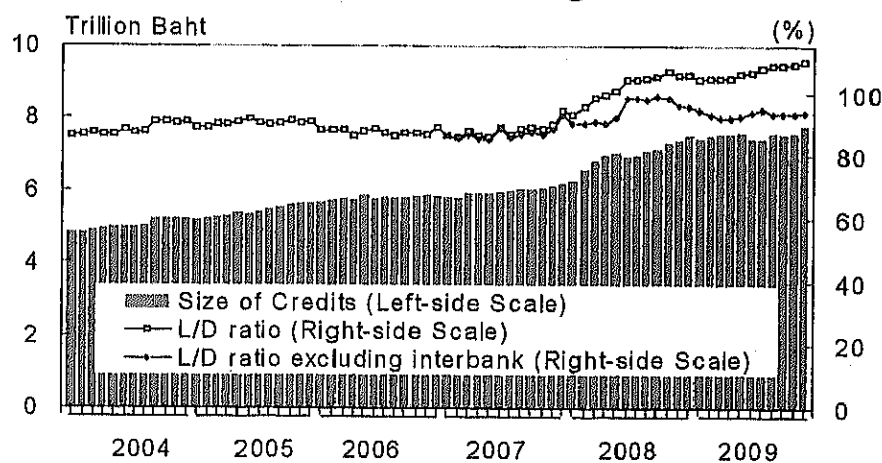
Figure 2.4-4: Size of Financial Market in Thailand



Source: Thai Bond Market Association

Figure 2.4-5: Share of Financial Market in Thailand

As of November 2009, there are 32 commercial banks operating in Thailand, 17 domestic commercial banks and 15 foreign commercial bank branches. Major domestic commercial banks are Krung Thai Bank, Bangkok Bank, and Thai Farmers Bank. The size of bank loans has shown an increasing trend since 2008. The ratio of loans to deposits has tended to increase from the later half of 2007 due to the increase in inter-bank lending.

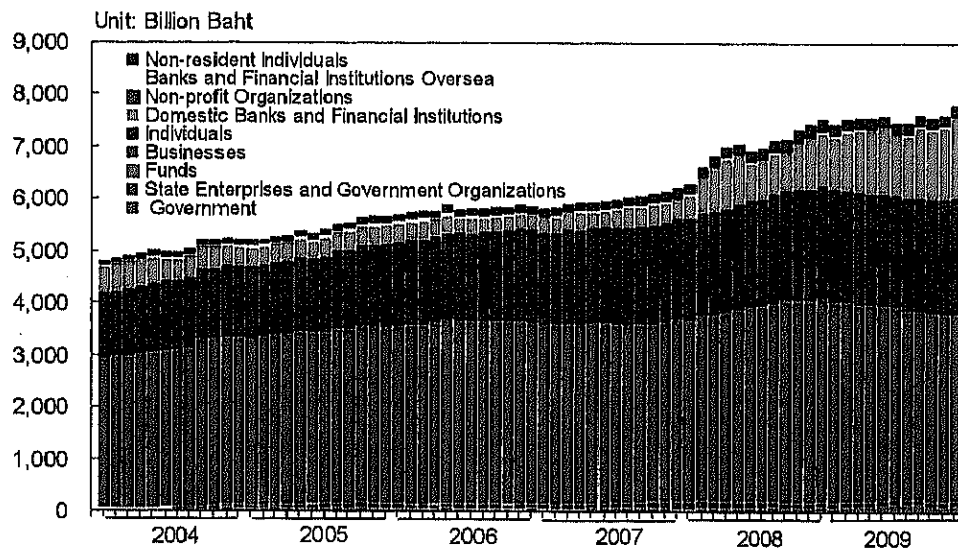


Note: Including inter-bank deposits and credits.

Source: Bank of Thailand

Figure 2.4-6: Size of Credits and Ratio of Loans to Deposits of Commercial Banks

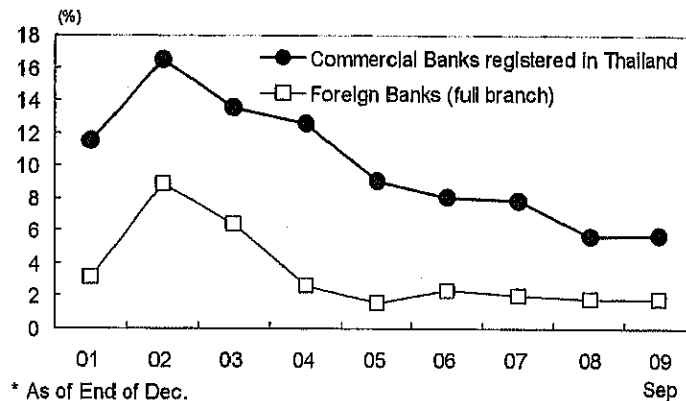
Among the total credits of commercial banks, almost half of total credits are directed to the business sector followed by individuals and domestic banks & financial institutions. As mentioned above, the loans to domestic banks and financial institutions increased through 2008 and 2009. The shares of government and state enterprises & government organizations are minimal.



Source: Bank of Thailand

Figure 2.4-7: Breakdown of All Commercial Banks' Credits by Type of Debtors

The ratio of gross non-performing loans (NPLs) of commercial banks to total loans has been decreasing steadily since 2001. As of September 2009, they were 5.7% of total loans for domestic commercial banks and 1.8% for foreign commercial banks.



Source: Bank of Thailand

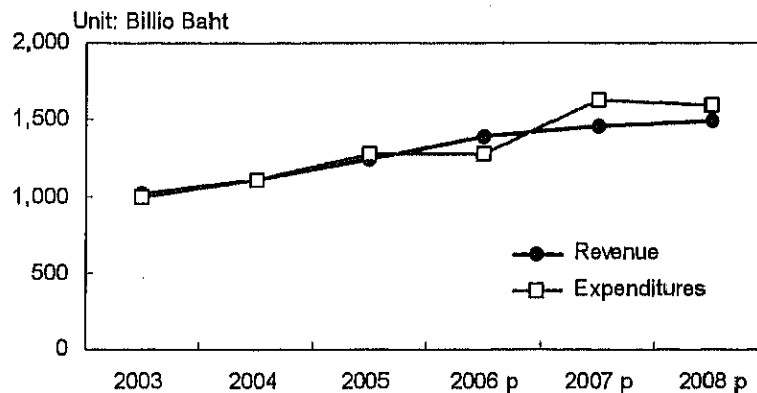
Figure 2.4-8: Ratio of Gross NPL to Total Loan

## 2.4.2 Fiscal Situation

### (1) Government Finance

The fiscal balance of the central government was balanced until 2006. However, the Thai government adopted a deficit budget for the fiscal year 2008 responding the predicted economic slowdown. In the budget, government expenditure was set at 1,660 billion baht against the net revenue of 1,495 billion baht. A deficit was projected to be 1.8% of GDP. For the fiscal year of 2009, the government continued to set a deficit budget under the impact of continuing global economic slowdown. The expenditure budget for fiscal year 2009 was 1,951.7 billion baht including supplementary budget of 116.7 billion baht against the estimated net revenue of 1,604.6 billion baht. The deficit is estimated at 347.1 billion baht, equivalent to 3.7% of GDP.

In January 2009, the Government allocated 116.7 billion baht in cash handouts, tax cuts, and subsidies as an economic stimulus mostly targeting low-income people. In May 2009, the Cabinet approved a second stimulus and social-welfare package of 1.43 trillion baht for the fiscal year 2009 - 2012. This package is an addition to the annual budget.



Source: Bank of Thailand

Figure 2.4-9: National Government Finance

## (2) Public Debt

The Public Debt Management Act was put into effect in 2005. This Act stipulates the regulations concerning the public debt management of Thailand. Under the Ministry of Finance, key organizations for public debt management are the Public Debt Policy and Supervision Committee and the Public Debt Management Office (PDMO).

The Public Debt Policy and Supervision Committee chaired by the Minister of Finance has the powers and duties relating to public debt management including reporting of public debt status to the Council of Ministers, the submission of public debt management plan for each fiscal year to the Council of Ministers for approval, prescription of rules on the loan raising, guaranteeing and repaying and rules on public debt restructuring, etc.<sup>8</sup>.

PDMO is responsible for general affair of the Public Debt Policy and Supervision Committee. PDMO takes a role of analyzing public debt structure, gathering information related to the estimate on financial need of public sector and on public debt management; managing public debt including borrowing of loan, disbursing loan and repaying debt, etc.<sup>9</sup>.

The Public Debt Management Act stipulates the following principles of public debt:

- a) In each fiscal year, the raising of loan by the Ministry of Finance to finance budget deficit shall be in Thai Baht and the aggregate amount of loan shall not exceed:
  - i) 20% of the existing annual budgetary appropriation and the additional budgetary appropriation;
  - ii) 80% of the budgetary appropriation as set out for repayment of principal (Section 21).

<sup>8</sup> Stipulated in the Section 35 of the Public Debt Management Act, B.E. 2548 (2005)

<sup>9</sup> Stipulated in the Section 36 of the Public Debt Management Act, B.E. 2548 (2005)

b) The raising of loan for economic and social development shall be made if it is necessary to spend money in foreign currency apart from the annual budgetary appropriation, or if it is necessary to raise loan so as to strengthen national financial security. In this case, the Ministry of Finance shall raise loan in foreign currency<sup>10</sup> and the aggregate amount of loan shall not exceed:

- 10% of the annual budgetary appropriation (Section 22).

In addition, the Ministry of Finance, according to the decision of the Council of Ministers, has the following framework for the fiscal sustainability:

- a) Public debt outstanding to GDP does not exceed 50%;
- b) Debt service ratio to total budget does not exceed 15%; and
- c) Capital budget is not less than 25% of total budget.

According to the statistics of PDMO<sup>11</sup>, total public debt was 3,799 billion baht as of the end of April, 2009. Total public debt of 3,799 billion baht consisted of direct government debt of 2,446 billion baht, non-financial public enterprise debt of 1,036 billion baht, Special Financial Institutions Guaranteed Debt of 205 billion baht, financial institution development fund (FIDF) Debt of 108 billion baht, and autonomous agency debt of 3,683 billion baht.

The ratio of public debt to GDP increased to 43.0 percent in April 2009. This increase is due to the higher public borrowing for expansionary fiscal policy in the fiscal year of 2009. However, the level of the ration is still below the 50 percent public debt ceiling under the Fiscal Sustainability Framework.

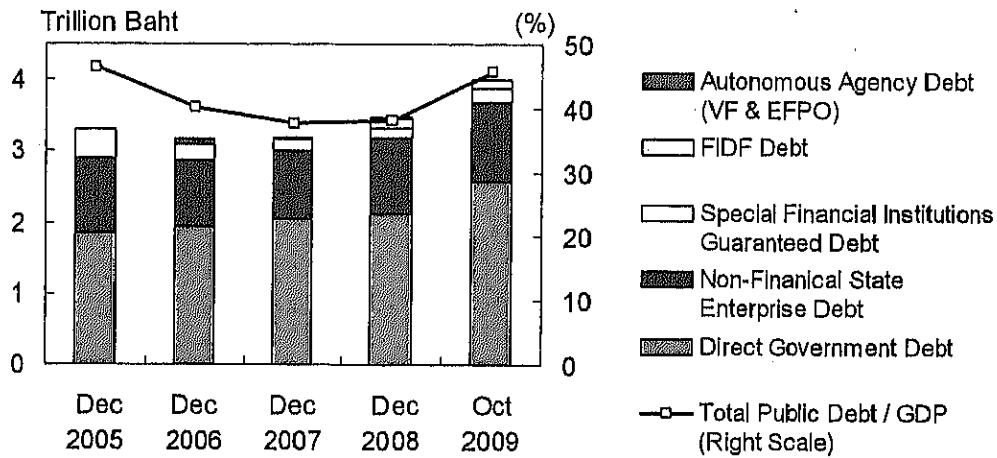
In 2009, the Government is forced to increase borrowing to finance the three-year stimulus programs. In May 2009, the Lower House passed two bills to authorize the government to borrow 800 billion baht. In June 2009, the Constitution Court ruled that the government's executive decree to borrow 400 billion baht from domestic banks is lawful because it is an act committed to sustain the economy as demanded by the constitution. The PDMO plans to borrow the first 200 billion baht during 2009 by offering 5-year savings bonds worth 30 billion baht to the public and offering 3-year floating rate promissory notes, long-term government bonds and treasury bills for the remaining 170 billion baht<sup>12</sup>. With the increase in public debt due to the borrowing of 400 billion baht loans, the government expects that the ratio of public debt to GDP will be 47%, below the ceiling<sup>13</sup>.

<sup>10</sup> If the conditions of domestic monetary market are conducive and it is beneficial to develop monetary system, public finance and capital market, the Ministry of Finance can borrow a loan in Thai Baht instead of foreign currency with approval of the Council of Ministers.

<sup>11</sup> <http://www.pdmo.mof.go.th/pdebte.php?type=dob>

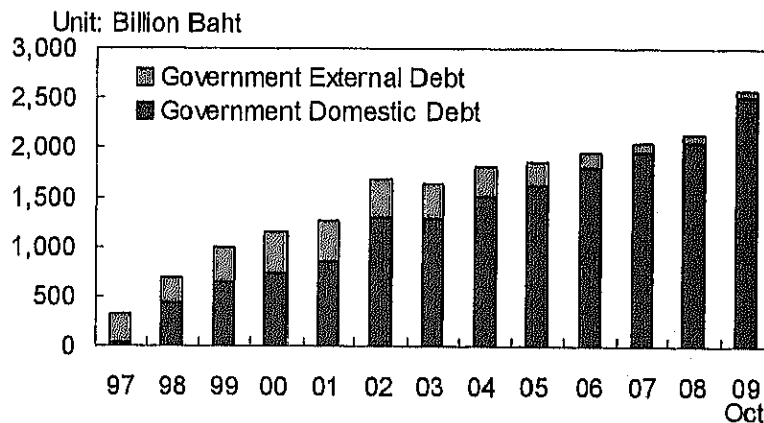
<sup>12</sup> Chalathip Thirasoonthrakul, "Thai court upholds borrowing decree for stimulus," June 3, 2009, Reuters

<sup>13</sup> National news bureau of Thailand, "Special Report: Necessity of Bt400-billion-loan Executive Decree for economic stimulation," May 23, 2009



Source: PDMO

Figure 2.4-10: Breakdown of Public Debt and Ratio of Public Debt to GDP



Note: As of the end of year.

Source: Bank of Thailand

Figure 2.4-11: Breakdown of Direct Government Debt

## 2.5 Review of Existing MRT Lines

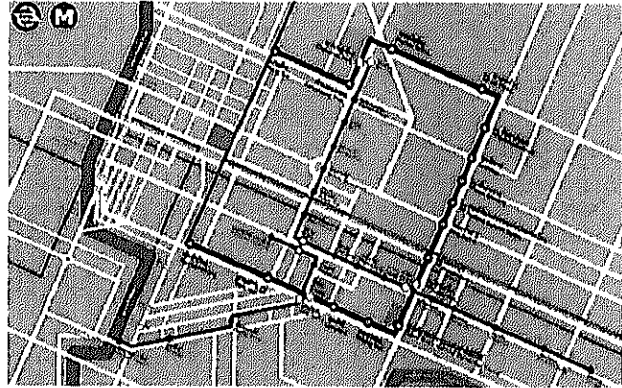
In this section, the current urban railway projects, i.e., Blue Line and SkyTrain, are studied and reviewed to understand the adopted financial framework, current service performance level and financial efficiency, and to identify lessons for the implementation of future MRT projects in Thailand.

### 2.5.1 Review of Blue Line

#### (1) Outline of Line

The MRT Chaloen Ratchamongkhon Line (the MRT System or Blue Line) is the first underground railway system in Thailand. The Blue Line links between Hua Lamphong to Bang Sue. The Blue Line, with 21 km of length and 18 stations, carried 194,230 passengers on average every day on week days.

The Blue Line starts from Bangkok Railway Station (Hua Lamphong) along Rama 4 road, crosses Sanyan intersection, Silom intersection and Wireless intersection, turns left to Ratchadaphisek Road at Rama 4 intersection, passing Queen Sirikit National Convention Center to Asoke-Sukhumvit intersection, Asoke-Phetchaburi intersection, Rama 9 intersection, Huai Khwang intersection, and Sutthisan intersection, then turns left to Lat Phrao road at Ratchada-Lat Phrao intersection, faces to Lat Phrao intersection, Phahon Yothin road, Chatuchak Park, Mo Chit Northern Bus Terminal (Old), and turns right to Kamphaeng Phet road, passing the Marketing Organization for Farmers (MOF) market, and finally ends at Bang Sue Railway Station<sup>14</sup>.



Source: BMCL

Figure 2.5-1: Map of Blue Line

## (2) Financial Framework

The concession agreement was signed between the Metropolitan Rapid Transit Authority (MRTA) and the Bangkok Metro Company Limited (BMCL) on August 1, 2000.

Table 2-5-1: Major Items in the Contract

Items	Contents	
a) Revenue sharing: The following payments were to be made from BMCL to MRTA:	i) From fair revenue	- A lump sum payment of 43.567 billion baht in annual installments from year 11 to year 25 - A proportional payment from fare revenues annually over 25 years: 1%: from year 1 to year 14, 2% from year 15, 5% from year 16 to 18, and 15% from year 19 to year 25
	ii) From commercial development	A lump sum of 930 million baht from commercial development
	iii) Access charge	A proportional payment from excess profit when the return on equity exceeds 14.75%
b) Commercial development of land:	Underground area of Lat Phrao park & ride and 13 designated station	
c) Technology transfer	BMCL provides training to MRTA staff	
d) Cooperation with other transit system	i) Cooperation for common ticketing and other forms of passenger movement; ii) Depot to be shared with other extension operator	
e) Concession extension	Not referred	
f) Line extension/ system expansion	Mentioned as "to be practical for ease of expansion and interfacing between the projects (Annex VII, Part 2. 2)"	
g) Variations	All additions, amendments and variations to be in writing and signed by authorized representatives	
h) Performance	Not referred	
i) Tributary	A few indications: carrying capacity, train performance, safety	

Source: JICA Study Team

### a. Type of Concession

<sup>14</sup> Homepage of Bangkok Metro Public Company Limited (BMCL).

A BTO method was applied for electrical & mechanical works. MRTA was responsible for civil works. Civil works were to be transferred to BMCL for use after the completion of construction. BMCL was granted an exclusive right to design, manufacture, install, test and commission M&E equipment and to perform MRTA Initial System.

#### b. Concessionaire

The concessionaire was the BMCL: Bangkok Metro Co. Ltd.

#### c. Concession Period

The concession period was 25 years after the construction period.

#### d. Major Items in the Contract

Major Items in the Contract are as the below table:

### (3) Review of Operation and Service Level

#### a. Current Operation Status

##### 1) Outline

During five years since its operation commencement, Blue Line has gained its position as an indispensable transportation for Bangkok citizens. Big shopping malls, condominiums and office buildings have been constructed around the stations of Blue Line. The punctuality of MRT is much higher than that of road traffic. Blue Line goes through sub city centers. It is observed that the operation of Blue Line has induced the development of areas.

##### 2) Ridership and Fare Revenue

Ridership is still lower than the estimation. However, at the peak hours in the morning, trains are so congested that some passengers sometimes pass on the next train. In line with the increase in ridership, fare revenue has been also increased. According to the deputy governor of MRTA, Dr. Yiemchai, the average fare price is around 22 baht and it is still higher than expected which is almost as same as lunch fee for the lower income class.

**Table 2.5-2: Ridership Forecast of Original plan**

	2002	2010	2020
Ridership Forecast (Trips/day)	321,600	793,000	984,500

Source: MRTA, "Project Completion Report"

**Table 2.5-3: Actual Number of Passengers and Revenue per Day**

Year	Working days		Whole days	
	Number of Trips (trips/day)	Fare Revenue per Day (Million Baht)	Number of Trips (trips/day)	Revenue per Day (Million Baht)
2004	151,255 (100%)	2.53 (100%)	147,458	2.43
2005	179,145 (118%)	3.02 (119%)	163,403	2.83
2006	179,563 (118%)	3.65 (144%)	158,396	3.37
2007	188,643 (125%)	3.92 (155%)	164,507	3.48
2008	194,230 (128%)	4.22 (169%)	169,813	3.76

Source: MRTA, "Annual report 2008-09"

## 3) Safety

On January 17, 2005, a traffic accident occurred. A deadhead train crushed into a parked train at Culture Center station and two hundred passengers in the parked train were injured. The cause of accident was the inappropriate braking of driver. The driver of the deadhead train released the brake of the train stopping at steeply-sloped section without any direction from the Operations Control Centre (OCC). After this accident MRTA and BTSC carried out the training of drivers to prevent a recurrence of accident.

Basically the accident is made by human error. However, normally poor equipments are behind. The Study Team could not find any description on improvement of facilities against this accident on their annual report.

## 4) Extension of Blue Line

Extension works of Blue line has not been commenced. Current conditions are as follows:

- On May 27, 2008, the Council of Ministers resolved to grant approval for MRTA to undertake construction of the Blue Line extension from Hua Lamphong to Bang Khae, within an amount of 56 billion baht.
- The National Environmental Board approved the Environmental Impact Assessment (EIA) of the project in July 2008.
- The financing arrangement has been suspended.

## b. Current Status of Operation Efficiency

## 1) Train Operation

Work Efficiency of Operation Staff

In the following table, train-km per driver and staff number per station of Bangkok and Japanese urban railways are express displayed. Basically the operation system of Sky Train is same with that of Blue Line. The train-km per driver of Sky Train is lower than that of Blue Line. This is because the travel time of Silom Line of Sky Train is extended due to the single track operation at Saphan Taksin after opening of the section between Saphan Taksin and Wongwian Yai, but their figure is almost same with that of Japanese metro. These facts show that the work efficiency of Sky Train and Blue Line is fine.

Table2.5-4: Work Efficiency of Drivers and Station Staff

Item	Thailand		Japan	
	Blue Line	Sky Train	Tokyo Metro	Osaka Metro
Route km	20.1	25.7	183.2	129.9
Train-km per day	8,749	11,833	85,729	47,562
Number of drivers	95	180	1,252	746
Train-km per driver	92.1	65.7	68.5	63.8
Number of station staff	594	674	2,734	2,177
Number of station	18	25	169	133
Staff number per station	33	27	17	17

Source: Annual Railway Statistics 2006(MLIT Japan), BMCL and BTSC



The staff number at stations of Blue Line is larger than that of Sky Train. It is said that the structure of underground stations of Blue Line needs more staff than that on the ground of Sky Train, but their staff numbers are much larger than those of Japanese metros. Few ticket bending machines are installed at stations of Blue Line and Sky Train. This fact may be the cause of the difference of the station staff number between Bangkok and Japan.

### Power Consumption

The following table displays unit traction power and power consumption per station of Blue Line and Sky Train.

Basically specifications for train sets of Blue Line are same with those of Sky Train. The result of traction power per train km of Blue Line is similar to that of Sky Train. Energy consumption per station was obtained by deducting the traction power consumption from the total power consumption. It should be noted that energy consumption per station includes the power consumption per the depot and the headquarters are included.

When comparing the power consumption per station of Blue Line with that of Sky Train, it can be seen that the volume of the Blue Line is much larger than that of Sky Train. This is due to the air-conditioning in underground stations. The Study Team has to suggest that the reduction of power consumption is one of the ways to enhance the profitability of Blue Lines. To reduce the power consumption for air conditioning at stations, the structure of stations has to be carefully designed.

**Table 2.5-5: Power Consumption per Train-km and per Stations**

Item	Unit	Blue Line	Sky Train
Traction power	KWh/train-km	8.9	9.4
Energy consumption per station	KW/day/station	5,348.0	236.2

Source: BMCL and BTSC

## 2) Maintenance

Although all of the maintenance works of BMCL facilities are outsourced, it is costly since these works are supervised by foreigners. According to Dr. Sombat Kitjalaksana, the BMCL managing director, the contract fee with the supplier for the coming five years is not going to be reduced from that of the initial five years' contract. However, the Study Team considers that there may be some room for negotiation since the number of foreign experts required for the second term will be smaller than that for the initial five years.

## c. Current Status of Service Level

### 1) Customer Satisfaction

Table 2.5-6 shows the results of customer satisfaction survey conducted by the Research and Development Institute, Ramkhamheang University. According to this survey, customers are satisfied with overall aspects of Blue Line. However, items on "pay rate" and "security" got lower score than the others. The above-mentioned comment by the deputy governor of MRTA on "pay rate" corresponds with this result. Regarding "security", BMCL carries out security

check at every front gate of station, and passengers are required to open their bags for it. Some of customers may feel uncomfortable.

**Table 2.5-6: Survey Result of Customer Satisfaction**

Item	Satisfied
All average	96.7%
Service	97.4%
Station	97.1%
Staff	97.3%
Pay rate	94.9%
Park and Ride	96.6%
Security	95.4%

Source: Study of Research and Development Institute Ramkhamheang University Year 2008(MRTA)

## 2) Number of Train Operation

On the train accident on January 17, 2005, two trains were damaged. One of the damaged trains was repaired and resumed the service on December 23, 2006. The other train resumed the service on September 1, 2007. Fluctuation of “number train in service” in 2007 of the following table shows the situation during the repairing tasks. Now all the trains are fully in daily operation as shown in 2008 of the following table.

The utilization ratio per full passenger capacity is around 50% and the train number at peak time seems to be enough. From these figures, it can be said that the operation plan of Blue line is efficient.

**Table 2.5-7: Full Passenger Capacity of MRT and Actual Number of Passengers**

	2007		2008
	Jan 1 - Aug 31	Sept 1 - Dec 31	Jan 1 - Dec 31
No. of Days of Service(Days)	243	122	366
No. of Trains in Service(Trains)	18	19	19
Full Passenger Capacity Per Day (Persons)	318,960	336,680	336,680
Full Passenger Capacity of the Metro (Persons)	77,507,280	41,074,960	123,224,880
	118,582,240		
No. of Actual Passengers of Service (Persons)	60,045,076		62,151,665
Utilization Rate Per Full Passenger Capacity	50.64%		50.44%

Source: Annual report of BMCL 2008

## 3) Reliability and Punctuality

According to the data on service Performance presented by BMCL, the ratio of trains which arrives at the station within 2 minutes was 99.76% in 2008. This figure means the punctuality of train operation is excellent.

Information of customer satisfaction also gives high score for its service level. This fact shows that its operation is carried out well.

#### d. Issues to Be Tackled

Blue Line is well operated and maintained by looking at the fact that the line is operated punctually, station staff is friendly to passengers, and both station and rolling stock are clean. However, there are some issues to be tackled. These issues are also pointed out by MRTA/BMCL.

##### 1) Fare Level

Although the number of passengers increases year by year, the ridership is still lower than estimated. As already mentioned, the average fare price is more than 22 baht, almost as same as lunch fee for the lower income class. The fare level is still higher than affordable level for the lower income class. The following table expresses that the minimum fare in Bangkok is rather higher than other cities. The urban railway is a kind of infrastructure for big cities. The reduction of fare level in Bangkok has to be discussed together with introduction of integrated fare system.

**Table 2.5-8: Minimum Fare of Commuter Lines at Asian Cities**

Cities	Line	Minimum fare	
		In local currency	In USD*
Manila	Line1	12 Pesos	0.55
Bangkok	Sky Train	16Bahts	1.00
	Blue Line	15Bahts	0.94
Singapore	SMRT	1S\$	0.93
Hong Kong	Hong Kong	4H\$	0.71
New Delhi	Delhi Metro	6 Rupees	0.41

\*Note: Converted to USD with Purchase Parity Power

Source: Study Team

##### 2) Enhancement of Efficiency

Even though BMCL assumes that it is difficult to bargain on the contract fee of maintenance for the second five years, there may be some ways to enhance maintenance efficiency by cutting the wages for foreign experts. To do this, the technology transfer on maintenance to the local staff becomes urgent. This issue will be important for future MRT projects in Thailand. Thus, the MRTA and BMCL have to study further on this issue.

##### 3) Enhancement of Safety

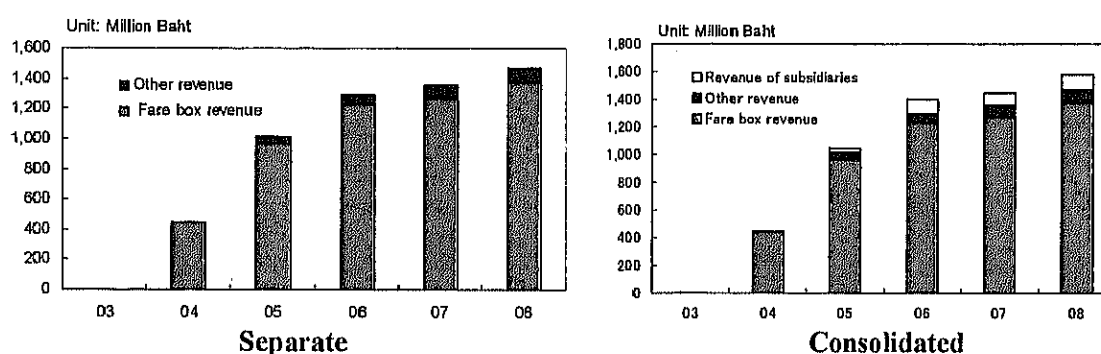
As a countermeasure to a collision accident, BMCL carried out the re-training of the drivers. As already expressed, poor facilities or equipment is considered to be one of the causes behind the accident since a human error could be avoided if facilities or equipment perfectly worked. An accident tends to occur at a weak point of the railway system. If there is no improvement of facilities or equipment, an accident may occur again. Therefore, the Study Team recommends MRTA/BMCL to examine the countermeasures against accidents also in the field of facilities /equipments.

## (4) Analysis of Financial Position

During the first field survey in Thailand, the Study Team collected the annual reports of BMCL during the period from 2003 until 2008. BMCL has three subsidiaries companies. Therefore, BMCL publishes consolidated and separate financial statements.

## a. Income Statement

BMCL officially started operation in August 2004. The growth of revenue in 2005 and 2006 was rather high. However, the growth of revenue in 2007 and 2008 was rather decelerated. The average annual revenue growth rate during the period from 2005 until 2008 was 14.7% on a consolidated basis. Fare box revenue was 1578.7 million baht, in 2008 on a consolidated basis, which accounted for 87.1% of total revenue. The breakdown of revenue is shown in the following table. Among other revenues, revenue from advertising services has the largest share of 7.25%. In addition, revenue from telecommunications services increases rapidly in 2008.



Source: BMCL

Figure 2.5-1: Revenue Trend of BMCL

Table 2.5-9: Breakdown of Revenue of BMCL Group

Type of Revenue	Operated by	2006		2007		2008	
		Revenue (Mil. Baht)	Share (%)	Revenue (Mil. Baht)	Share (%)	Revenue (Mil. Baht)	Share (%)
Revenue from train operations	BMCL	1,229.50	87.89	1,270.41	87.87	1,374.59	87.07
Revenue from advertising services	Triads Networks	101.62	7.26	103.86	7.18	114.46	7.25
Revenue from telecommunications services	BMCL Network	-	-	11.96	0.83	48.92	3.1
Revenue from retail space leases	Metro Mall Development	23.02	1.65	17.32	1.2	19.27	1.22
Revenue from ATM and public telephone services	BMCL	20.41	1.46	20.29	1.4	17.29	1.09
Other income	BMCL and its subsidiaries	24.39	1.74	21.99	1.52	4.19	0.27
<b>Total</b>		<b>1,398.94</b>	<b>100</b>	<b>1,445.83</b>	<b>100</b>	<b>1,578.72</b>	<b>100</b>

Source: BMCL

During the last five years, the total expenses continued to largely exceed the total revenues. BMCL recorded a loss before finance cost and corporate income tax every year. The loss before finance cost and corporate income tax was equal to 37.0% of total revenues in 2007 and 31.7% in 2008. Financial cost was also huge, equal to more than 60% of total revenues. Therefore, BMCL has continued to report a huge net loss every year. Net loss in 2008 was 1,457.0 million baht, equivalent to 92.3% of total revenues.

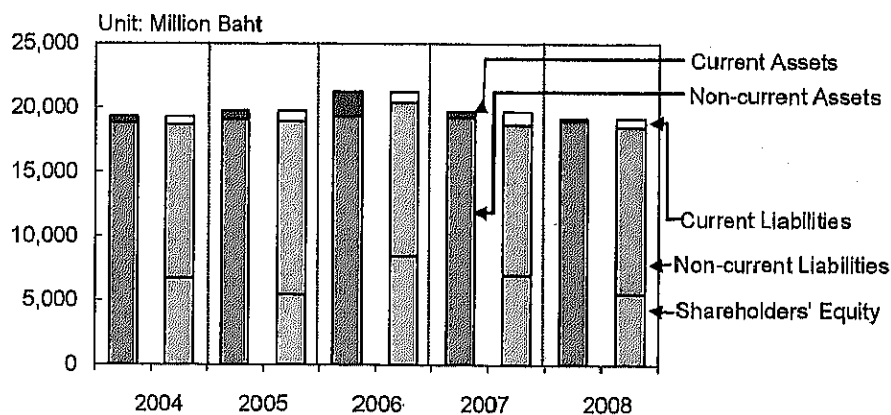
**Table 2.5-10: Income Statement of BMCL: Consolidated**

	Unit: Million Baht				
	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

Source: BMCL

#### b. Balance Sheet

Total assets of BMCL on a consolidated basis were 19,187.6 million baht as of December 31, 2008 compared with 19,705.3 million baht in the previous year. Total liabilities increased from 12,737.4 million baht in 2007 to 13,680.7 million baht in 2008. On the contrary, shareholders' equity decreased from 6,967.8 million baht in 2007 to 5,506.9 million baht in 2008. The decrease in total assets was mainly due to a decrease in cash and cash equivalents and amortization of projects costs. On the credit side, a huge deficit was offset by an increase in long-term loans. BMCL's shareholders' equity significantly increased in 2006 because of issuance of shares. However, it has continued to decrease due to successive deficit in the following period.



Note: As of the end of year.

Source: BMCL

**Figure 2.5-2: Balance Sheet of BMCL (Consolidated)**

The major item of assets is “project cost” in non-current assets, which accounted for 96.7% of total assets as of the end of December 2008. The breakdown of net project cost was as shown in the following table.

**Table 2.5-11: Breakdown of Project Cost of BMCL (Consolidated)**

	2004		2006		2008	
	Amount (Mil. Baht)	Share (%)	Amount (Mil. Baht)	Share (%)	Amount (Mil. Baht)	Share (%)
M&E Equipment	11,949	64.3	12,381	65.2	12,470	64.2
Project management fees per agreement	2,464	13.3	2,464	13.0	2,464	12.7
Consultant fees	601	3.2	607	3.2	607	3.1
Depot building and administration building	1,255	6.8	1,256	6.6	1,257	6.5
Interest expenses	1,265	6.8	1,265	6.7	1,265	6.5
Others	1,040	5.6	1,011	5.3	1,353	7.0
Total	18,574	100.0	18,984	100.0	19,416	100.0
Less: Accumulated amortization of Project costs	-125		-453		-866	
Project costs, net	18,449		18,530		18,550	

Source: BMCL

Among the total liabilities, long-term loans and accrued interest, and long-term loans from shareholder and accrued interest account to 92.1%. BMCL raised funds in December 2001 under the long-term loan agreement with a group of four commercial banks. The amount of long-term loan was 11,000 million baht for the payment of project costs. The interest rate is 7.75% for the first 2 years from the date of the agreement, MLR+0.25 for the third year until the project completion date<sup>15</sup>, and MLR after the project completion date. Repayment conditions were quarterly installments from March 2006 until December 2016. Thereafter, BMCL was granted an extension of the grace period for repayment of the principal until December 2012. The modified repayment period is from March 2013 until December 2024. The balance of long-term loan and accrued interest was 10,780.2 million baht as of December 2008.

BMCL has made the sponsor support agreement for liquidity support with three major shareholders, i.e., CH. Karnchang Public Company Limited, Natural Park Public Company Limited, and Hicrete Products & Technology Co., Ltd., according to the sponsor support agreement. The balance of long-term loans from CH. Karnchang Public Company Limited, and its accrued interest from was 1,821.6 million baht as of December 31, 2008 on a consolidated basis.

### c. Financial Ratios

The trend of BMCL’s major financial ratios is as shown in the following table. The current ratio drastically improved in 2006 due to the offering of shares. However, this ratio tended to significantly decrease since then. Since the fixed assets capitalization ratio is around 100%, long-term project costs are covered with long-term funds. Net loss before interest payment has

<sup>15</sup> As of end of March, 2009, MLR of Bangkok Bank, largest commercial bank in Thailand, was 6.00%.

been minus and debt service coverage ratio has also been minus. Therefore, ratios regarding profitability, return on assets and return on equity, have continued to be minus. These indicators show that BMCL does not have a capacity to pay installments and interests of long-term loans. In addition, BMCL needs to raise funds through loans and/or share issuing to finance operating deficit at the moment.

**Table 2.5-12: Key Financial Ratios of BMCL**

Ratio	2004	2005	2006	2007	2008
Current ratio	78.0%	76.6%	218.7%	44.9%	27.4%
Fixed ratio	279.5%	351.9%	228.8%	275.7%	344.7%
Fixed assets capitalization Ratio	100.6%	100.8%	94.8%	103.0%	102.7%
Debt Service Coverage Ratio (DSCR)	-0.61	-0.53	-0.37	-0.36	-0.35
Assets turnover	-	0.023	0.051	0.068	0.074
Return on assets	-	-5.0%	-8.4%	-8.2%	-7.6%
Return on equity	-	-16.1%	-24.9%	-21.8%	-23.8%
Debt to Equity Ratio	1.87	2.64	1.52	1.83	2.48

Source: Calculated by the Study Team based on the financial statements of BTSC.

#### d. Change in Share Capital

BMCL was established on February 18, 1998 with an initial registered capital of one million baht and was converted to a public limited company on May 11, 2004.

**Table 2.5-13: Shares of Major Shareholders**

Shareholder		Unit: %			
		2006 Jan	2006 Sep	2007 Mar	2008 Apr
Mass Rapid Transit Authority of Thailand		-	25.00	25.00	25.00
CH. Karnchang Public Company Ltd.	CH. Karnchang Group	28.23	15.80	24.61	24.61
Bangkok Expressway Public Company Ltd.		18.89	9.99	11.93	11.93
Hicrete Products & Technology Co., Ltd.		-	-	-	6.68
Kim Eng Securities Pte. Ltd.		-	-	-	4.85
Krung Thai Bank Public Company Ltd.		9.48	-	-	3.94
Mahasiri Siam Company Ltd.	CH. Karnchang Group	11.91	3.68	6.88	3.68
Natural Park Public Company Ltd.	Natural Park Group	13.94	8.92	6.86	3.38
Syntec Construction Public Company Ltd.	Natural Park Group	4.81	3.08	3.08	3.08
TMB Bank Public Company Ltd.		4.81	2.00	2.30	2.12
Merrill Lynch International		-	-	3.97	-
Krung Thai Bank Public Company Ltd.	Krung Thai Bank Group	-	3.94	3.94	-
Nomura Singapore Ltd.		-	-	0.84	-
Siam City Bank Public Company Ltd.		2.30	0.96	-	-
Tokyu Construction Company Ltd.		1.31	0.84	-	-
Transit Expert Company Ltd.	CH. Karnchang Group	0.12	0.08	-	-
The Krung Thai Thana Wattana Fund	Krung Thai Bank Group	0.07	-	-	-
Others		4.13	25.71	10.59	10.73
Total		100.00	100.00	100.00	100.00

Source: BMCL

The value of registered stock was 6.8 billion baht at the beginning of 2003. With newly paid-up share capital of 3.0 billion baht during 2003, the issued and paid-up share capital at the end of 2003 was 6.4 billion baht. At the end of 2004, BMCL's issued and paid-up capital increased to 7.25 billion baht because of capital increase and call for share payment. In 2004, the par value of an ordinary share decreased from 100 baht to 1 baht. Therefore, the number of issued and paid-up shares increased from 64.0 million at the end of 2003 to 7,250 million at the end of 2004. In 2005, the issued and paid-up share capital increased to 7.35 billion baht by the allocation of additional ordinary shares to the existing shareholders at a price of 3 baht.

On September 21, 2006, BMCL was listed on the Stock Exchange of Thailand. BMCL made a public offering of 1,315.8 million additional shares at a price of 1.31 baht per share. BMCL's shares are registered in the transportation & logistics sector of the Stock Exchange of Thailand. At the same time, 2,987.5 million ordinary shares (25% of the issued and paid-up capital) were allocated and offered to the Mass Rapid Transit Authority of Thailand at the par value of 1 baht. As at December 31, 2008, the registered capital and paid-up capital of BMCL are 11,950 million baht with par value of 1 baht each.

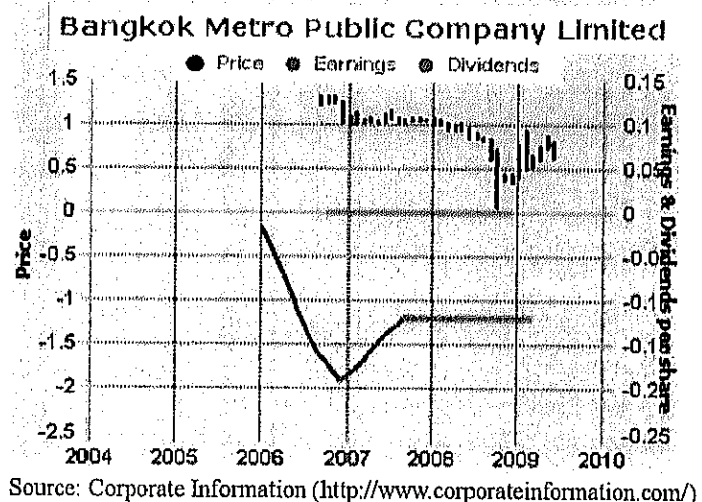


Figure 2.5-3: Share Price of BMCL

## (5) Non-rail Business of BMCL

### a. Provisions of Non-rail Business in Concession Agreement

#### 1) Right of Commercial Development

In the concession agreement between MRTA and BMCL ("8.2 Commercial Development Rights"), BMCL is granted the right to exclusively undertake Commercial Development including advertising, leasing, such as retail outlets and other commercial activities in all 18 stations as well as cars provided that the Commercial Development in the form of retail outlets shall be allowed in the thirteen 13 designated stations.

As for Lat Phrao Park and ride facilities, BMCL has the right to exclusively undertake commercial development only in the underground areas. The parking building management and maintenance are under the responsibility of the MRTA.

#### 2) Concession Fee of Commercial Development

In the concession agreement between MRTA and BMCL ("8.5 Payment of Remuneration to the MRTA"), BMCL should pay the following concession fees for commercial development to MRT:



**i) Annual Remuneration:**

930 million baht (inclusive of value added tax) through the contract period consists of: 10 million baht per year from the 1st - 8th years of Revenue Service; and 50 million baht per year from the 9th - 25th years of Revenue Service.

**ii) Percentage Remuneration**

7% per annum inclusive of value added tax from Revenue Service commencement year until the end of Contract Period

**b. Types of Non-rail Business**

BMCL receives gains from commercial development in addition to fares. Revenue from commercial development consists of two categories, i.e., direct business by BMCL and business by BMCL's subsidiaries.

**1) Direct Business**

BMCL directly executes business with other companies by granting the following rights:

- ATM service in all 18 stations to 7 commercial banks;
- Public telephone service to True Corporation Public Company Limited;
- Procurement and/or production of advertising media on Platform Screen Doors in all 18 stations to How Come Media Co., Ltd.;
- Procurement and/or production of advertising banners on the hand grip media in 19 trains, by granting the rights to Ambient Media Co., Ltd.

**2) Business by Subsidiaries**

BMCL has granted the following rights to the Subsidiaries:

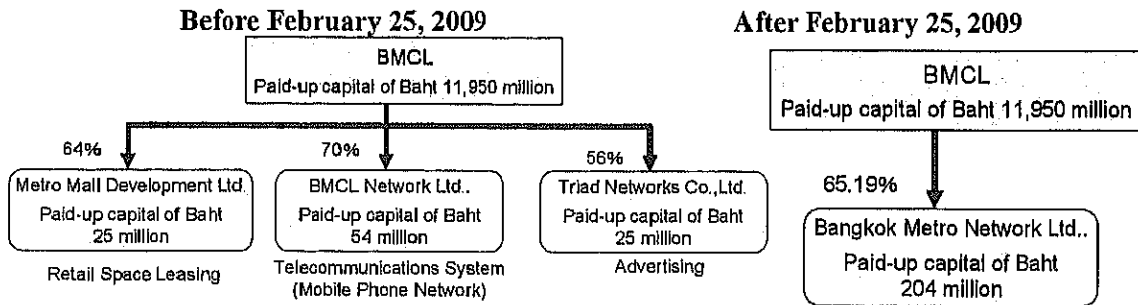
- Procurement of image advertisement signboards to Triads Networks Company Limited;
- Management of retail spaces to Metro Mall Development Limited; and
- Service and maintenance of telecommunications system equipment to BMCL Network Limited.

In return, BMCL has received a revenue sharing before deduction of expenses, as well as dividends from the Subsidiaries.

On February 25, 2009, Bangkok Metro Networks Limited was incorporated to combine the subsidiaries' businesses with the purposes of minimizing operating costs and enhancing the competitiveness. The business of Bangkok Metro Networks consists of the followings:

- i) To provide space rental for retail shops in 11 stations and spaces in the basement level of the Lat Phrao park and ride facility. At Present, the company operates 4 retail shops in Sukhumvit station, Phahon Yothin Station, Chatuchak Park Station and Kamphaeng Phet Station
- ii) To manage the advertising panels (e.g., advertising light boxes and stickers) in the 18 stations and 19 trains with operations in the train network

iii) To provide and maintain the telecommunication system and equipment in each station.



Source: BMCL

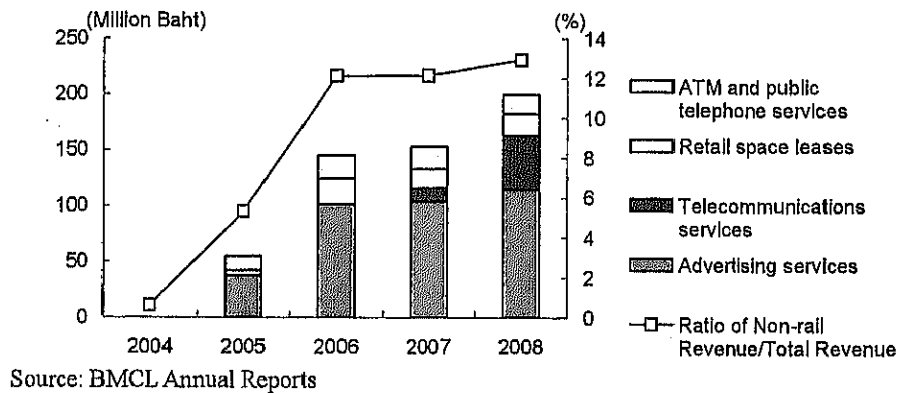
Figure 2.5-4: Subsidiaries of BMCL

Metro Mall Development was a joint venture with Ch. Karnchang PCL to handle the retail trading inside MRTA Subway station areas.

Triads Networks (former Radianz Communications Network Limited) was a joint venture between BMCL and Yimwilai family (44% shareholding). In 2004, the concession contract was modified, advertisement in the train tunnels was removed and contract period was shortened from 25 years to 10 years. BMCL explained that How Come Co Ltd, established by Mr. Panthongtae Shinawatra, offered the higher prices for advertising. BMCL and Triads Networks agreed to revise the sole advertising concession for BMCL.

c. Revenue of Non-rail Business

The revenue from commercial development significantly increased in FY2006. However, it has not shown a significant increase in the following years. In FY2008, the revenue from commercial development occupies 12.9% of total revenue. Among revenue from commercial development, revenue from advertising accounts for 57.2%, followed by telecommunications services (24.5%), retail space leases (9.6%), and ATM and public telephone services (8.6%).



Source: BMCL Annual Reports

Figure 2.5-5: Non-rail Business Revenue of BMCL

d. Concession Payment to MRTA

BMCL paid 13.6million baht in 2007 and 15.4 million baht in 2008 as remuneration from commercial development revenue according to the concession contract. According to the annual

reports of MRTA, MRTA received concession fees from BMCL from commercial development as shown in Table 2.5-14.

When BMCL invested in subsidiaries to operate commercial development, MRTA and BMCL negotiated the revenue sharing of subsidiaries' businesses. MRTA demanded a revenue share higher than the 7% of total revenues of three subsidiaries<sup>16</sup>. MRTA agreed to receive 7% from BMCL's revenue from commercial development including revenue from subsidiaries. The subsidiaries pay 25% of revenue of the 1st - 5th year, and 35% from that of the 6th -10th year.

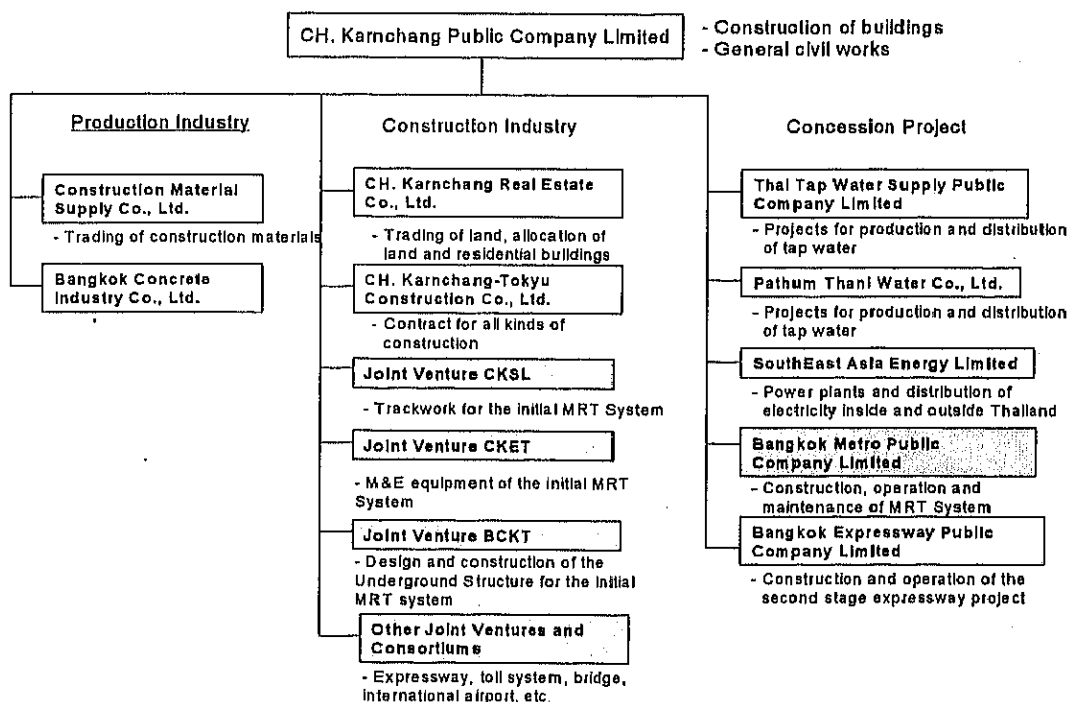
**Table 2.5-14: MRTA's Receipt of Concession Fees from Commercial Development**

Item	2005	2006	2007
Percentage Remuneration from Commercial Development (Operation Year)	10.37	9.34	9.35
Percentage Remuneration from Commercial Development (7%)	0.74	3.83	3.67
Total	11.11	13.17	13.02

Source: MRTA Annual Reports

**e. Parent Company of BMCL**

CH. Karnchnag Group is the main shareholder of BMCL. CH. Karnchang Public Company Limited (CH. Karnchang) was incorporated as a limited company in November, 1972 to engage in general construction business, i.e., construction of buildings and general civil works. CH. Karnchang was listed on the Stock Exchange of Thailand in 1994. Other than the construction business, CH. Karnchang engages in concession business operation of basic infrastructure, such as hydroelectric power production, tap water production, etc.



Source: CH. Karnchang Public Company Limited

**Figure 2.5-6: Simplified Organization Chart of CH. Karnchnag Group**

<sup>16</sup> Bangkokpost, Feb 21, 2005

CH. Karnchang engaged in the construction works of the MRTA Initial System Project, Chaloem Ratchamongkhon Line.

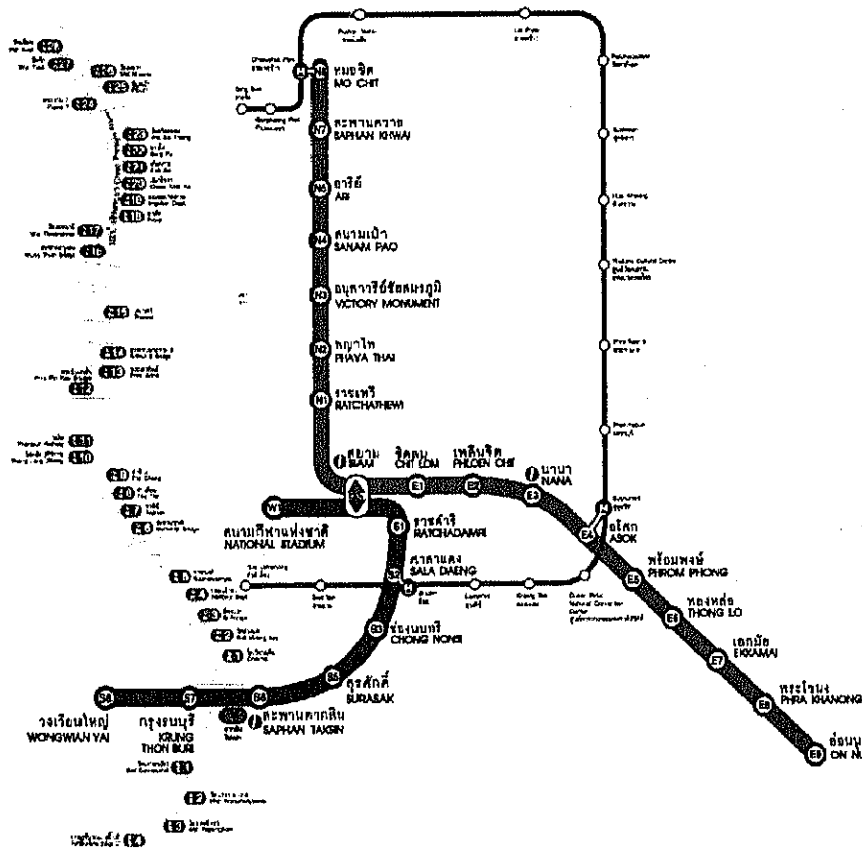
### 2.5.2 Review of SkyTrain

#### (1) Outline of Line

The SkyTrain system was officially opened in December, 1999. The SkyTrain is operated by the Bangkok Mass Transit System Public Company Limited (BTSC) under the concession form the Bangkok Metropolitan Authority (BMA). BTSC now operates two lines: Sukhumvit Line from Mo Chit station to On Nut station and Silom Line from National Stadium station to Wongwian Yai station. Two lines interchange at Siam station.

During the financial year from April 2007 to March 2008, the total ridership of SkyTrain was 133.1 million trips and average weekday ridership was 414,595 trips.

BMA has commenced the construction of the Silom Line extension to the south and the Sukumvit Line to the east, fully funded by BMA for civil infrastructure and electrical & mechanical works excluding rolling stock.



Source: BTSC (<http://www.bts.co.th>)

Figure 2.5-7: Map of SkyTrain

**(2) Financial Framework**

The concession contract was signed between the Bangkok Metropolitan Administration (BMA) and the Bangkok Mass Transit System PCL (BTSC) for the construction and operation of the BMA Transit System on April 9, 1992.

**a. Type of Concession**

A BTO method was adopted for civil works, and a BOT method for the electrical & mechanical works. BMA was responsible for land acquisition and utility diversions and BTSC was responsible for financing and construction of all other project components including operations. Civil works were determined to be transferred to BMA after construction on a BTO basis. The electrical and mechanical works were to be transferred to BMA at the end of concession.

**b. Concessionaire**

The concessionaire was the Bangkok Mass Transit System PCL (BTSC).

**c. Concession Period**

The concession period was 30 years from the first day of the commercial operation.

**d. Major Items in the Contract**

a) Revenue sharing:	No revenue sharing
b) Commercial development of land:	Little land included except Right-of-Way
c) Technology transfer	Not referred
d) Cooperation with other transit system	Not referred
e) Concession extension	To be notified by BTSC between 3-5 yrs before expiration
f) Line extension/system expansion	BTSC has the first refusal right to negotiate with BMA for new routes
g) Variations	Not referred
h) Performance	Not referred
i) Tributary	BMA supports vacating/accepting passengers of Sky Train, "including operation of supplemental system such as minibus."

**(3) Review of Operation and Service****a. Current Operation Status****1) Outline**

As well as Blue Train, Sky Train has obtained its position as an indispensable traffic mode for Bangkok citizens. The areas along SkyTrain have been developed and SkyTrain transports passengers by linking sub city centers.

**2) Ridership and Fare Revenue**

Ridership has been increasing year by year. At peak hour, a lot of passengers use Sky Train. Trains are much crowded on the peak section between Silom and Sukhumvit.

Fare revenue has been increased in line with the increase in ridership.

Table 2.5-15: Yearly Ridership per Day of BTSC

Year	Working day		Overall	
	Passengers	Index*	Passengers	Index*
2000	176,246	100	161,146	100
2001	243,507	138	217,133	135
2002	300,683	171	264,360	164
2003	328,852	187	287,140	178
2004	370,547	210	324,561	201
2005	411,437	233	361,335	224
2006	434,813	247	379,600	236
2007	414,595	235	363,737	226
2008	425,076	241	372,438	231

Note: \* The number of passengers in 2000 = 100

Source: BTSC Annual Reports

Table 2.5-16: Yearly Fare Revenue of BTSC

Year	Million Baht	Index*
2000/01	1,392	100
2001/02	1,779	128
2002/03	2,116	152
2003/04	2,284	164
2004/05	2,562	184
2005/06	2,807	202
2006/07	3,063	220
2007/08	3,221	231
2008/09	3,288	236

Note: \* Fare revenue of 2000/01 = 100

Source: BTSC Annual Reports

### 3) Safety

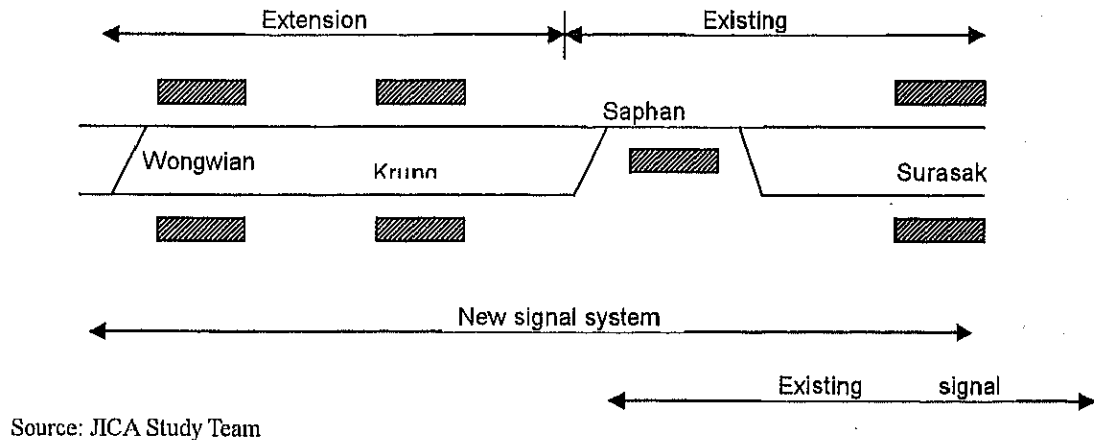
According to BTSC annual reports, passenger injuries were reported only in year 2004. The figure is 0.017 per million passenger trips. In this year, yearly ridership was 1,698 million trips. From these data, about 30 ( $=0.071 \times 1,698$ ) people were injured by some incidents in 2004. Basically, train operation without incidents is required to the urban railway operators. Though the safety level of BTSC seems high, BTSC is still required to enhance safety by studying "What BTSC acquired a lesson for enhancement of safety through these incidents?"

### 4) Extension of BTSC

On May 15, 2009, the extension section of Sky Train was opened. On this section, Communication Based Train Control system of which specification is quite different from the existing one was installed. In the morning of the second day, an incident happened, but basically this signal system conversion was successfully completed.

Previously, the headway of this line was 3 minutes 21 seconds, but after the extension, the headway extends to 4 minutes 50 seconds, and the travel time was also extended for more than one minute. This was caused by a single track layout of Saphan Taksin station located between the extension section and the existing section.

BTSC will replace the existing three-car train-sets to the new four-car train-sets in 2009 to make up the extension of headways, and the replaced train-sets will be transferred to Sukhumvit Line for congestion mitigation. Of course, BTSC is discussing with BMA the modification of track layout of Saphan Taksin station.



Source: JICA Study Team

Figure 2.5-8: Track Layout of Extension Section of Silom Line

## b. Current Status of Operation Efficiency

### 1) Train Operation

The total number of drivers for two lines is 180 and the number of drivers on duty per day is 110. The average train-km per driver is 65.7km per day as expressed in the Table 2.5-4. This figure is smaller than that of BMCL, but this is almost same with those of Japanese metros. Hence, the Study Team considers that the work efficiency of BTSC has no problem to be raised.

### 2) Maintenance

BTSC holds 107 staff members for maintenance. BTSC takes charge of civil works, automatic fare collection (AFC) system maintenance. The maintenance of E & M is subcontracted to Siemens. BTSC fulfills a role of contract supervision regarding E&M maintenance.

The cost of maintenance works by foreign contractors tends to be high. BTSC has been obliged to place an order to Siemens for maintenance works since the start of operation. BTSC could not maintain its equipments by itself because the supplier did not agree to disclose the information required for maintenance tasks.

BTSC has recently changed a contractor of AFC because a new contractor had promised BTSC to transfer the knowledge of AFC maintenance to BTSC. BTSC has also changed the contractor of rolling stock from Siemens to new one under the situation same as AFC. The reduction of AFC maintenance cost is estimated at 30%. Therefore, it is expected that the cost of maintenance works to be soon decreased when the new maintenance scheme is established.

### c. Current Status of Service Level

#### 1) Customer Satisfaction

Table 2.5-17 shows the survey result of customer satisfaction. Scores of all the items exceeded the target.

The Study Team considers that these results basically correspond to the Study Team's evaluation of service level based on hand-on boarding on SkyTrain.

**Table 2.5-17: Survey Result of Customer Satisfaction**

Item	Target	2004	2005	2006	2007	2008
Security & Safety	3.50	4.10	3.93	4.11	4.12	4.09
Punctuality (service reliability)	3.50	3.91	3.84	3.97	4.01	4.13
Station facilities	3.50	3.82	3.84	3.97	4.02	4.10
Staff attitude & manner	3.50	3.87	3.80	3.79	3.78	3.90
Value for Money	3.50	3.67	3.72	3.77	3.72	4.11
Overall	3.50	4.01	3.98	3.94	3.97	4.12

Source: BTSC

#### 2) Number of Train Operation

The passenger number of Sky Train has been gradually increasing year by year. Therefore, the ratio of actual number of passengers to the train capacity at peak time zone was surveyed. As the following table indicates, there is still place to absorb more passengers even at peak time zone, but BTSC has already decided the introduction of 12 new four-car train-sets in order to respond to the increasing number of passengers and the increase of travel time of train-sets due to line extensions.

**Table 2.5-18: Capacity and Actual Number of Passengers at Peak Time Zone**

Lines		Sukhumvit	Silom
Number of Trains per Hour	A	23	18
Capacity per Hour	B	19,618	15,421
Actual Number of Passengers per Hour	C	16,753	11,163
Ratio	D=C/B	85%	72%

Source: BTSC

#### 3) Availability

Regarding the availability, the following data is available from the annual report of BTSC. The figure of train delay in 2007 was under the target. The annual report of BTSC says that in 2007 train delays were brought about by some troubles at the morning peak time due to the general aging of rolling stocks. Nowadays BTSC maintains its facilities and rolling stock with intensive and continuous improvement of maintenance. Train km per fault in 2007 increased from the previous year by 21%. It is expected that train delay due to train fault will soon decrease.



Table 2.5-19: Yearly Result of Indicators of Availability

Year	Trip number per a train delay equal to or more than 5 minutes	Train km per fault
	More than 1,000 trips	Not less than 45,000 km
2001	1,044	19,655
2002	1,505	36,323
2003	1,579	44,607
2004	1,698	56,623
2005	1,503	42,837
2006	1,796	42,891
2007	1,079	51,873
2008	960	41,282

Source: BTSC Annual Reports

#### d. Issues to Be Tackled

BTSC has started to tackle with issues required to establish the sound train operation as follows:

- a) To increase the efficiency in operation and maintenance;
- b) To increase the train-capacity by increasing the number of cars in a train-set; and
- c) To improve the track layout of Saphan Taksin station.

#### (4) Analysis of Financial Position

##### a. Income Statement

Net fare box revenue increased from 1,392 million baht in 2000/01 to 2,318 million baht in 2003/04, and to 3,288 million baht in 2008/09. Net fare box revenue recoded an average annual growth rate of 13.2% during the period from 00/01 until 03/04 and 9.72% during the period from 03/04 until 06/07. However, the annual growth rate was decreased to 5.2% in 07/08 and 2.1% in 08/09. Revenue from non-rail business, i.e., revenue from advertising and merchandising space rental and from utility services, showed a favorable growth of 13.1% during the period from 03/04 until 08/09.

On the other hand, cost of fare box and selling and administrative expenses including directors' remuneration grew rather modestly at the average annual rate of 3.1% during the period from 03/04 until 08/09. Therefore, BTSC continued an increase of operating profit since 04/05 when BTSC suffered high maintenance contract fees.

The size of net interest expense continued to be much larger than profit from operation. This is the major factor which made BTSC's business unprofitable.

Major items of non-operating income and expenditures were related to gain and loss due to a change in exchange rate, a re-assessment of BTSC's asset value, and the rehabilitation plan.

Table 2.5-20: Income Statement of BTSC

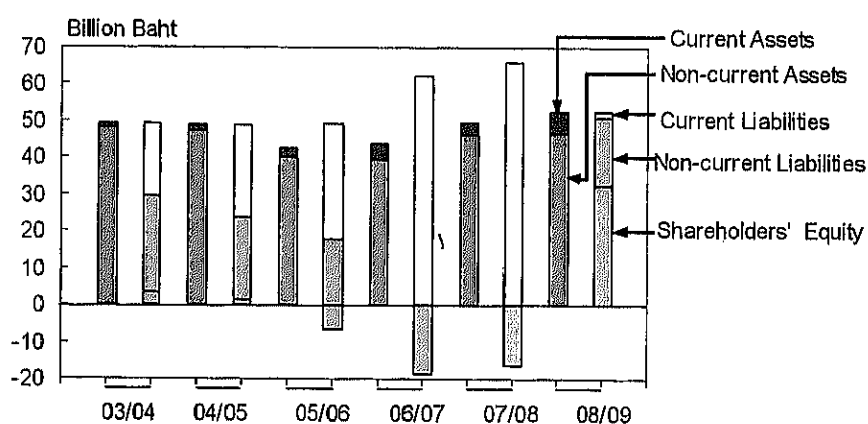
Unite: Million Baht

	03/04	04/05	05/06	06/07	07/08	08/09
Fare box revenue - net	2,318	2,562	2,807	3,063	3,221	3,288
Other income	186	260	263	277	340	821
Of which revenue from non-rail business	199	215	228	248	309	370
Costs of fare box	-1,896	-2,808	-1,749	-1,769	-1,899	-2,108
Selling and administrative expenses	-383	-422	-603	-380	-527	-545
Operating Profit/(Loss)	225	-407	717	1,191	1,135	1,457
Non-operating income	2,332	217	249	579	4,689	29
Non-operating expenditure	0	0	-6,335	-10,401	-9	0
Earnings before interest	2,557	-190	-5,368	-8,631	5,815	1,486
Net interest expense	-1,635	-1,770	-2,657	-3,368	-3,415	-1,930
Gain on debt restructuring	0	0	0	0	0	22,447
Net Profit	922	-1,959	-8,025	-12,000	2,400	22,003

Source: BTSC

### b. Balance Sheet

The financial structure of BTSC drastically changed in 06/07 when the company proposed the rehabilitation plan for debt restructuring. During the financial year 06/07, two major changes in accounting processing were made. Firstly, most of liabilities were moved to the account of creditors per rehabilitation plan as current liabilities. Secondly, par value of ordinary share was reduced from Baht 10 per share to Baht 1 per share. Due to the progress capital restructuring and debt restructuring according to the rehabilitation plan after October 2008, the balance sheet of BTSC drastically improved. The capital deficit was resolved, and the financial ratios were also improved.



Source: BTSC

Figure 2.5-9: Balance Sheet of BTSC

The major item of assets is “project cost” in non-current assets, which accounted for 82.4% of total assets as of March 31, 2009. The breakdown of net project cost was as shown in the following table.

Table 2.5-21: Breakdown of Project Cost

Items	March 31, 2004		March 31, 2009	
	Amount (Million Baht)	Share (%)	Amount (Million Baht)	Share (%)
Right to use of civil works transferred to authorities	20,060	40.1%	20,211	40.6%
Electrical and mechanical works	23,817	47.6%	23,981	48.2%
- Rolling stock	8,855	17.7%	8,855	17.8%
- Other machinery and equipment	14,961	29.9%	15,125	30.4%
Other project costs	5,454	10.9%	5,454	11.0%
Items awaiting for transfer	705	1.4%	132	0.3%
Total gross project cost	50,035	100.0%	49,778	100.0%
Accumulated amortization and allowance for diminution in value	3,192	-	7,657	-
Net project cost	47,636	-	42,120	-

Source: BTSC

The changes in liabilities and shareholders' equity are shown in the following table.

Table 2.5-22: Liabilities and Shareholders' Equity of BTSC

		Unit: Million Baht					
Item		03/04	04/05	05/06	06/07	07/08	08/09
Current liabilities	Creditors per rehabilitation plan	0	0	0	59,197	59,197	0
	Accounts payable	2,350	3,595	4,219	408	812	193
	Accounts payable - related parties	0	0	33	34	40	13
	Current portion of long-term loans	9,850	13,225	17,595	0	0	0
	Current portion of finance lease liabilities	0	0	0	5	5	4
	Current portion of liabilities under rehabilitation plan	0	0	0	0	0	1,094
	Loan from shareholders	275	275	275	0	0	0
	Other current liabilities	7,456	7,961	9,090	2,624	5,949	336
Total	19,931	25,056	31,212	62,269	66,003	1,640	
Non-current liabilities	Finance lease liabilities - net current portion	0	0	0	13	7	3
	Liabilities under rehabilitation plan - net of current portion	0	0	0	0	0	13,627
	Unsubordinated convertible bonds - liability component	0	0	0	0	0	4,958
	Long-term loans - net of current portion	22,569	19,037	14,498	0	0	0
	Loan from contractor	356	353	350	0	0	0
	Subordinated convertible debentures	2,740	2,740	2,740	0	0	0
	Liabilities from related party	396	396	396	0	0	0
Total	26,061	22,526	17,985	13	7	18,589	
Share-holders' equity	Share capital	12,159	12,159	12,159	1,216	1,216	10,058
	Share premium	2,773	2,773	2,773	0	0	16,639
	Unsubordinated convertible bonds - equity component	0	0	0	0	0	1,089
	Deficit	-11,594	-13,553	-21,579	-19,862	-17,462	4,541
	Total	3,337	1,378	-6,647	-18,647	-16,247	32,327

Source: BTSC

Major items of liabilities before the implementation of rehabilitation plan were long-term loans, subordinated convertible debentures and accrued interests. BTSC procured funds for the

MRT project under the loan agreements and issuance of debentures. Original amounts of long-term loans and debentures are as shown in the following table.

**Table 2.5-23: Original Long-term Loans and Debentures for the Project**

Type	Currency	Conditions and Lenders	
Loans	Domestic Currency	Amount	Baht 12.42 billion
		Lenders	A group of domestic lenders led by the Siam Commercial Bank Public Company Limited
		Interest rate	MLR + 1.25% per annum due monthly
	Foreign Currency	Amount	US\$689.7 million
		Lenders	Foreign lenders led by KfW and IFC
		Interest rate	LIBOR + 2.375% per annum due semi-annually
	Foreign Currency	Amount	US\$6.0 million (Siemens, contractor, arranged this subordinated loan)
		Lender	KfW
		Interest rate	LIBOR + 2.375% per annum due semi-annually
Bonds	Subordinated convertible debentures	Amount	Baht 2.74 billion (17.34 million debentures at par value of Baht 158 for each debenture)
		Interest	Zero coupon
		Conversion price	Baht 15.80 per one ordinary share (10 ordinary shares per one debenture)
		Issuance date	November 11, 1996
		Maturity	November 11, 2012

Source: BTSC

At the start of rehabilitation plan, long-term loans were moved to “Creditors per rehabilitation plan” account in the current liabilities in 06/07. However, due to the implementation of rehabilitation plan, liabilities to be repaid over years were moved to the non-current liabilities.

The shareholders’ equity turned from negative to positive as the results of the issuance of shares to new investors and share premium from debt to equity swap in 08/09.

### c. Financial Ratios

The trend of BTSC’s major financial ratios is as shown in the following table. Because BTSC were in a difficult financial position as mentioned above, the company could not satisfy the financial ratios stipulated in the loan agreements. However, because of the rehabilitation plan, key financial ratios such as current ratio and fixed ratio were significantly improved.

**Table 2.5-24: Key Financial Ratios of BTSC**

	03/04	04/05	05/06	06/07	07/08	08/09
Current ratio	6.3%	6.3%	7.3%	6.5%	5.4%	364.3%
Fixed ratio	1440.5%	3438.0%	-605.7%	-212.2%	-284.2%	144.1%
Fixed assets capitalization Ratio	163.5%	198.2%	355.1%	-212.3%	-284.4%	91.5%
Debt Service Coverage Ratio (DSCR)	1.57	-0.09	-2.00	-2.46	1.69	0.81
Assets turnover	0.10	0.06	0.07	0.09	0.18	0.08
Return on assets	1.9%	-4.0%	-17.5%	-27.8%	5.1%	43.0%
Return on equity	21.7%	-83.1%	304.6%	94.9%	-13.8%	273.7%

Source: Calculated by the Study Team based on the financial statements of BTSC.

#### d. Rehabilitation Plan

BTSC had been in a difficult financial situation until the Central Bankruptcy Court approved the debt restructuring plan in October 2008, because BTSC had become insolvent due to a huge burden of installment and interest payment. While the first installments of long-term loans were due in July 2002, BTSC could not pay to creditors.

BTSC filed a request to the Central Bankruptcy Court for a business rehabilitation of BTSC upon the approval by the Central Bankruptcy Court on July 7, 2006, BTSC started negotiations with creditors for its business rehabilitation plan. A business rehabilitation plan which BTSC presented to a meeting of creditors was accepted on December 22, 2006 and the Central Bankruptcy Court approved BTSC's rehabilitation plan on January 31, 2007. On October 29, 2008, the Central Bankruptcy Court ordered the termination of the business rehabilitation.

Capital restructuring taken for the business rehabilitation were as follows<sup>17</sup>:

- 1) Reduction of registered capital by canceling the un-issued portion.
- 2) Reduction of paid-up capital to offset with deficit by reduction the par value of Baht 10 per share to Baht 1 per share. BTSC registered the change in the par value of its shares with the Ministry of Commerce on February 23, 2007. As the results, the paid-up share capital decreased from 12,158.7 million Baht on March 31, 2006 to 1,215.9 million Baht on March 31, 2007.
- 3) Debt to equity swap at a conversion ratio of Baht 15.8 to 1 ordinary share (per value of Baht 1). The 1,034.1 million ordinary shares were issued to convert debt to equity.
- 4) Issuance of convertible bonds. On October 8, 2008, BTSC issued and offered zero coupon convertible bonds with a total value of 11,643 million Baht.
- 5) Issuance of 1,986.5 million ordinary shares to new investors for future business plan at a price of 1.6 Baht each.

Debt restructuring was implemented in parallel with capital restructuring. The BTSC's debts were 67,751 million baht, consisting of 16,469 million baht for secured creditors, 46,080 million baht for unsecured creditors, and 5,203 million baht for creditors receiving settlement under existing contracts. Among the total of 67,751 million baht, the amount of 8,554 million baht was considered to have no legal obligations and future obligations. The adopted debt restructuring was as shown in the following table.

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<sup>17</sup> BTSC Annual Report for 2008/09

Table 2.5-25: Method of Debt Restructuring

Type of Credit	Measure
<b>Secured creditors</b>	
1) Financial institutions	To be repaid in the amount of 10,401 million baht within 120 days after the date of capital increase.
2) Guarantors under letters of guarantee	To be receive the debt repayment when the liabilities under the letters of guarantee occur. BTSC paid 10,401 million baht to this group of creditors on October 22, 2008.
<b>Unsecured creditors</b>	
1) Financial institutions	To be repaid 100% of the principal amount. The 47.58% of the principal amount (10,016 million Baht) will be repaid by 8 annual installments. The rest of the principal amount will be repaid by the debt to equity swap at a conversion rate of 15.8 Baht to 1 ordinary share. On October 9, 2008, The amount of 11,035.2 million baht was converted to 698.4 million ordinary shares.
2) Guarantors under letters of guarantee	To be receive the debt repayment when the liabilities under the letters of guarantee occur.
3) Loans from principal shareholders	To be repaid 100% of principal amount. The 50% of the principal amount (2,564.4 million baht) was repaid in cash on October 22, 2008. The rest was to be repaid by the debt to equity swap at the conversion rate of 15.8 baht to 1 ordinary share. BTSC converted deBTSC of 2,564.4 million baht to 162.3 million ordinary shares on October 9, 2008.
4) Advisory fees, a creditor subject to dispute under concession contract, a government authority, and creditors subject to disputes in connection with torts	To be repaid in cash by 50 - 100% of the principal amount.
5) Creditors under subordinated convertible debentures	To be repaid 100% amount by the debt to equity swap at the conversion rate of 15.8 baht to 1 ordinary share. BTSC converted deBTSC of 2,739.9 million baht to 173.4 million ordinary shares on October 9, 2008.
6) Creditors and guarantors having obligation to give financial support to BTSC under the Principal Shareholders Subordinated Debt Facilities Agreement	To terminate the agreement
<b>Creditors receiving settlement under existing contracts</b>	
1) Creditors under maintenance agreement and spare supply services agreement	To be repaid in cash at the rate of 100% of the principal amount.
2) Creditors under performance guarantees for construction contracts	To be repaid in cash at the rate of 100% of the principal amount.

Source: BTSC

After the restructuring, new major shareholders are Siam Rail Transport and Infrastructure Ltd. (63.7%) and Siam Capital Development Ltd. (23.8%). The majority shares of Siam Rail Transport and Infrastructure are owned by Mr. Keeree Kanjanapasm, current, executive chairman & CEO of BTSC.

Table 2.5-26: Composition of Major Shareholders of BTSC

Unite: %

Shareholders	Percentage of Shares		
	Mar 2007	Mar 2008	Mar 2009
Siam Rail Transportation and Infrastructure Ltd.			63.65
Siam Capital Development Ltd.			23.76
CTF Resources Ltd.	17.27	17.27	2.09
Thai Asset Management Corporation (TAMC)	6.25	6.25	1.61
Tai Fuk Asset Management (Thailand) Ltd.	9.05	9.05	1.09
Mr. Wiroj Tangjedtanaporn			1.01
Keen Leader Investment Ltd.	3.6	3.82	0.81
Connaught Road Ltd.			0.61
Siamthanee Real Estate Co.Ltd. (Land & Houses)	3.13	3.6	0.61
Kiatnakin Bank Pcl.	4.88	4.88	0.59
Citibank Nominees Singapore Pte Ltd.	3.82		0.46
Tanayong Pcl.			0.38
International Finance Corporation	1.3	1.3	0.32
Perkasa Holding Co.,Ltd.	10.89	10.89	
ADRC Ltd.	8.23	8.23	
Mr. Chanthong Patthamapong		5.19	
Mr. Paiboon Benjarit		5.19	
The ADM Maculus Fund L.P.	4.43	4.43	
Others	27.15	19.9	3.01
Total	100.00	100/00	100.00

Source: BTSC

**(5) Non-rail Business of BTSC****a. Provisions of Non-rail Business in Concession Agreement**

In the concession agreement between BMA and BTSC ("Clause 3"), BTSC is authorized to undertake the Project, to realize and to solely operate and maintain the BMA Transit System, and to earn income from activities relating to the BMA Transit System, including advertisement, franchising, fare with the BMA Transit System.

**b. Types of Non-rail Business**

Non-rail business of BTSC is largely separated into two categories, i.e., advertising and merchandising space rental revenues, and revenues from utility services.

BTSC has granted VGI Global Media Co., Ltd. (VGI Global) a 15-year exclusive license to market all commercial areas and advertising in the Sky train in June, 2001. BTSC received the minimum guaranteed revenue or 50% of gross revenue from the use of advertising space and merchandising areas, whichever was greater. VGI was responsible for all investments and operating expenses<sup>18</sup>. In March, 2009, BTSC agreed to purchase all VGI Global shares from FN Asia Co., Ltd. for Bt 2,500 million<sup>19</sup>.

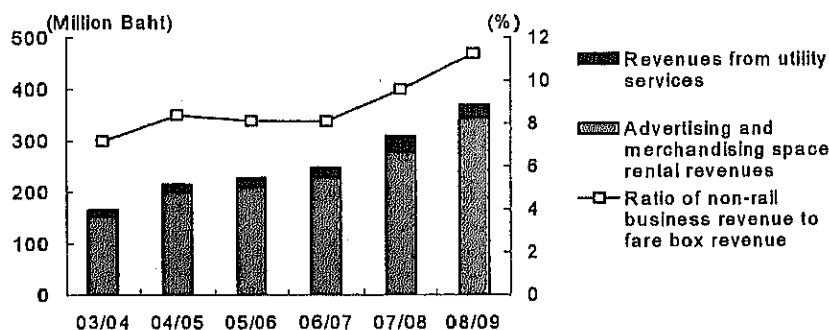
<sup>18</sup> Chadamas Chinmaneevong, "Transit, in-store continue to shine" Article on Bangkok Post on September 15, 2009. <http://www.bangkokpost.com/business/telecom/20259/transit-in-store-continue-to-shine>

<sup>19</sup> TRIS Rating, "TRIS Rating Assigns "A/Stable" Ratings to "BTSC" and Debentures" <http://www.thaipr.net/nc/readnews.aspx?newsid=EF649A1095E541C81FE01DB72EF1C4D7>

BTSC recently intends to diversify its business into property development along MRT routes through its subsidiaries, Nuvo Line Agency Co., Ltd. (Nuvo Line) and UniHolding Co., Ltd. (UniHolding). BTSC has acquired several land plots, which are located near or next to Sky Train stations. According to the newspaper, BTSC's first property development project will be a four-star hotel located on South Sathorn road, close to the Sky Train Surasak station.

**c. Revenue of Non-rail Business**

The revenue from commercial development has tended to increase since FY2007/08. In FY2008/09, the revenue from commercial development occupies 11.2% of total revenue. Among revenue from commercial development, advertising and merchandising space rental revenues account for 93.3% and revenues from utility services, 6.7%).

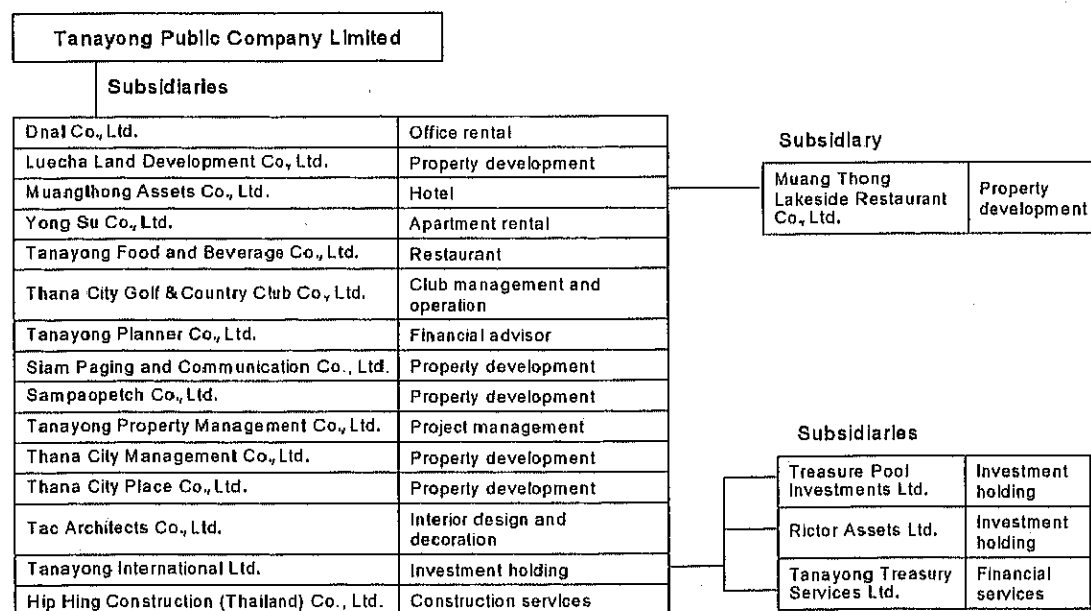


Source: Annual Reports of BTSC

**Figure 2.5-10: Non-rail Business Revenue of BTSC**

**d. Parent Company**

After the rehabilitation, Siam Rail Transport and Infrastructure Co., Ltd. (SRTI) held 63.65% and Siam Capital Developments (Hong Kong) Ltd. (SCD) held 23.76% of shares of BTSC. Mr. Keeree Kanjanapas, executive chairman and CEO of BTSC, holds the majority shares of SRTI.



Source: Annual Reports of Tanayong Public Company Limited

**Figure 2.5-11: Simplified Organization Chart of Tanayong Group**



Mr. Keeree Kanjanapas Group holds 36.89% of Tanayong Public Company Limited. Tanayong Public Company Limited (Tanayong) was established in March, 1968 to operate the property development business. Tanayong was listed on the Stock Exchange of Thailand in March, 1991. Tanayong has three core businesses, i.e., i) property development, ii) hotel, hospitality, property management and services, and iii) project management. In the area of property development, Tanayong develops residential and commercial projects including apartments, condominiums, offices, restaurants, hotels, and clubs. Tanayong suffered from the economic crisis in 1997. Tanayong finalized the debt restructuring in 2006. Since 2007, Tanayong has been actively developing projects in the area of property and hotel development over the country. As of the year ended March 31, 2009, Tanayong held 15 subsidiaries.

## 2.6 Lessons from Blue Line and BTSC

### 2.6.1 Implementation Scheme

The implementation schemes for these two lines were generated as pioneers for urban city railway in Thailand. Therefore, needless to say, much of the issues concerning the implementation schemes are in the detail contents of how public and private agreed to work together. The role sharing did not specify action commitments and left behind little clues to check whether the public side or the private side has complied with the agreement. Also, despite the uncertainties of pioneering MRT, the risk sharing was too heavy on the private side to bear. Network considerations to agree on extension conditions and linkages with other lines and modes are also areas requiring further clarity. In addition, the areas of KPI target setting and detail contractual terms need improvements for future lines.

**Table 2.5-27: Observations Regarding Implementation Scheme (BMCL)**

Category	Observed Issues
Role sharing	<ul style="list-style-type: none"> <li>- Action commitment from both party not clearly defined. For example, i) Capability building plan commitment by private consortium (to build domestic industry), ii) Network building plan commitment by government (as basis for ridership forecast)</li> <li>- Government intervention rights (to ensure public service) in case of non-performance not clear. For example, how to intervene during debt restructuring.</li> </ul>
Risk sharing	<ul style="list-style-type: none"> <li>- Revenue risk too heavy on private party, despite controlling factors on the government side (i.e. build up of network)</li> </ul>
Target setting	<ul style="list-style-type: none"> <li>- Standard cost, service level KPI not agreed in detail. Therefore, government monitoring lacks spike.</li> </ul>
Network consideration	<ul style="list-style-type: none"> <li>- Inadequate considerations on extension arrangements and linkages with other lines (e.g. AFC, Signal). Blue line extension could be costly and inconvenient.</li> </ul>
Other contractual terms	<ul style="list-style-type: none"> <li>- Lack flexibility despite early stages of mass transit network building. For example, revision clause not clearly defined.</li> </ul>

Source: JICA Study Team

### 2.6.2 Performance

In terms of observed performance issues, there are four areas: i) financial performance of railway business; ii) financial performance of non-railway; iii) operational performance; and iv) supplier management.

**Table 2.5-28: Observations Regarding Performance (Case of BMCL)**

Category	Observed Issues
Financial performance (railway)	<ul style="list-style-type: none"> <li>- Ridership assumption too optimistic, actual less than 50% of forecast</li> <li>- Maintenance cost too high compared to other country standards, for track, rolling stock and systems. For example, as a percentage of total operating cost and as a percentage of annual depreciation amount</li> </ul>
Financial performance (non-railway)	<ul style="list-style-type: none"> <li>- Business handled by subsidiary. There is a room for disproportionate dividend payment from subsidiaries to BMCL although profit sharing of non-fare revenue is clearly described in the agreement.</li> <li>- In future, non-rail revenue must be clearly considered and described in the agreement.</li> </ul>
Operational performance	<ul style="list-style-type: none"> <li>- Access to other modes of transport not fully integrated</li> <li>- Common ticketing not planned upfront, creating passenger inconvenience</li> <li>- Fare integration not planned yet. Short distance trip (with change from Blue line to Sky train) can be quite expensive for mass segment.</li> </ul>
Supplier Management	<ul style="list-style-type: none"> <li>- Lack strategic view to obtain bargaining power vis-à-vis supplier (e.g. contractual commitment for maintenance capability building, periodic cost review to bring down maintenance service fee )</li> </ul>

Source: JICA Study Team

Financial performance of railway business by operating companies clearly performed below target mainly due to overly optimistic assumptions. In addition, maintenance cost seems high and requires further benchmarking to ensure competitive cost levels. Financial performance of non-railway does not contribute much directly to the P&L of operating companies. It is worth considering the managing non-rail businesses as a part of the operating entity. This allows cashflow to be much more stable, especially as railway profits take many years to reach positive profits. On management topics, supplier management stands out as most important area for future improvement. This is especially important as the MRT sector in Thailand is new and it is obliged to depend largely on overseas suppliers for its initial capability building. In addition, network building requires avoiding the over-dependence on suppliers.

## CHAPTER 3 SYNTHESIS OF CURRENT ISSUES REGARDING DEVELOPMENT OF URBAN RAILWAY SYSTEM IN THAILAND

### 3.1 Three Tier Structure Approach Adopted for Identifying Issues

As we have described, characteristics of urban railway in Thailand are quite sophisticated in terms of network, usage of PPP and organization. To synthesize current issues on urban railway in Thailand, the Study Team will use the 'three-tiered' structure.

- **Tier 1** is issues surrounding overall Urban Mass Transit Sector, including sector vision, governance, law and regulation.
- **Tier 2** is issues on MRT Network Master Plan, including integrated Bangkok city transit-oriented development (TOD) plan, integrated multi-modal plan and MRT network integration
- **Tier 3** is issues on each MRT line implementation scheme consisting of financial framework, concession agreement, supplier management and non-rail business management

Based on analysis of current situation described in the previous chapter, we have synthesized issues into the three tier structure shown in the figure below.

	Category	Key Issues
<b>Tier 1 Mass Transit Sector</b>	<ul style="list-style-type: none"> <li>• Sector Vision</li> <li>• Governance</li> <li>• Law and Regulation</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of clear vision on future mass transit sector structure</li> <li>• Weak governance structure of mass transit</li> <li>• Sector-specific law and regulation for urban mass transit does not exist</li> </ul>
<b>Tier 2 Integrated MRT Master Plan</b>	<ul style="list-style-type: none"> <li>• Integrated Bangkok City TOD Plan</li> <li>• Integrated Multi-modal Plan</li> <li>• MRT Network Integration</li> </ul>	<ul style="list-style-type: none"> <li>• Degree of integration is weak between MRT plan and city plan</li> <li>• Degree of integration is weak between MRT plan and other modes of transport</li> <li>• Degree of integration is weak between different MRT lines</li> </ul>
<b>Tier 3 Each MRT Line Implementation</b>	<ul style="list-style-type: none"> <li>• Financial Framework</li> <li>• Concession Agreement</li> <li>• Supplier Management</li> <li>• Non-rail Business Management</li> </ul>	<ul style="list-style-type: none"> <li>• There is a misperception that selection of financial framework alone can provide bias for efficiencies in construction, procurement and operations</li> <li>• Tender preparation and concession agreement were not optimal</li> <li>• Poor supplier management caused problems (e.g. line extension)</li> <li>• Full potential of non-rail business revenue has not been exploited</li> </ul>

Source: Study Team interviews and analysis

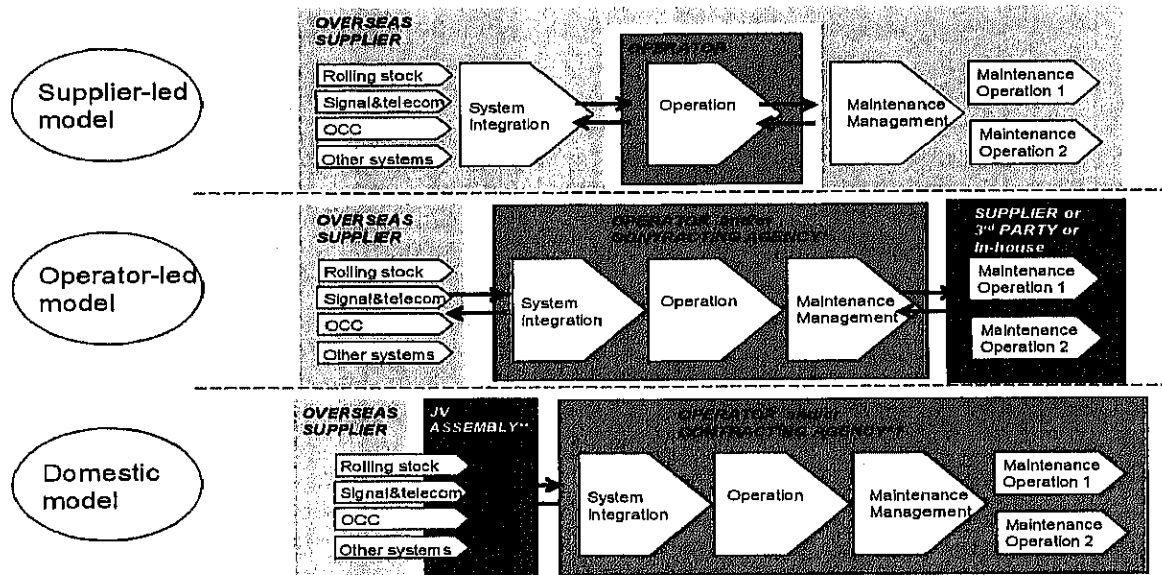
Figure 3.1-1: Summary of Key Issues

### 3.2 Details of Tier 1 Issues - Sector Vision, Governance, Law and Regulation

#### 3.2.1 Issues on Sector Vision

In the past, Thailand has developed BTS and BMCL in a mode of trial and error. This is because mass transit was just introduced to the country without any form of sector related institution. Now, after a decade, it seems quite timely to think through how to shape the mass transit sector in this country.

Figure 3.2-1 illustrates the simplified value chain of this sector. First, mass transit system components are manufactured and sourced. Then, there is system integration to enable the various system components into a cohesive, high performing and user-friendly system. Once all installments are made and construction activities are concluded with firm testing results, then, operation will start with close monitoring of service levels. Thereafter, maintenance management will need to decide the basic philosophy of equipment maintenance strategy. Following such strategy, actual maintenance operations are carried out in forms of A checks, B checks, overhauls, etc.



\* In case of gross model concession  
 \*\* spare parts, rolling stock CKD, etc

Source: Study Team

Figure 3.2-1: Sector View Value Chain

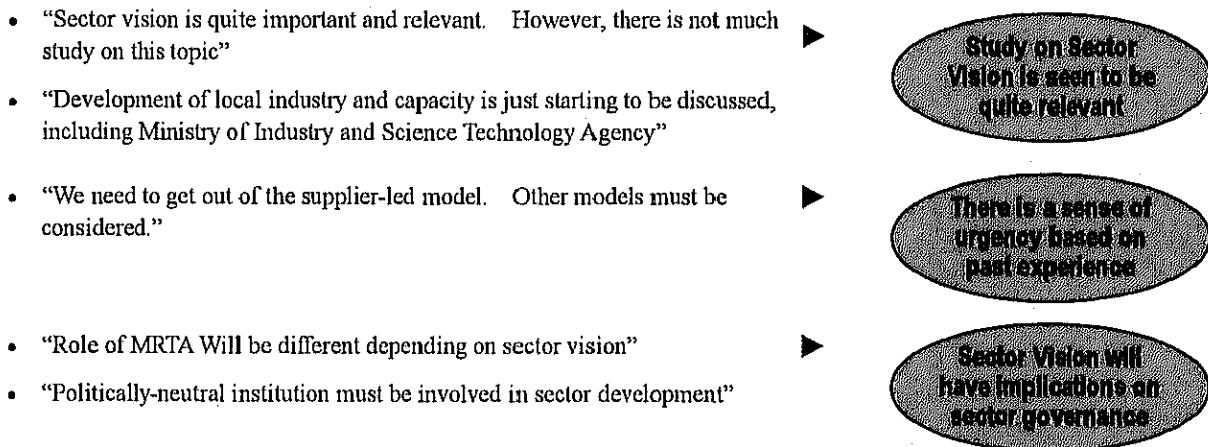
In shaping the mass transit sector, the key question is to think about who will own and drive each part of this value chain. Examples of three models are:

- **Supplier-led model:** One dominant supplier will provide a “turn-key” solution. Operator will only need to worry about day-to-day train operation and services. Maintenance activities are also managed by the supplier in a package.
- **Operator-led model:** Operator or the contracting agency will take initiative to manage both the system integration and maintenance management. Independent system integrator, consultants could be hired to augment lack of capacity.

- **Fully in-house model:** This model illustrates a value chain that is mostly done in-house, except for the high technology system sourcing. Economies of scale to justify in-house activity must be confirmed.

Selection of this value chain model is a critical element in developing a sector vision. This selection will have implications on contracting agency’s (e.g. MRTA) function and capacity building requirements.

Based on interviews with Thai stakeholders, the Study Team has found that the vision on future Thai mass transit sector structure is unclear. Discussions on this sector vision are just starting to intensify within the Thai government. However, not much study has been done in this area thus far. It seems this is an area that external studies could have a true impact.



Source: JICA Study Team

Figure 3.2-2: Key Interview Comments on Sector Vision

### 3.2.2 Issues on Governance

#### (1) Problems of Responsibilities of Public Agencies

According to the MRTA Act, MRTA can be an operator of the MRT System in Thailand, i.e., MRT can create and hold shares of a company engaging in MRT business and grant its right to the private individual in the form of concession. The MRT Act authorizes MRTA to carry out a variety of roles and functions of MRT business in Thailand. However, there are several problems regarding the MRT Act as follow.

MRTA Act lacks the definition of MRT, which distinguish MRT from the and national railway system.

SRT’s Red Line Project can be considered to be MRT System. However, MRTA is not a management body of Red Line. Red Line may be interpreted as a part of SRT network in the right of way of SRT. However, from the standpoint of general meaning of MRTA act, Red Line Project is to be under MRTA.

The same can be said for BTSC-SkyTrain. BTSC-SkyTrain is also MRT, but it is under BMA, which is the local government under the Ministry of Interior. The development of MRT System was initiated by BMA. BMA’s role is to serve for the public interest of Bangkok citizens, which is the

legal basis of planning and implementing SkyTrain. BTS-SkyTrain was planned and constructed by the private sector prior to the establishment of MRTA Act. BMA is now planning the extension of line to the north and the east of the boundary of Bangkok Metropolitan Area. BMA may justify the implementation of extension because it is a part of the existing system, but this would also raise a question, “who is the responsible public body for MRT System development?”

This situation can be allowed if the network consists of only one or two lines. But it is better to have common operation rules, operation plan, and/or safety standard, and fare standard for all the lines, in order to maintain adequate level of passengers’ affordability and quality of train services.

The stipulation which authorizes MRTA to be an operator, an owner of operator, and a shareholder of operator may cause a conflict of interest.

Currently MRTA grants the concession to BMCL, MRT-Initial Blue Line operating company. At the same time, MRTA is not the majority but the largest shareholder (having 25% of total shares) of BMCL, although MRTA is in the position to supervise and monitor MRT operation and has the authority to decide and cap MRT fare from a view point of public transportation. Issues on governance can be summarized as follows;

- 1) Integrated planning and mass transit sector regulator function are expected to be established
- 2) Independent PPP regulator is to be established
- 3) MRTA role and function are to be re-defined
- 4) SRT is revitalized to match sector vision

### 3.2.3 Issues on Law and Regulation

#### Problems of the PPP Act

There are opinions pointing out an inadequacy of the PPP Act among officials and business people in Thailand.

For example, the Minister of Finance, Mr. Chalongphob Susangarn, pointed out the problems of the current PPP Act in his presentation at the Asia-Pacific Ministerial Conference on PPPs in Infrastructure in October 2007..

According to him, methods to assess project’s value, feasibility and value for money test should be standardized to reduce confusion. The PPP Act does not prescribe the methodology for project valuation nor procurement methods. The PPP Act is not based on the PPP principle of sharing burden between the public and private sectors but focuses on granting rights to operate or make use of state assets. He considered that more reasonable risk allocation between the public sector and private sectors was necessary because there is no scope for sharing risks and burdens with private sector for the case where projects are economically viable but not financially. The Thai Government had recently introduced a regulation of Public Service Obligation (PSO). Although PSO would help to meet some of the gap required to make PPP projects more viable, he considers that much remain to be done to ensure appropriate risk allocation.

He pointed out the following actions were needed for good use of PPP:

- To create a central agency to act as clearing house and provide technical and legal support to projects;
- To create a more acceptable rules for risk allocation and mitigation;
- To develop template documents for use in request for proposal, bidding, contract negotiation, model contract framework, etc.; and
- To develop guidelines such terms of references for project development studies, tools for financial assessment and management as well as value for money assessment PSO, etc.

It is recognized that the current PPP Act only stipulates procedures how to process the public project with private participation. This Act is not an act to define and/or promote PPP (public and private partnership). Therefore, the fundamental question is raised whether the Thai government is encouraging or supporting private the sector to participate in a state undertaking project or not. Another issue is that no clear indication to which sectors/types of project the government invites and encourages private participation.

Following these opinions, the Thai Government has been considering a revise of PPP Act.

MRT act should be established, together with improvements to PPP act and MRTA Act as shown below.

	Key Points of Improvement
PPP Act	<ul style="list-style-type: none"> <li>• Commitment of government support/subsidy guidelines (e.g. political risk guarantee)</li> <li>• Generate sector-specific regulations</li> <li>• Define PPP process guidelines in more detail (e.g. tender process, concession agreement)</li> </ul>
MRT Act	<ul style="list-style-type: none"> <li>• Clarify difference between urban mass transit and inter-city railway</li> <li>• Position integrated master plan to be stable and limit political intervention</li> <li>• Consider legal support for station and surrounding development (e.g. special land acquisition treatment)</li> <li>• Provide details of tariff policies, safety/security/ environmental standards</li> </ul>
MRTA Act	<ul style="list-style-type: none"> <li>• Clarify re-definition of MRTA's future functions according to sector vision</li> </ul>

Source: JICA Study Team

Figure 3.2-4: Key Comments of Improvement

### 3.3 Details of Tier 2 Issues - Integrated MRT Master Plan

#### 3.3.1 Issues on Integrated Bangkok City TOD Plan

##### Insufficient Coordination between Urban Railway Plan and Urban Plan/ Land Use Plan

Transportation and land use has a close relationship; transportation affects land use and land use

affects transportation. Accordingly, closed coordination between public transportation plan and land use plan is considered to be essential keys to alleviate traffic congestion in BMA.

The first master plan of Bangkok “Bangkok General Plan” was prepared by the Department of Town and Country Planning (DTCP) of MOI in 1992. Then major revisions of the plan were made by the City Planning Division of BMA in 1999 and 2006. BMA is the only local authority that has formulated a master plan for the development of the area under its administration (city planning in other cities are formulated by MOI). In order to ensure consistency of urban planning and transport plan, BMA and OTP held a joint meeting to report their plans when need arises.

Although information exchange of respective plans is currently made, more closed coordination is expected from inception stage of planning in the future.

Identified issues on the integration of MRT planning with Bangkok city planning are as follow:

- Lack of Legislation: Due to the insufficient legal support in city planning, both public and private sectors cannot work efficiently in developing the station surrounding area.
- Lack of Coordination Mechanism: Due to the lack of authorized coordination agency in developing the city planning and MRT planning, those plans are not well incorporated each other.
- Lack of Detailed Action Plan: City development requires the joint work between the Government and private. Due to the lack of the PPP scheme which enables joint development between the Government and private, public-commercial complex development cannot be implemented.
- Lack of Implementing Committee: Due to the lack of implementing committee for city development, the coordination work between stakeholders as well as financing the development work cannot be smoothly implemented.

### **3.3.2 Issues on Integrated Multi-Modal Plan**

#### Insufficient Coordination between Urban Railway Plan and Other Transport Plan

Several agencies are responsible for various aspects of transportation in Bangkok. Coordination has improved since the Government’s reforms announced in September 2002 whereby key road and rail functions of various government agencies were brought under the control of the MOT.

OTP acts as coordinating agency reporting, through MOT, to the Committee for Management of Land Transport (CMLT) which is chaired by the Prime Minister to achieve overall system integration and development. Although OTP has had some success in coordinating transport investment plans of agencies, there is still no agreed comprehensive transport framework for BMR. Each agency continues to develop its own budget requests. Furthermore, while MRTA and SRT receives approval of development plan from the MOT after the reforms of 2002, BMA still receives approval from the MOI.

Identified issues on the integration with other public transport modes are as follow:



- Integration of the Plan: Studies on other public transport mode are separately conducted from the MRT plan. To achieve the effective public transport network in Bangkok, the integration of those plans is necessary.
- Coordination with Public Transport Tariff Policy: To shift the private vehicle users to the public transport, consistent tariff structure across public transport systems should be developed by studying the ability to pay and willing to pay of target segment. It seems that study on the tariff of each transport mode has been prepared but overall transport tariff policy has not been developed yet.

### 3.3.3 Issues on MRT Network Integration

The existing masterplan covers issues, such as network development plan, cost estimate and investment plan, evaluation of financial and economic feasibility, and evaluation of potential environmental impact. In addition, various studies examined fare integration and ticket integration. Also concerned stakeholders in Thailand try to coordinate urban plan and transport plan. Although variety of efforts to improve urban railways have been made, the results are still far from desirable. Some of issues are not necessarily settled due to lack of sufficient budget, and insufficient coordination among the stakeholders having different interests.

Among the various issues regarding masterplan of urban railways, the Study Team extracted the following four issues, and explained other countries case as best practice at subsequent section.

#### (1) Insufficient Physical Network Integration among Urban Railways and Other Mode of Transport

##### 1) Fragmented Interchange Station between Urban Railways

Transfer among urban railways in Bangkok is not necessarily smooth. For example, at Mo Chit, the Blue Line is not directly connected to the BTS station. A passenger from Blue Line has to exit to the street and then walk a little and enter the BTS.

Blue line and BTS do not use the same names at interchanges. For example, passengers transfer Blue Line and BTS at Sukhumvit Station (Blue Line) and at Asoke (BTS). However there is another Sukhumvit Station of BTS next to Asoke Station, which is far away from Blue Line's Sukhumvit Station. Such naming often confuses passengers, particularly foreign tourists. Similar problems can be seen at interchange stations between Blue Line's Petchaburi Station and ARL's Makkasan City Air Terminal (CAT). Since designs of these stations are not well coordinated at the design stage, passengers have to exit to the street and then walk to transfer these stations with different names.

According to a newspaper, after the completion of the Makkasan CAT station, SRT is requesting additional 90 million baht (about US\$ 2.6 million) to the government for building sky walkway linking these stations. While underground structure (tunnel) has more advantages for passenger, SRT decided to construct sky walkway because high voltage underground power lines could be affected by the tunnel construction.

## 2) Fragmented Interchange Station between Bus and Urban Railway

Transfer between bus and BTS's Mochit station and Mochit bus terminal also can be pointed out as a bad example. Mochit bus terminal is Thailand's largest bus terminal. It serves commuter bus access to many different parts of Bangkok and also inter-city routes to the central, east, north and northeast areas of Thailand.

The Mochit bus terminal used to be located near from BTS's Mochit station. However, when BTS was built, the old Mochit terminal was relocated to make way for BTS's workshops and a park and ride facility for BTS system. As a result, current location of Mochit bus terminal is away from BTS's Mochit station (about 1.5km northwest to the station).

## (2) Insufficient Fare/Ticket System Integration among Urban Railways and Bus

Introduction of common ticket and fare integration are quite important to making public transport easy to use. Common ticketing system allows passengers to use more than one public transport with a single type of ticket. Fare integration allows passengers to transfer urban railways and or other mode of public transport without paying additional boarding charge.

Operators of BTS and Blue Line adopted different ticketing technologies. While BTS uses a magnetic stripe stored value ticket, BMCL uses a contact-less smart card system. In addition, passengers need to pay additional boarding charge when they transfer between these lines.

Several reports were submitted by ADB to ameliorate these conditions. Also, currently, the Office of Transport and Traffic Policy and Planning (OTP) executes a study for introduction of common ticketing and fare integration. However, neither common ticketing system nor fare integration among urban railways and other public transport systems has been introduced in Bangkok.

From the view point of Tier 2, there are several issues relating to the MRT masterplan and network integration as following:

- Continuity of the Masterplan: Due to the political intervention, mass transit network plan and its implementation program change constantly. To achieve the efficient mass transit network within the target period, the masterplan must have more stability and continuity.
- Network Integration: As a mass transit network, some part of railway facilities or management systems such as Operation Control Center, Workshop, Public Information System, Enterprise Resource Planning (ERP) and Common Ticket Management should be shared between the lines to reduce the investment cost and enhance the passenger's convenience.

### 3.3.4 Issues on Positioning of Plans

There have been many studies and reports on components of the integrated master plan. However, the positioning of the plans is not so clear. Some are just reference materials and some are plans that go through multiple institution review followed by cabinet approval.

The latest MRT master plan (so called URMAPP3) is currently being drafted and will go through cabinet approval. However, other components, such as city planning, are not reviewed as part of the

integrated plan for approval.

Even if the plan goes through cabinet approval, political change has triggered unnecessary interventions in the past. To summarize, the issues are:

- a) Lack of clear system to formalize and stabilize the plan: In some countries, mid-long term plans are well positioned within the legal framework and it is kept relatively stable. It seems such framework is weak in Thailand.
- b) Lack of appropriate scoping to properly integrate plans: Notion of TOD is still quite weak and the need to scope the plans to include all the components of integrated plans are non-existent.

### **3.3.5 Issues on Implementation Organization and Coordination Mechanism**

Today, each agency develops plan from its own viewpoint. MRT components are under OTP and city planning components are under BMA and Public Works. PDMO plans for funding and PPP financial framework.

The need for institution that can coordinate across ministries in this area has been discussed in the past. For example, IMAC report refers to the establishment of Urban Development Authority. However, no specific action has been observed.

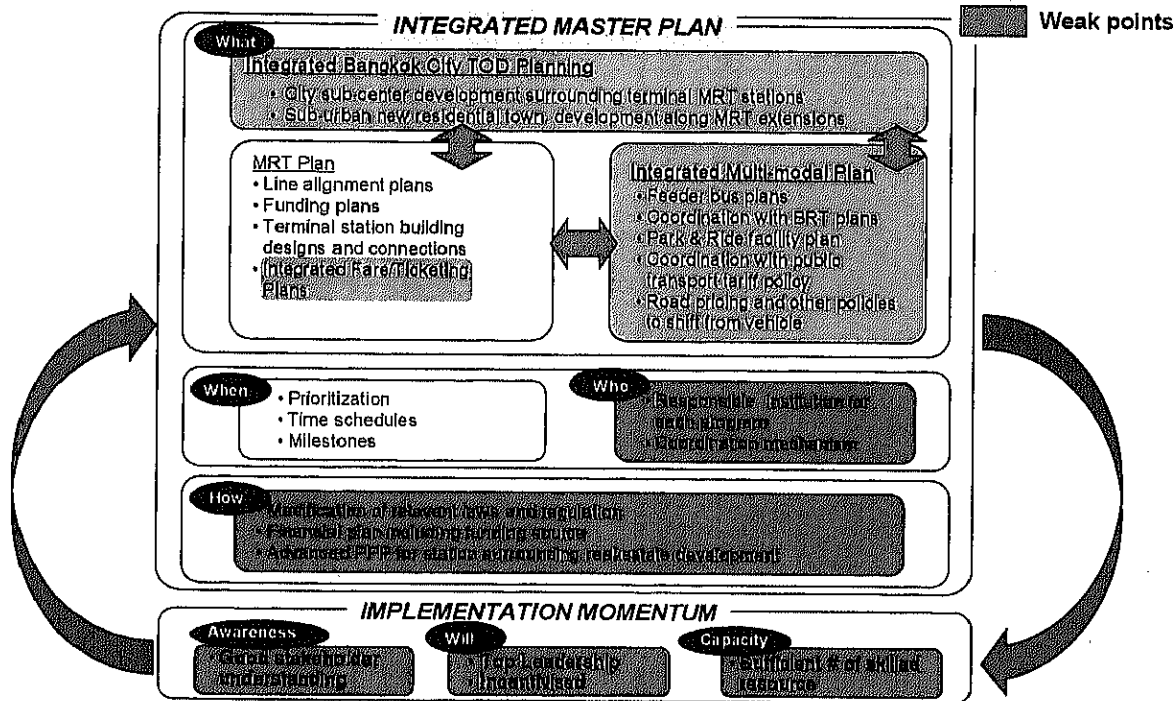
Identified issues on the organization and coordination mechanism are as follows:

- a) Lack of clear oversight organization and coordination mechanism for integrated implementation: For TOD implementation, value is created in the integration of MRT plans, other transport plans and city plans. If each agency continues to pursue with limited coordination, value creating opportunities will be lost.
- b) Lack of awareness and leadership to drive integration: Based on discussions with stakeholders on this topic, there is limited sense of urgency to improve integration. We suspect that the reason could be because a clear image of success is not shared across various stakeholders. This is understandable since the notion of TOD will only ring a bell when it is seen and experienced.

### **3.3.6 Summary of Tier 2 Current Situation, Issues and Gap from the Ideal State**

In summary, there are many past and on-going efforts on studies related to the “What” components of integrated master plan. While some weaknesses still remain in areas of network integration and transport policies, we view that most of the “What” components have been studied. However, due to a lack of total oversight, each agency has a tendency to develop plans from their own point of view with limited coordination. While information is shared across agencies, sharing of information will not lead to true integration. For example, town planning and transport related agencies have not really spent enough time discussing the plans for city sub-center development. The root cause of this is the lack of coordination mechanism. In other words, the “Who” dimension of plans. Also, some components lack the depth of “How” dimension which could cause implementation delays. This is apparent in the area of station and surrounding development, which requires government leadership and advanced PPP scheme development. Lastly, we must point out the lack of

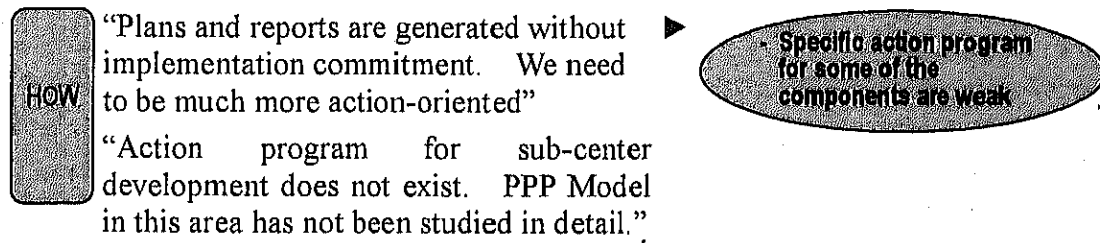
implementation momentum. While each line implementation is underway, the need for integration and coordinated implementation is not well understood and lacks top leadership to drive “Transit-oriented development”. Capacity for implementation is also a concern. PPP implementation is required not just for each line implementation but also for city sub-center development, especially around key terminal stations. This requires significantly more government agency staff with finance, legal and commercial expertise. Please refer to below Figure 3.3-1 and Figure 3.3-2 on explanation of current weak points and summary of key comments from Thai stakeholders.



Source: JICA Study Team

Figure 3.3-1: Weak Points of Current Plans (Tier2)

<p><b>WHAT</b></p>	<p>“City planning for sub-sector development exists. However, our plan and each agency’s plan may not be coordinated”</p> <p>“There are on-going studies on bus re-routing and common ticketing, which will complete soon”</p> <p>“Each agency develops study from their own point of view. Overall view is missing”</p>	<p>▶</p>	<p>• Components of Tier 2 plan mostly exists</p> <p>• Integration of components seem weak</p>
<p><b>WHO</b></p>	<p>“Key is to develop an authority/committee that is responsible overall. Format could be similar to the 2<sup>nd</sup> airport committee”</p>	<p>▶</p>	<p>• Overall coordination mechanism does not exists</p>



Source: JICA Study Team

Figure 3.3-2: Key Interview Comments on Tier 2

### 3.4 Details of Tier 3 Issues - Financial Framework, Concession and Supplier Management, Non-rail Business

#### 3.4.1 Issues of Financial Framework

There have been many discussions on financial framework for MRT development in Bangkok. Issue is that there seems to be several questions on perceptions shared by stakeholders.

1) Perception: Optimal financial framework exists

Question: Is there such thing as a best financial framework? (To be analyzed in Chapter 4)

2) Perception: Financial framework selection is the most important factor in solving the past issues related to BMCL and BTS

Question: Can financial framework alone solve all the issues? (Financial framework selection needs to be packaged with concession agreement, supplier management and non-rail business management)

3) Perception: Involvement of private party will achieve better construction efficiency and operation efficiency

Question: Is there such evidence that private party can better succeed in urban mass transit? (to be analyzed in Chapter 4 and 5)

#### 3.4.2 Issues of Concession Agreement

##### (1) Concession Related Issues on Existing Urban Railway Systems in Bangkok

On existing urban railways in Bangkok, the Study Team identified several concessionaire management issues to be improved for future lines.

1) In terms of financial framework of existing concession agreement, most key risks were allocated to the private sector, despite early stages of network establishment.

Both BTS and BMCL have huge amount of debt for their investment and their profit and loss statements have been red figured from the beginning. Their financial schemes and situations are as follows.

- For construction of BTS, all the construction cost was funded by the concessionaire, i.e., BTSC. With all the ridership risks of the first line of MRT network, capital cost burden was too heavy. This issue has led to debt restructuring in 2008.
- For Blue Line, civil work was funded by the central government. Construction cost of E&M was funded by the concessionaire, i.e., BMCL. With all ridership risk, BMCL has not been able to earn profit for interest and debt repayment. This issue has led to rescheduling of debt service.

2) Shareholder's healthy incentives to cherish operating company must be ensured.

In overseas case examples, the Study Team has observed issues from conflict of interest around the shareholders of concessionaire. If look at Bangkok case, there would be potentially similar conflicting interests.

- Italian Thai Public Company Ltd and Tanayong Public Company Ltd, who are construction companies and real estate developer, were shareholders of BTSC. Similarly, CH. Karnchang Public Company Ltd, who is also a construction company, is a shareholder of BMCL. In general, for construction companies, increase of construction cost brings about the increase of profit to their companies. On the contrary, for the concessionaire, this means increase of capital cost. Therefore, ensuring construction efficiency should have been an important part of this concession scheme.
- MRTA, which is the contracting agency of the concession, has acquired shares of BMCL which is the concessionaire. MRTA is the contracting agency for concession and also a shareholder of concessionaire. This is also potentially a conflict of interest.

3) Unclear conditions for the revision, extension of concession and extension of the routes are stipulated in the concession agreement.

SkyTrain and Blue Line are the initial urban railway concessions in Bangkok. The initial stage of these projects can be considered to be a learning period for the Thai government and it is natural that problems of concession agreement emerge after commencement. However, very limited attention has been paid on articles related to revision of concession agreement.

In the concession agreement between MRTA and BMCL, following improvement points have been identified.

- a. For a revision of agreement, only procedures are described with no clarity for timing and what triggers such discussions.
- b. For the extension of concession, there are no articles in the concession agreement.
- c. For the extension of routes, only the expression "to be practical for ease of expansion and interfacing between the projects" is described in the concession agreement and no concrete measures are described.

In the concession agreement between BMA and BTSC, following improvement points have been identified.

- a. There are no articles for the revision of concession agreement.
  - b. Regarding expansion of concession agreement, it is only specified in the concession agreement that it should be proposed from BTSC 3 or 5 years prior to the completion.
  - c. For new lines, BTSC has the right to refuse the negotiation on this issue but there is no article in the concession agreement on the matter for the extension of the existing line.
- 4) Revenue sharing mechanism of non-rail business are not clearly specified in Concession Agreement

As discussed in the following section, non-rail business is quite important for the sound operation of urban railway business.

In case of BMCL non-rail business is carried out at subsidiary companies. There is the possibility that receipt of profit sharing from non-rail business of the contracting agency according to the concession agreement can not be maximized. This is because in the concession agreement, there is no article which defines the revenue sharing of non-rail business between the concessionaire and its subsidiaries.

## (2) Reasons behind Concession Related Issues

Following are our understanding of reasons behind identified issues described above.

- a. Bangkok mass transit is the first challenge for Thailand, with limited direct overseas reference case.
  - Schemes of urban railway in the developed countries have gone through long history of evolution. They could not be a directly applicable model for the urban railways in Bangkok.
  - In Asia, Hong Kong and Singapore have pioneered ahead of Bangkok. Since no problems were raised on their management and operation, not much attention was paid on management issues.
- b. Lack of mindset to develop local capability
 

Most of equipments, especially electric & mechanical equipments for urban railways, are imported from foreign countries. Although most equipment or replacement parts are not produced in Thailand, daily or overhaul maintenance are carried out with local staff. However, there is a problem of capability of local staff due to the following reasons.

  - Until recently, BTS and MRT have focused on new technologies and they have been satisfied with the “full turnkey” scheme.
  - It seems there is an organizational culture to depend on proposals from consultants without own independent thinking on long term vision.
- c. Future plan considerations are missing

The urban railway master-plans in Thailand cover extension plans for the future. However, once it comes to the implementation stage of each line, there is a tendency to focus on immediate projects.

- In concession agreement between BMA and BTSC, there are no articles on the future extension. This may be due to the scheme that the project was proposed from BTSC and extension of the line was regarded as a given condition. On the contrary, regarding a new line, the right of refusal was given to BTSC.
- Regarding concession agreement between MRTA and BMCL, it might be assumed in concession agreement that an entity other than BMCL could potentially be the concessionaire of the extension section. Therefore, no articles for extension of the line are stipulated in concession agreement. If this is true, disclosure of the technical conditions of existing section should be stipulated since it is required for the extension of the line.

### 3.4.3 Issues of Supplier Management

#### (1) Supplier Management Related Issues on Existing Urban Railways in Bangkok

The concessionaires in Thailand, who procured equipment and rolling stock from suppliers, have preferred “full turnkey” scheme for steady operation and have not carried out supplier management sufficiently. Some observed issues are as follows.

- a. Increase of construction cost because of leaving all supplier management task to engineering design consultants
  - Engineering design consultants tend to manage their designs on safety side and are devoted to make advanced infrastructure and systems. This increases construction cost. (For example, wide underground station based on NFPA standard. Stations of Purple Line will become wider than those of Blue line.)
  - This is further exacerbated by the fact that their supervising fee increase in proportion to total amount of construction cost.

- b. Nondisclosure of specifications

Suppliers did not disclose the specifications of electric and mechanical equipments to concessionaires despite of concessionaires' request.

- Signal system for the extension section of BTS was changed to a new supplier.
- BTSC and BMCL cannot maintain their systems by local staff even after 10 years of operation.

#### (2) Reasons behind Supplier Management Related Issues

Major reasons identified from interviews are as follows:

- a. Lack of mindset to optimize the construction cost among the concessionaires
  - Efforts of the concessionaires focused on introduction of new technologies.
  - Optimization of construction cost requires new concepts. This has been regarded too complex by the concessionaires.

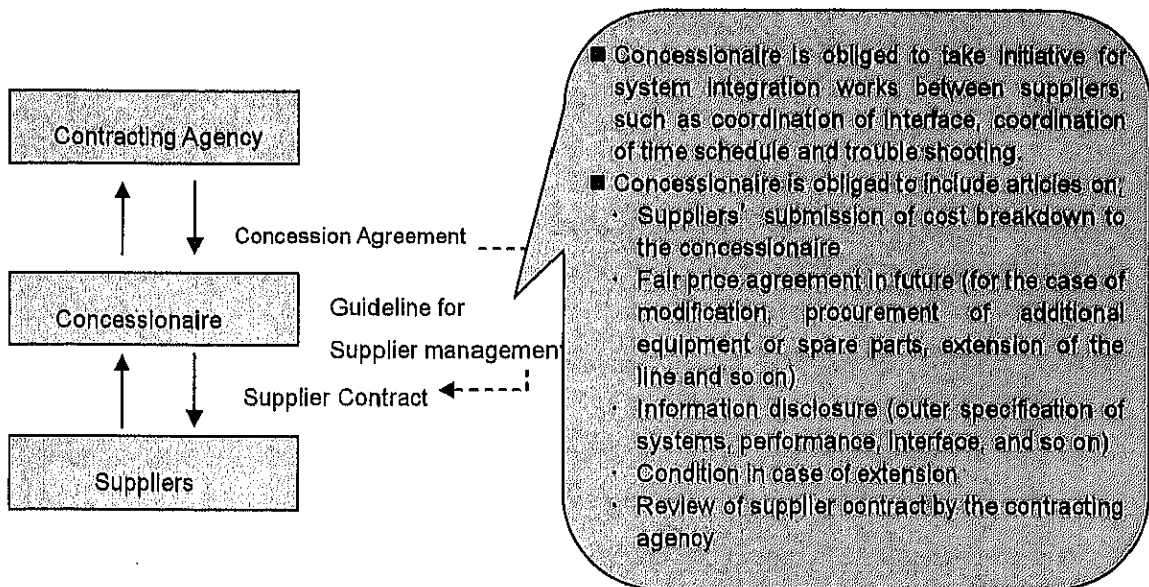


b. Lack of considerations on required information from suppliers

- When disclosure of information regarding electrical and mechanical system is discussed between concessionaire and supplier, software source code of the system is overly focused. The source code is the supplier's intellectual property and disclosure becomes costly. In maintenance work at railway operation, software source code is not needed. The role of maintenance is to find whether software has any defect. If a failure of equipment is caused by failure of software source code, suppliers may willingly fix the failure without charge. This procedure should be included in a supplier contract in detail.
- At the extension project of line or increase of train-sets, when a concessionaire tries to make other suppliers participate in the project, the performance and interface specifications of existing system are needed. Again, the software source code itself is not needed.
- As for rolling stock maintenance, technical knowledge to find a failed board computer is required. Procedure for repair should be included in a supplier contract in detail. To repair a failed board computer is not the business of railway operator in Japan (In most cases, the cause of failures is deterioration of condensers on board computers). Railway operators send failed board computers to the suppliers for repairing. In Thailand, this may be costly and there are a lot of skilled workers in Bangkok who can amend failed mobile computers and personal computers by themselves. To ask them to amend failed board computers may be a good way to reduce maintenance cost.

c. Lack of mindset to build local (in-house) capabilities

Mass transit development is a long-term business. Maintenance and some spare parts should be localized overtime. It seems there is still a lack of vision to develop such localized sector in Thailand.



Source: JICA Study Team

Figure 3.4-1: Supplier Management

### 3.4.4 Issues of Non-rail Business Management

#### (1) Issues for Operators

- 1) The ratio of non-rail business of BMCL and BTSC matches MRT operators in other cities.

The ratio of non-rail business to total revenue of BMCL and BTSC is relatively high compared with other operators studied in the benchmark study except MTR (Hong Kong) and DMRC (New Delhi). However, one reason for this possibly is that the ridership of two companies is still small compared with other cities.

- 2) There are opportunities of diversifying non-rail business.

The scope of non-rail business of BMCL and BTSC is rather basic and narrow. There are lots of opportunities of non-rail business when reviewing MRT projects in other countries.

In the case of BMCL, the facilities which can be used for non-rail business are strictly limited by the concession agreement. When BMCL plans to start new business, it is necessary to fully negotiate with MRTA and receive approval of MRTA board.

- 3) Collaboration with affiliated companies should be pursued.

BMCL's parent company is a conglomerate in the construction sector and BTSC's related company is a conglomerate in the property development. Both operators can further pursue a synergetic effect of business operations with affiliated companies.

#### (2) Issues for Project Implementation Body

- 1) To maximize the benefit of MRT-related business

When MRTA or other project implementation body gives a concession of operation to a concessionaire, it should carefully consider which affiliated businesses it keeps and which are given to a concessionaire.

MRT currently operates the Lat Phrao parking building and telecommunication business based on facilities maintained by BMCL's subsidiary. The right to develop underground area outside the territory defined in the concession contract may belong to MRTA. It is considered that business opportunities of affiliated business will expand. Therefore, careful examination of affiliated businesses given to a concessionaire, based on the consideration of who can maximize the return of affiliated business, is necessary for new lines.

In addition, clauses of contract should be carefully examined when MRTA provides concession of affiliated businesses with a concessionaire. When BMCL established subsidiaries for related businesses, the percentage of revenue share from subsidiaries became the issue for negotiation between MRTA and BMCL.

- 2) To share the benefit of property development to MRT projects

In Thailand, MRTA, BMA and SRT are MRT project implementation bodies. While SRT has available land, MRTA does not possess land for property development. When MRTA formulated a development plan of inter-modal transfer facilities and station area for the Blue line, the developments of office buildings, commercial buildings and apartments as a mid and long term

plan. However, the land for these developments mostly belonged to the private. Therefore, there was little that MRT could do for large-scale property development.

Thus, MRTA or other project implementation body should elaborate possible potential of property development along MRT lines to be constructed. Possible measures are:

- a) A project implementation body estimates the possible return on facilities adjacent to stations and along lines and acquires wider areas to enable non-rail business, e.g., shops, at the acquisition of land.
- b) A project implementation body arranges the transfer of land from government ministries and agencies to the body.
- c) A project implementation body acquires a legal basis for property development and the responsibility and right to engage in property development.
- d) A project implementation body closely cooperates with central and/or local government bodies in charge of urban planning and development. If a government body establishes a public corporation for property development, a project implementation body should collaborate with this organization.



## CHAPTER 4 FINANCIAL SIMULATION AND ANALYSIS OF FINANCIAL FRAMEWORK OF URBAN RAILWAY DEVELOPMENT IN THAILAND

In this chapter, the Study Team considers conditions of successful pattern of financial framework for future MRT projects and alternatives of financial frameworks of MRT project by examining decisive factors. Then, the Study Team identifies factors which realize the value for money (VfM) of PPP scheme for MRT project. Finally, a trial simulation of the future three MRT projects in Thailand, namely Purple Line, Pink Line and Orange Line is conducted with the purpose of clarifying the conditions to achieve VfM.

### 4.1 Outline of the Financial Simulation of MRT Projects

#### 4.1.1 Purpose of the Financial Simulation

The Study Team carried out a financial simulation of future MRT projects in Thailand in order to understand the effects of different financial frameworks of private participation schemes as well as state operation scheme.

This simulation aims at examining a required level of efficiency achieved by the private sector under a private participation scheme to achieve public sector's VfM<sup>20</sup> on a basis of the existing financial framework under the MRT Assessment Standardization (MAS)<sup>21</sup>.

The Thai Government uses MAS as a guideline to evaluate a MRT project. MAS requires the comparison of five private participation schemes, and offers guidelines on how to quantify the difference of ridership demand, capital cost for E&M, and O&M cost, among the five private participation schemes. To differentiate assumptions of five schemes, MAS uses a concept of optimism bias. MAS assumed that private sector's implementation is more efficient than the public sector. For example, according to MAS, while capital cost of E&M under concessionaire (private sector) procurement is 15% higher than the best estimate, capital cost of E&M under government (public sector) procurement is as much as 45% higher than the best estimate. The optimism bias has significant influence on the result of calculation, while evidence of the figures are considered to be quite weak. Also, differences of private/ public sectors performance among patterns of financial framework are deemed to be quite difficult to generalize.

On the financial simulation of MRT projects, the following point should be understood. In implementing an urban railway project under the private sector participation through vertical separation scheme<sup>22</sup>, financial burden of the public sector is reduced during inception stage of the project. On the other hand, since many of urban railway projects are unprofitable, the public sector may need to assist the private sector through the provision of subsidy (or some kind of payment) after the commencement of commercial operation. Therefore, even though the public sector's financial

<sup>20</sup> Life-cycle cost levied on public sector under public participation scheme is smaller than the life-cycle cost levied on public sector under state operation scheme.

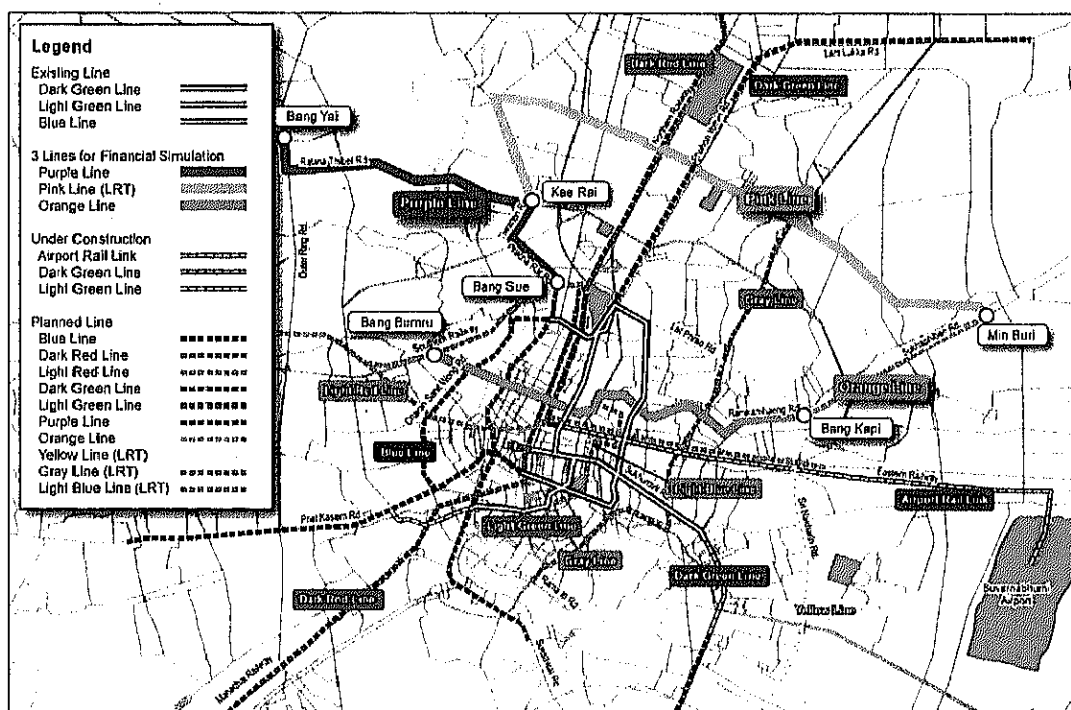
<sup>21</sup> MRT Assessment Standardization, ADB, 2007

<sup>22</sup> A private sector concessionaire finances all E&M and rolling stock investment and undertakes O&M, with the Government financing other infrastructure investment

burden for capital expenditure is smaller, continuous subsidy payment can result in larger financial burden for public sector in the long term. Degree of subsidy that government needs to pay is debatable. On one hand, it is government’s responsibility to maintain public transportation operation. On the other hand, private investor (including financial institutions) should be responsible for the inherent risks involved in business investment. For the purpose of this simulation exercise, we took the view that public transportation must be maintained by government in the form of subsidy.

#### 4.1.2 Profile of the Analyzed 3 MRT/LRT Projects

After consultation with related organizations of Thai stakeholders and JICA, the Purple line (Bang Yai - Bang Sue Section), the Pink Line (Khae Lai – Minburi section) and the Orange Line (Bang Kapi - Bang Bamru Section) were selected for the target for financial simulation. The figure 4.2-1 illustrates planned alignments of the analyzed line.



Source: JICA Study Team modified based on M-MAP 2009, OTP, August 2009

Figure 4.1-1: Location Map of the 3 Analyzed Lines

The table 4.1-1 ~ 4.1-3 summarized major feature of the analyzed projects. The Orange line plans to align across from east to west, and run through the center of Bangkok city. Ridership of the Orange line was forecasted to be about 485,000 per day in the first year of its operation, which is more than twice of that of the Purple and the Pink Line. However, since most of alignment of the Orange line runs underground, the project cost per km of line length (4,612 million Baht/km) is highest among others.

On the other hand, the Pink line is planned to be situated in the northern suburbs of Bangkok City, and is planned as Monorail. The land acquisition cost, and the civil work cost are considerably lower than those of the Orange Line. The project cost per km of line length of the Pink Line (1,030 million Baht/km) is considerably lower than those of the others (Orange: 4,612 million Baht, Purple:

2,367 million Baht).

**Table 4.1-1: Profile of the Purple Line Project (Bang Yai – Bang Sue Section)**

<b>Line Length</b>	23 km, 16 stations (23 km: elevated, 0 km: underground)
<b>Total Project Cost (2007 constant price)</b>	<p>Land Acquisition: 9,314 million Baht (17.4%)</p> <p>Civil Works: 29,495 million Baht (55.3%)</p> <p>M&amp;E Equipment: 6,866 million Baht (12.9%)</p> <p>Rolling Stock: 5,578 million Baht (10.5%)</p> <p><u>Detailed Design &amp; Consultation Fee: 2,097 million Baht ( 3.9%)</u></p> <p>Total Project Cost: 53,350 million Baht (100%)</p>
<b>Project Cost per 1 km of line length</b>	2,367 million Baht/ km (2008 constant price*) (including land acquisition, civil work, M&E equipment, rolling stock and detailed design & consultation fee)
<b>Demand Forecast</b>	Demand Forecast: 1st Year 195,505/day, 5th Year 220,116, 10th Year 250,879/day (without transfer fee)
<b>Project Features</b>	<p>Purple line aligns in northwestern suburb of Bangkok and in Nonthaburi Province, with the first stage of construction commencing in early 2010. The line will be in operation in 2013.</p> <p>The line starts from MRT's underground Bang Sue terminus and runs along Pracha Rat Sai 2 Road on elevated structure to Tao Pun junction, transfers to the western extension of the Blue Line. It continues north along Krung Thep-Nonthaburi Road, transfers to the Light Red Line at Bang Son, and approaches Mueang Nonthaburi district of Nonthaburi Province.</p> <p>The line goes further north and crosses the Chao Phraya River at Phra Nangklao Bridge, and then continues to a large residential area at Bang Yai junction in Bang Yai district. The line then goes north along Kanchanaphisek highway, passes Bang Yai market and reaches to the terminus at Khlong Bang Phai in Bang Bua Thong district.</p>

Source: Project Evaluation Report Bang Yai – Bang Sue Mass Transit Line, AEC, PCI, Chotichinda Mouchel Consultants Ltd., MRTA 2007

\*Note: Price level was adjusted using Consumer Price Index quoted from IMF, International Financial Statistics

**Table 4.1-2: Profile of the Orange Line Project (Bang Bamru – Bang Kapi)**

<b>Line Length</b>	24 km, 17 stations (3 km: elevated, 21 km: underground)
<b>Total Project Cost (2005 constant price)</b>	<p>Land Acquisition: 10,772 million Baht (10.6%)</p> <p>Civil Works: 64,169 million Baht (63.1%)</p> <p>M&amp;E Equipment: 14,913 million Baht (14.7%)</p> <p>Rolling Stock: 7,475 million Baht ( 7.4%)</p> <p><u>Detailed Design &amp; Consultation Fee: 4,347 million Baht ( 4.3%)</u></p> <p>Total Project Cost: 101,677 million Baht (100%)</p>
<b>Project Cost per 1 km of line length</b>	4,612 million Baht/ km (2008 constant price*) (including land acquisition, civil work, M&E equipment, rolling stock and detailed design & consultation fee)
<b>Demand Forecast</b>	1st Year 485,256/day, 5th Year 544,473/day, 10th year 618,494/day (without transfer fee)
<b>Project Features</b>	<p>Orange Line aligns from west to east along Ramkamhaeng, Rajvithi and Sirindhorn Road. This line serves high density residential area and commercial area in the eastern suburbs. The line runs through Victory Monument and Sam Saen where are currently suffered from serious traffic congestion. The line also serves important large community space, such as BMA 2, Din Dang area, Thailand Cultural Center, Ramkamhaeng University, Chamber of Commerce, ABAC University, Rajamangala National Stadium and Hua Mak Stadium.</p>

Source: Feasibility Study, Detailed Design for the Remaining Extensions and New Routes, Total 3 Projects, Bangkok Mass Transit Design Consortium, MRTA, 2006

\*Note: Price level was adjusted using Consumer Price Index quoted from IMF, International Financial Statistics

**Table 4.1-3: Profile of the Pink Line Project (Kac Rai – Minburi Section)**

Line Length	36 km, 24 stations (36 km: elevated, 0 km: underground)
Project Cost (2008 constant price)	Land Acquisition: 4,458 million Baht (12.0%) Civil Work: 16,862 million Baht (45.4%) M&E Equipment: 7,857 million Baht (21.2%) Rolling Stock: 6,768 million Baht (18.2%) Detailed Design & Consultation Fee: 1,164 million Baht ( 3.1%) Total Project Cost: 37,109 million Baht (100%)
Project Cost per 1 km of line length	1,030 million Baht/ km (2008 constant price) (including land acquisition, civil work, M&E equipment, rolling stock and detailed design & consultation fee)
Demand Forecast	Demand Forecast: 1st Year 167,000/day, 10th Year 264,000/day (without transfer fee)
Project Features	Pink Line is planned to develop as monorail, and serves for travel demand to the new Government Service Center on Chang Wattana Road, Nonthaburi Government Service Center, support the growth of cities in the north of Bangkok, provide linkage to community and commercial area in the north and north-east suburbs.  There area 4 interchange stations; Nonthaburi Government Center Station (Purple Line), Laksi Station (Red Line), Pitak Rattathamanoon Monument Circle Station (Dark Green Line), and Minburi Station (Orange Line)

Source: Feasibility Study and Preliminary Design of Yellow Line, Brown Line and Pink Line Mass Transit Projects, Thai MM Ltd., Mott MacDonald (Thailand) Co. Ltd., Epsilon Co. Ltd., Dhara Consultants Co. Ltd., Nippon Koei Co. Ltd., JARTS, Wishakorn Co. Ltd., OTP, 2009

The Purple line aligns in the northeastern suburb of Bangkok city and in Nonthaburi Province. The project cost per km and the forecasted ridership of the Purple line are almost half of the Orange line. While the project cost per km of the Purple line is about twice of that of Pink line, the forecasted ridership is almost same as the Pink line.

#### 4.1.3 Major Assumptions Adopted for the Financial Simulations

The financial simulation was made based on the existing feasibility study of each project. Regarding the project specific data (ridership demand forecast, capital cost of the project, operation and maintenance cost, etc.), same data used in existing reports were adopted for the simulations<sup>23</sup>. Other general assumptions basically follow MAS guideline (see the table 4.1-4).

Public sector's financial burden throughout the project cycle, namely public sector's net present value (NPV), was calculated for each pattern of financial framework based on the best estimate of the capital cost, O&M cost, forecast ridership demand, etc. as estimated in the existing studies.

In analyzing a project under private participation schemes and state operation scheme, one of the key points is how to estimate the difference of performance (such as ridership, capital cost, and O&M cost) between the public sector and the private sector. MAS guideline quantified such difference between the public and the private as "Optimism Bias". Although, as mentioned earlier, the

<sup>23</sup> Reference Reports: Purple line= "Project Evaluation Report, Bang Yai – Bang Sue Mass Transit Line, 28 August, 2007 Asian Engineering Consultant Corp. / Pacific Consultant International/ Chotichinda Mouchel Consultants". Orange Line= "Feasibility Study, Detailed Design for the Remaining Extensions and New Routes, Total 3 Projects, Bangkok Mass Transit Design Consortium, MRTA, 2006", Pink Line= "Feasibility Study and Preliminary Design of Yellow Line, Brown Line and Pink Line Mass Transit Projects, Thai MM Ltd., Mott MacDonald (Thailand) Co. Ltd., Epsilon Co. Ltd., Dhara Consultants Co. Ltd., Nippon Koei Co. Ltd., JARTS, Wishakorn Co. Ltd., OTP, 2009". Since same of the detailed data was not shown in these reports, some of the data was not necessary as same as the original report.



assumption given in MAS has significant influence on the result of calculation, evidence of the optimum bias is considered to be quite weak.

**Table 4.1-4: Major Assumptions adopted for the Simulation**

Basic Assumption	Currency Used: Baht Project Evaluation Period: 40 years Concession Duration: 40 years Corporate tax: 30% of profit before tax Base Year Price: early 2007	Inflation rate: 2.5% p.a. Price Level Used: Current Price Discount Rate: 5.0% Exchange Rate: 35 Baht/US\$
Fare	Boarding Charge: 10 Baht (2001 price) Distance Charge: 1.8 Baht/km (2001 price) Without transfer fee between lines (with each MRT boarding requiring payment of a fare)	
Debt Equity Ratio	Private Sector Financing - Net cost concession 2.0 times - Gross cost concession 6.0 times- - Modified gross cost concession 5.0 times	Public Sector Financing - All schemes: 3.0 times (except for land acquisition)
Interest Rate of Loan/Bond	Private Sector - Net cost concession 8.5% p.a. - Gross cost concession 7.5% p.a. - Modified gross cost concession 7.75% p.a.	Public Sector (for all schemes including swap rate)* - ODA Loan: 3.75% p.a. (civil work) - ODA Loan: 4.05% p.a. (E&M, rolling stock) - Baht Bond: 5.20% p.a.
Repayment period of Loan	Private Sector - Grace period: 2 years of service - Repayment Period: 15 years (incl. grace period)	Public Sector (for all schemes)* - Grace period: 6 years of service - Repayment Period: 20 years (incl. grace period)
Return on Equity for Private sector	- Net cost concession 13.50% - Gross cost concession 12.50% - Modified gross cost concession 12.75%	

Source: MRT Assessment Standardization, ADB 2007 and Project Evaluation Report, Bang Yai – Bang Sue Mass Transit Line, 28 August, 2007 AEC/ PCI/ Chotichinda Mouchel Consultants Ltd.

\* Following same assumption as used in the evaluation report of Purple Line, which was prepared based on the comments of the MRT Subcommittee and the MRTA Board.

In this simulation, optimism bias proposed under MAS was not adopted because of its weak evidence base. Instead of adopting optimism bias, another approach was employed in this simulation (details are mentioned in following section).

## 4.2 Methodology and Results of the Financial Simulations

Financial simulation was made for six potential financial framework, which consists of five private participation schemes (PPP net cost, PPP gross cost, PPP modified gross cost, PSC gross cost, and PSC modified gross cost) and a state operation scheme.

In this simulation, following two kinds of analyses were made. Detail method and results of the two analyses will be mentioned in the following sections.

### Analysis 1 (Public Sector's NPV Gap Calculation)

Analysis 1 aims to clarify the difference of public sector's NPV without adopting the "Optimism Bias". Under this analysis, performance of the private sector (such as ridership, operation and maintenance cost) is assumed the same as that of public sector.

### **Analysis 2 (Sensitivity Analysis)**

Analysis 2 aims to clarify degree of minimum performance to be achieved by the private sector under five private participation schemes, in order to achieve public sector's VfM (NPV under State Operation Scheme  $\leq$  NPV under private participation scheme). The Newton Raphson Method was adopted for this analysis.

## **4.2.1 Analysis 1 (Public Sector's NPV Gap Calculation)**

### **(1) Methodology of the Analysis 1**

"Analysis 1" aims to clarify the difference of public sector's NPV without adopting the "Optimism Bias". Under this analysis, performance of the private sector (such as ridership, operation and maintenance cost) is assumed as same as that of public sector.

Public sector's NPV under various financial frameworks can be formulated as follows;

$$NPV_X = \sum_{t=-5}^{40} \left\{ \frac{FR_{xt} + NFR_{xt} - OSC_{xt} - OM_{xt} - PP_{xt} - IP_{xt} - SB_{xt} + RS_{xt} - CI_{xt} - AR_{xt}}{(1 + \phi)^t} \right\}$$

Here:

- NPV<sub>X</sub>: Public sector's present value of net cashflow under financial framework "X"
- FR<sub>x<sub>t</sub></sub>: Public sector's fare revenue in year "t" under financial framework "X"
- NFR<sub>x<sub>t</sub></sub>: Public sector's non-fare revenue in year "t" under financial framework "X"
- OSC<sub>x<sub>t</sub></sub>: Operator's service charge paid by public sector to private sector in year "t" under financial framework "X"
- OM<sub>x<sub>t</sub></sub>: Public sector's operation and maintenance cost in year "t" under financial framework "X"
- PP<sub>x<sub>t</sub></sub>: Principal repayment in year "t" under financial framework "X"
- IP<sub>x<sub>t</sub></sub>: Interest payment in year "t" under financial framework "X"
- SB<sub>x<sub>t</sub></sub>: Subsidy from public sector to private sector in year "t" under financial framework "X"
- RS<sub>x<sub>t</sub></sub>: Revenue Share and/or annuity paid by private sector to public sector in year "t" under financial framework "X"
- CI<sub>x<sub>t</sub></sub>: Initial Capital Investment Cost (public sector's equity portion) in year "t" under financial framework "X"
- AR<sub>x<sub>t</sub></sub>: Additional Investment and Refurbishment cost levied by public sector in year "t" under financial framework "X"
- φ: discount rate (5.0%)

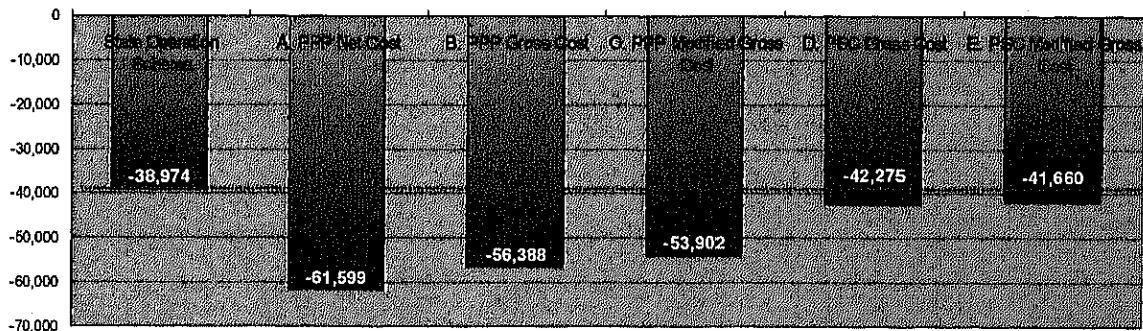
Here, subsidy to the private (SB) or revenue share from the private to public (RS) are calculated in order to fulfill the private sector's required return on equity (ROE) (ROE is 12.5% for gross cost concession, 12.75% for modified gross cost concession, and 13.5% for net cost concession).

### **(2) Results of the Analysis 1**

Figure 4.2-1~4.2-3 shows the present value of public sector's net cashflow during the whole project life (4 - 6 years project implementation period<sup>24</sup> + 30 years concession period), namely

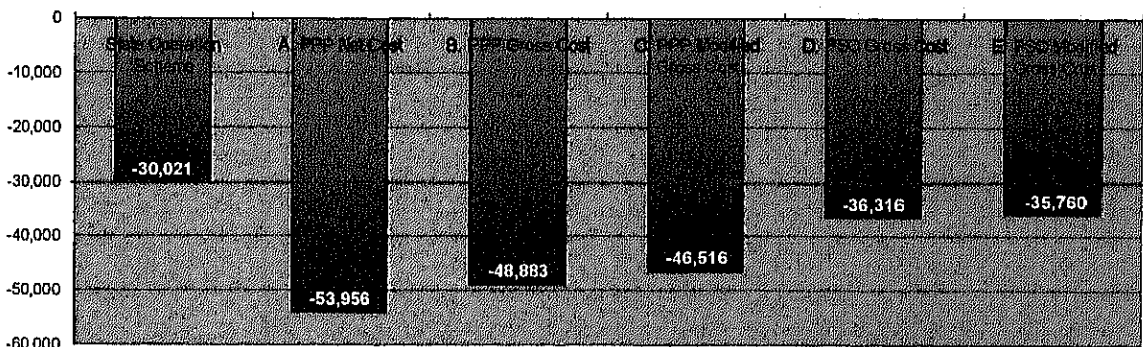
<sup>24</sup> As same as the feasibility study report of each line, Construction period of the Purple and Pink Lines are 4 years, and that of the Orange

net present value (NPV). Public sector's NPV were calculated based on 5% discount rate and best estimate assumptions made at feasibility study. Figure 4.2-4 ~ 4.2-6 illustrate the cash inflow/outflow and the net cashflow of each financial framework (also see Appendix 3 for detailed cashflow of public sector and private concessionaire).



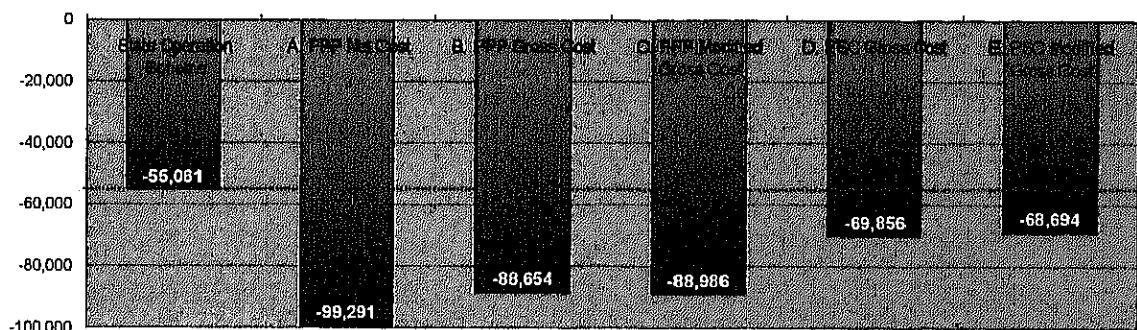
Source: JICA Study Team, Note: Unit= million Baht

Figure 4.2-1: Public Sector's NPV Gap Under 6 Patterns of Financial Framework (Purple Line)



Source: JICA Study Team, Note: Unit= million Baht

Figure 4.2-2: Public Sector's NPV Gap Under 6 Patterns of Financial Framework (Pink Line)



Source: JICA Study Team, Note: Unit= million Baht

Figure 4.2-3: Public Sector's NPV Gap Under 6 Patterns of Financial Framework (Orange Line)

As the above figure indicates, the public sector's NPVs under 6 patterns of financial framework are negative for all the analyzed projects, because, as the previous studies revealed, all the analyzed projects themselves are financially not profitable as a whole.

Financial burden of the public sector of each line is the smallest when adopting state operation scheme (the public sector's NPV= Purple Line: -38,974 million Baht, Pink Line: -30,021 million Baht, and Orange Line: -66,081 million Baht). This is because the public sector is able to access ODA loan with longer repayment period, and lower interest rate (3.75% for civil work, 4.05% for E&M and rolling stock, which is including swap rate<sup>25</sup>).

If no efficiency is achieved by the private sector, PPP Net cost concession impose heaviest burden on the public sector (public sector's NPV= Purple: -55,615 million Baht, Pink: -53,956 million Baht, and Orange: -99,291 million Baht). According to MAS, in the case of PPP net cost, the private sector required the highest ROE (13.5%) due to high ridership risk, and commercial banks request the highest interest rate to the private sector because of high project risk. In case of PPP net cost, the public sector needs to compensate the private sector's profitability through providing sizable amount of subsidy. Provision of such subsidy levied heavy burden on the public sector.

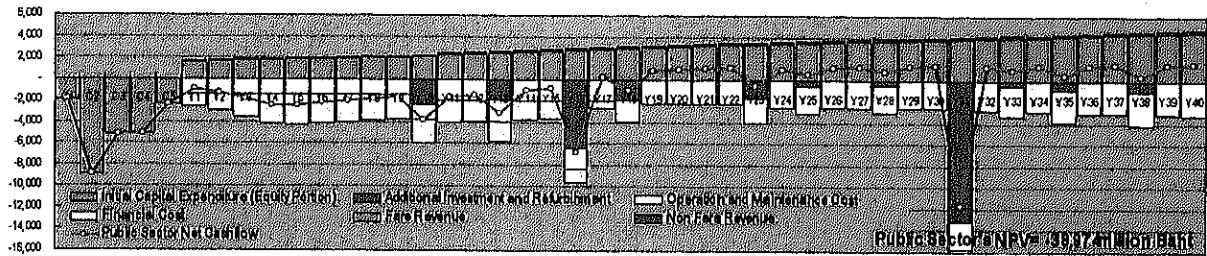
In case of PPP gross cost and PPP modified gross cost schemes, while the public sector finances less capital expenditure, the public sector also needs to bear subsidy payment to the private throughout the concession period. On the other hand, in case of PSC gross cost and PSC modified gross cost, while the public sector finances all infrastructures, the public sector can receive some revenue share and/or annuity from the private sector (otherwise their ROE exceeding predetermined percentage).

These analyses revealed that, if the private sector can not bring about operational efficiency and cost efficiency, project implementation thorough the private participation will increase the public sector's financial burden during whole project period.

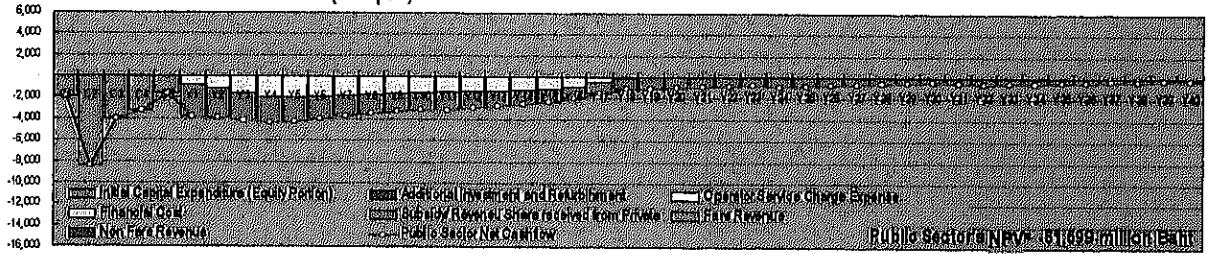
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<sup>25</sup> Following same assumption as used in the evaluation report of Purple Line, which was prepared based on the comments of the MRT Subcommittee and the MRTA Board.

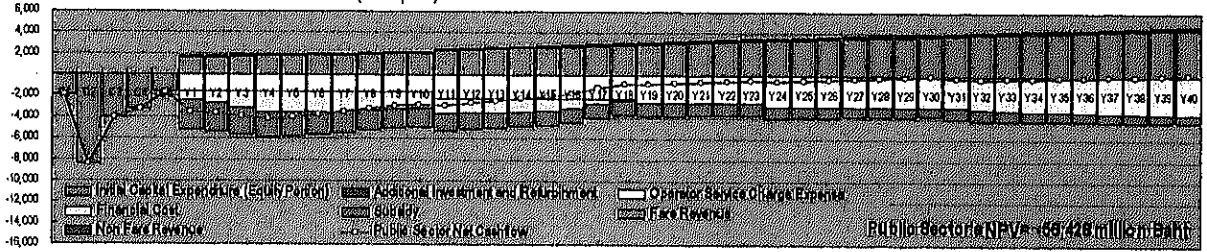
State Operation Scheme (Purple)



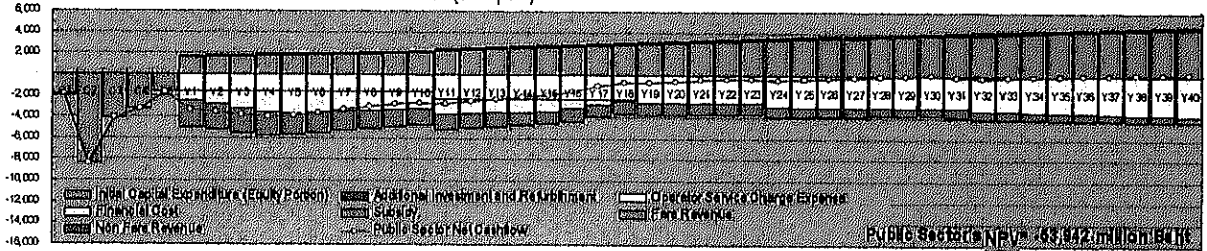
A. PPP Net Cost Concession (Purple)



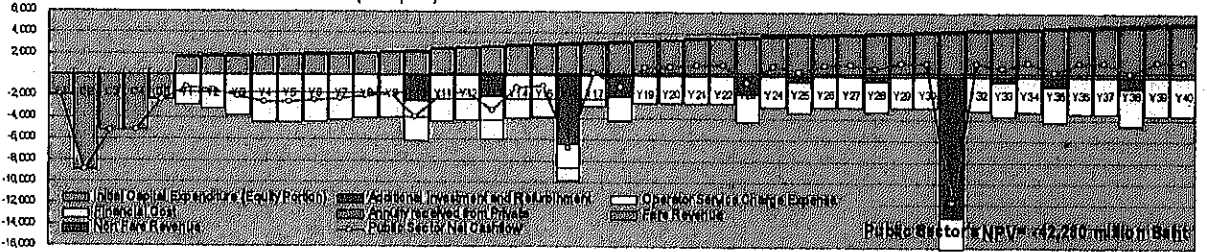
B. PPP Gross Cost Concession (Purple)



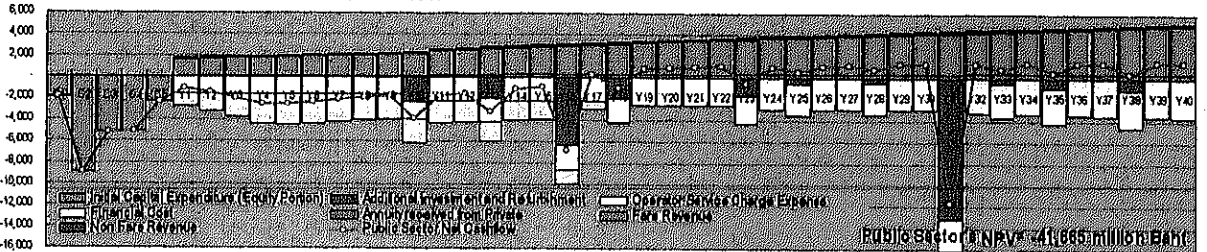
C. PPP Modified Gross Cost Concession (Purple)



D. PSC Gross Cost Concession (Purple)



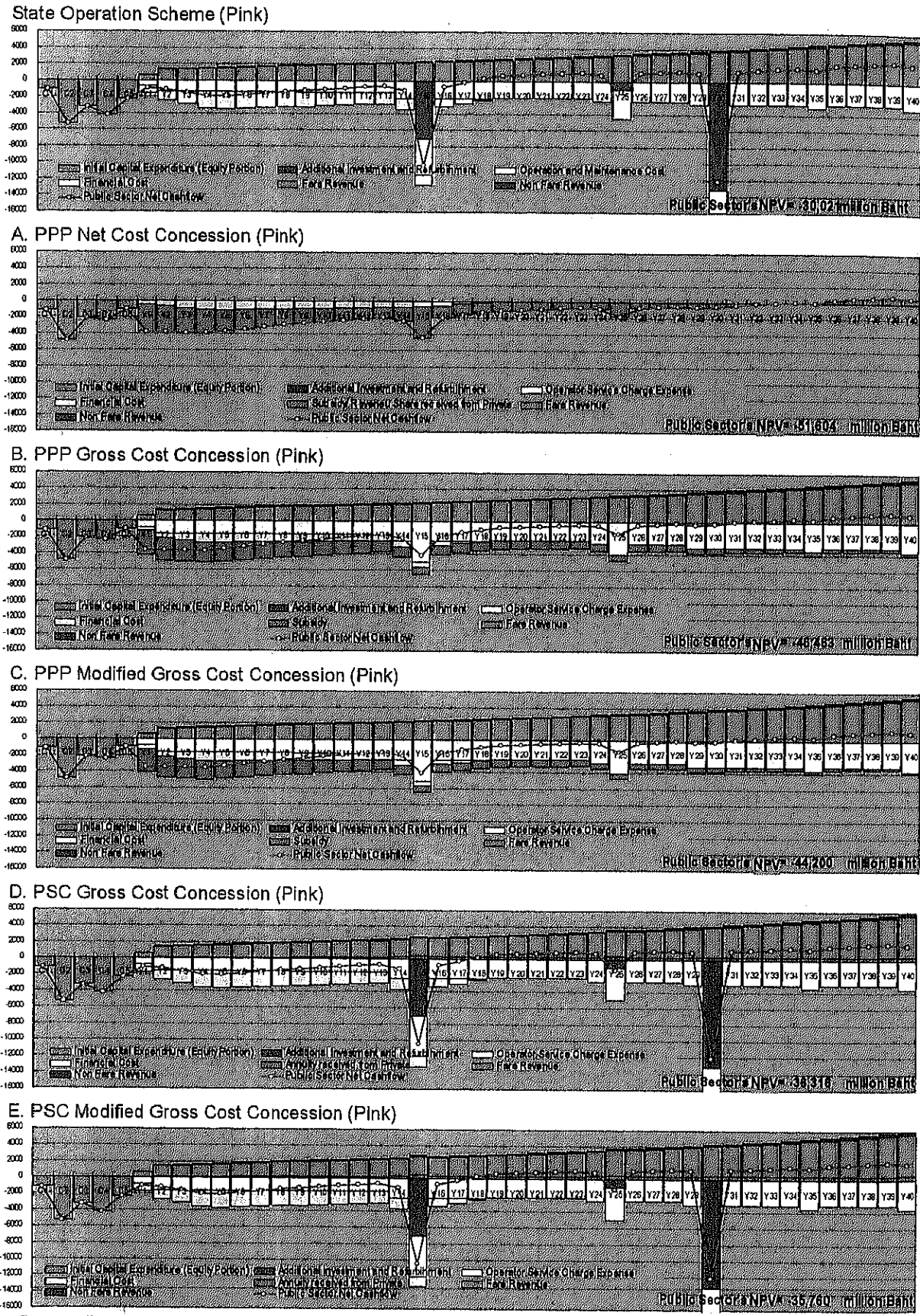
E. PSC Modified Gross Cost Concession



Source: JICA Study Team Note: 2007 Constant Price (unit: million Baht)

Figure 4.2-4: Public Sector's Cashflow under 6 Patterns of Financial Framework (Purple Line)

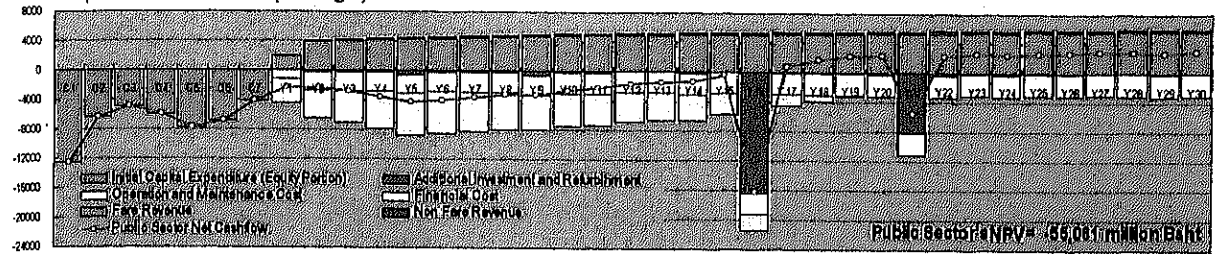




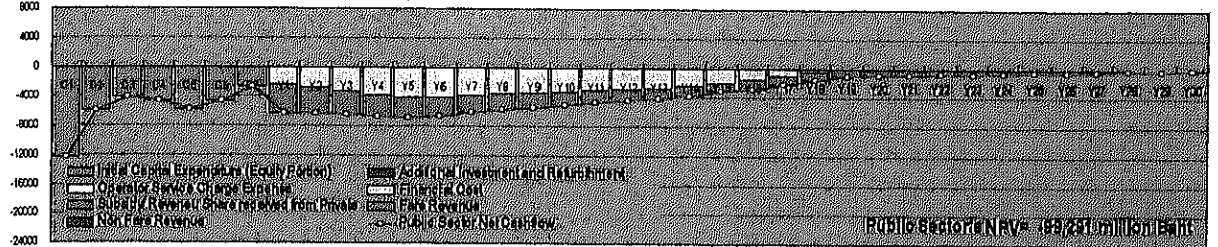
Source: JICA Study Team Note: 2008 Constant Price (unit: million Baht)

Figure 4.2-5: Public Sector's Cashflow under 6 Patterns of Financial Framework (Pink Line)

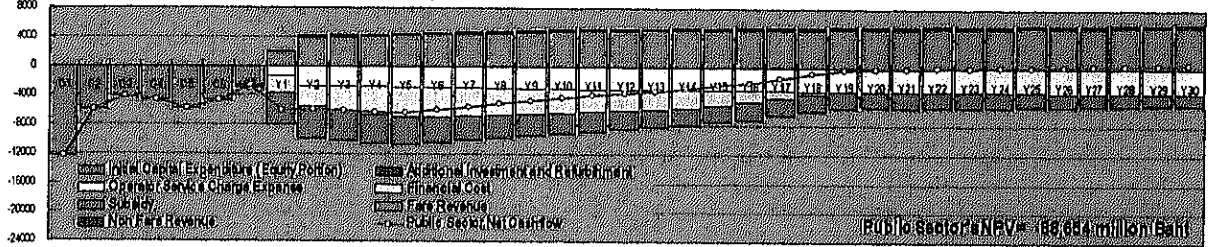
State Operation Scheme (Orange)



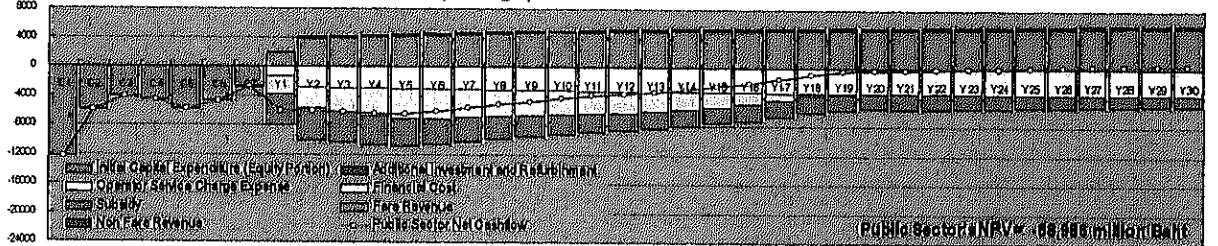
A. PPP Net Cost Concession (Orange)



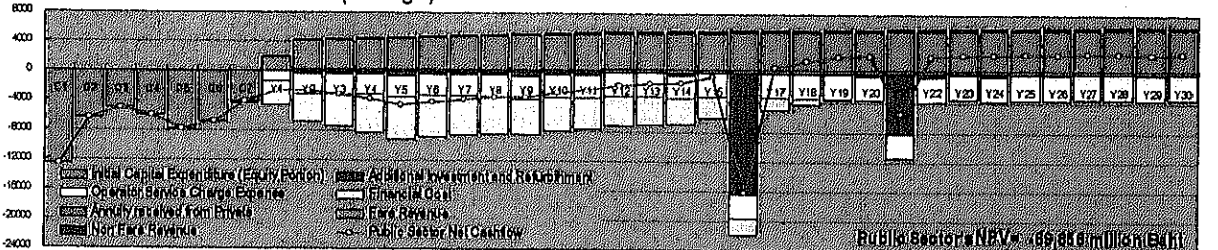
B. PPP Gross Cost Concession (Orange)



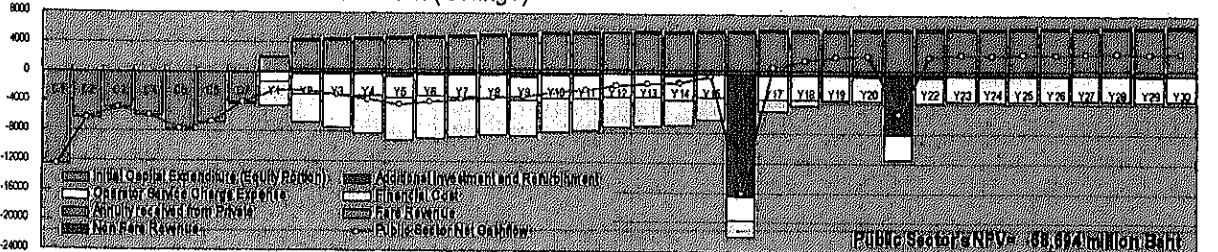
C. PPP Modified Gross Cost Concession (Orange)



D. PSC Gross Cost Concession (Orange)



E. PSC Modified Gross Cost Concession (Orange)



Source: JICA Study Team Note: 2005 constant price (unit: million Baht)

Figure 4.2-6: Public Sector's Cashflow under 6 Patterns of Financial Framework (Orange Line)

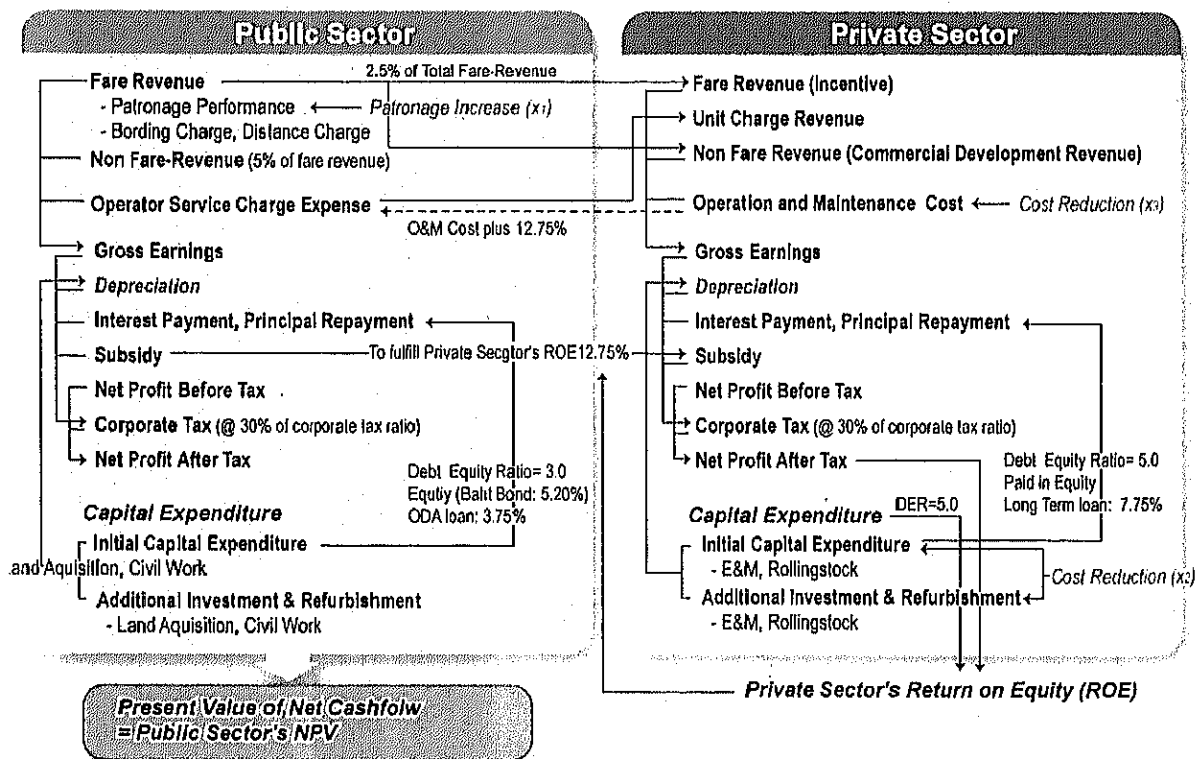
### 4.2.2 Analysis 2 (Sensitivity Analysis adopting Newton Raphson Method)

#### (1) Methodology of the Simulation

As the Analysis 1 (public sector's NPV gap calculation) indicated, the private sector is required to achieve a certain degree of efficiency, in order to fill the gap between public sector's NPV under state operation scheme and that under private participation schemes. If the private sector cannot bring about efficiency, it is better for the public sector to implement the project through a state operation scheme.

"Analysis 2" aims to examine the efficiency to be achieved by the private sector quantitatively to reduce the public sector's financial burden in comparison with the state operation scenario. In analyzing the cashflow, i) ridership demand, ii) capital expenditure for E&M equipment and rolling stock, and iii) operation and maintenance cost are adopted as the variables.

Figure 4.2-7 illustrates schematic figure of financial model adopted for the simulation (shown only the case for PPP modified gross cost as a sample). Changes in the variables ( $x_1$ ,  $x_2$ , and  $x_3$ ) affect the profitability of the private sector as well as subsidy payment or revenue share between the public and the private sector, which eventually affects public sector's NPV.



Source: JICA Study Team

Figure 4.2-7: Schematic Figure of the Financial Model (PPP Modified Gross Cost)



As same as Simulation 1, the public sector's NPV can be formulated as follows;

$$NPV_X = \sum_{t=5}^{40} \left\{ \frac{FR_{Xt} + NFR_{Xt} - OSC_{Xt} - OM_{Xt} - PP_{Xt} - IP_{Xt} - SB_{Xt} + RS_{Xt} - CI_{Xt} - AR_{Xt}}{(1 + \phi)^t} \right\} \dots (a)$$

Here:

- NPV<sub>X</sub>: Public sector's present value of net cashflow under financial framework "X"
- FR<sub>Xt</sub>: Public sector's fare revenue in year "t" under financial framework "X"
- NFR<sub>Xt</sub>: Public sector's non-fare revenue in year "t" under financial framework "X"
- OSC<sub>Xt</sub>: Operator's service charge paid by public sector to private sector in year "t" under financial framework "X"
- OM<sub>Xt</sub>: Public sector's operation and maintenance cost in year "t" under financial framework "X"
- PP<sub>Xt</sub>: Principal repayment in year "t" under financial framework "X"
- IP<sub>Xt</sub>: Interest payment in year "t" under financial framework "X"
- SB<sub>Xt</sub>: Subsidy from public sector to private sector in year "t" under financial framework "X"
- RS<sub>Xt</sub>: Revenue Share paid by private sector to public sector in year "t" under financial framework "X"
- CI<sub>Xt</sub>: Initial Capital Investment Cost (public sector's equity portion) in year "t" under financial framework "X"
- AR<sub>Xt</sub>: Additional Investment and Refurbishment cost levied by public sector in year "t" under financial framework "X"
- φ: discount rate (5.0%)

Among the above-mentioned indicators, some of them vary according to change in the three variables (=the performance of the private sector). For example, in the case of net cost concession, better ridership demand and smaller capital cost for E&M/rolling stock are resulted in smaller subsidy from the public sector. Also, smaller O&M cost of the private sector is resulted in smaller operator's service charge paid by the public sector. Financial model was formulated to always fulfill the private sector's required ROE defined under MAS, whenever 3 variables are moving.

$$NPV_X = f(x_{1t}, x_{2t}, x_{3t}) \dots (b)$$

Here:

- NPV<sub>X</sub>: Public sector's present value of net cashflow under financial framework "X"
- f(x<sub>1t</sub>, x<sub>2t</sub>, x<sub>3t</sub>): net cashflow of public sector in year "t" under financial framework "X" adopting assumptions of x<sub>1t</sub>, x<sub>2t</sub>, and x<sub>3t</sub>
- x<sub>1</sub>: difference of ridership demand between state operation and financial framework "X" in percentage
- x<sub>2</sub>: difference of capital investment cost for E&M and rolling stock between state operation and financial framework "X" in percentage
- x<sub>3</sub>: difference of O&M cost between state operation and financial framework "X" in percentage

This calculation aims to find the combination of the variables (x<sub>1</sub>, x<sub>2</sub>, and x<sub>3</sub>) which make break-even to fulfill following equation (c).

$$NPV_X - NPV_{SO} = 0 \dots (c)$$

Here:

- NPV<sub>SO</sub>: Public sector's present value of net cashflow under state operation scheme

As the first step to find a root of the above-mentioned equation, among 3 variables, 2 variables (increase in ridership demand, and reduction in capital investment cost for E&M/rolling stock) are fixed. The remaining variable, namely O&M cost reduction, to fulfill the above-mentioned equation is calculated with the Newton Raphson method. The Newton Raphson method uses the slope of the function to estimate the location of the root. Such calculations are repeatedly made for various cases; ridership demand increase (0% to 20% for

0.1% point interval), and reduction in capital investment cost for E&M equipment (-20% to 0% for 10% point interval).

## (2) Results of the Analysis

Figure 4.2-8 shows the sample result of the simulation based on the assumption of the private sector can reduce 10% capital investment cost for E&M and rolling stock. While the horizontal ( $x_1$ ) axis indicates ridership demand increase to be achieved by the private sector, the vertical axis ( $x_3$ ) indicates O&M cost reduction to be achieved by the private sector. The line in the figure indicates threshold whether the public can achieve VfM<sup>26</sup> (above the line) and it fails to achieve VfM (below the line).

For example, the left figure of Figure 1 shows that the public sector's VfM is achieved only when the private sector can reduce O&M cost by 25.1% and, at the same time, increase ridership demand by 20% compared with the public sector.

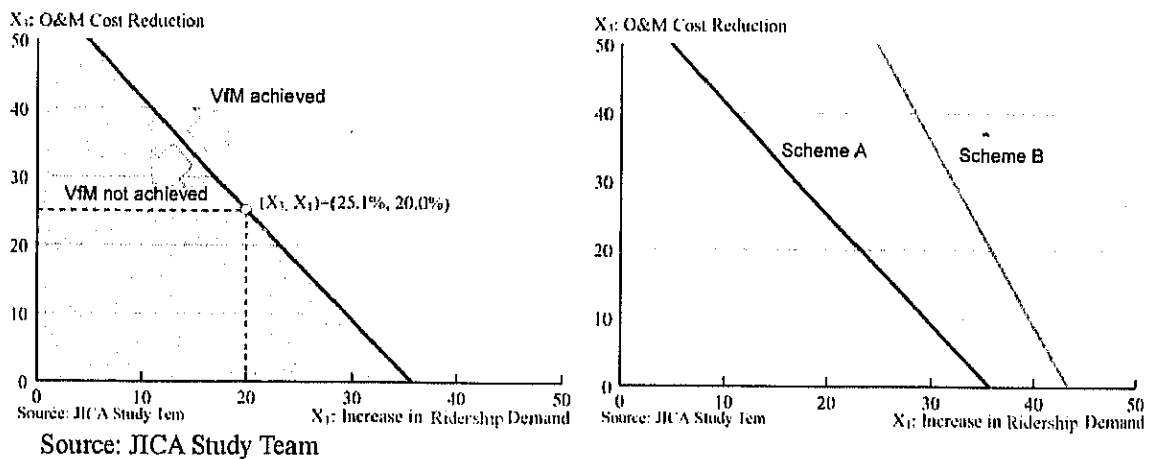


Figure 4.2-8: Example of the Result of Simulation

The graph also indicates that it becomes more difficult for the public sector to achieve VfM with increasing the distance of line from the position of the origin ( $x_1=0$ ,  $x_3=0$ ). For example, scheme B is more difficult for public sector to achieve VfM (please refer to right side of the above figure)

The figure 4.2-9 ~ 4.2.11 shows the results of the simulation for 5 project implementation schemes. In the case of the Orange line, required level of the private sector's performance is considerably higher than the others (threshold line is away from position of the origin).

<sup>26</sup> "Achieve VfM" indicates public sector's NPV under private participation scheme is bigger than the public sector's NPV under state operation scheme.

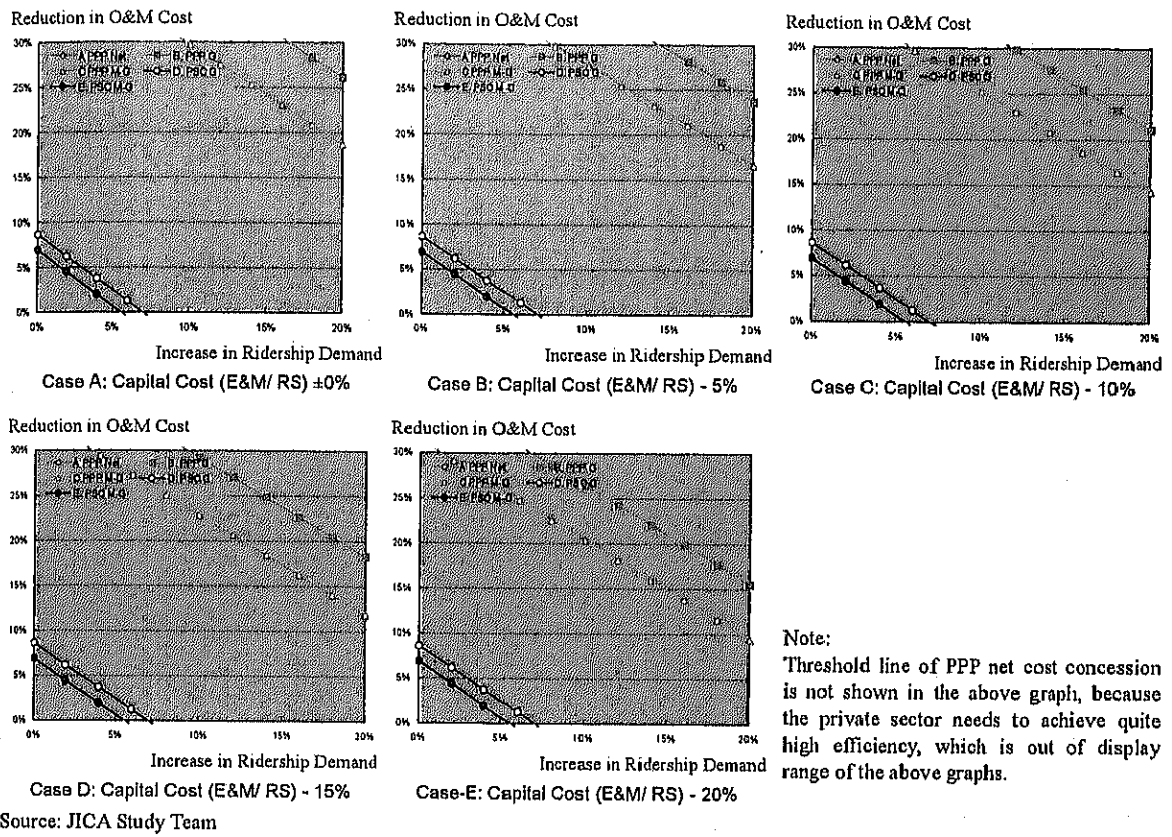


Figure 4.2-9: Results of the Simulation 2 for the Purple Line

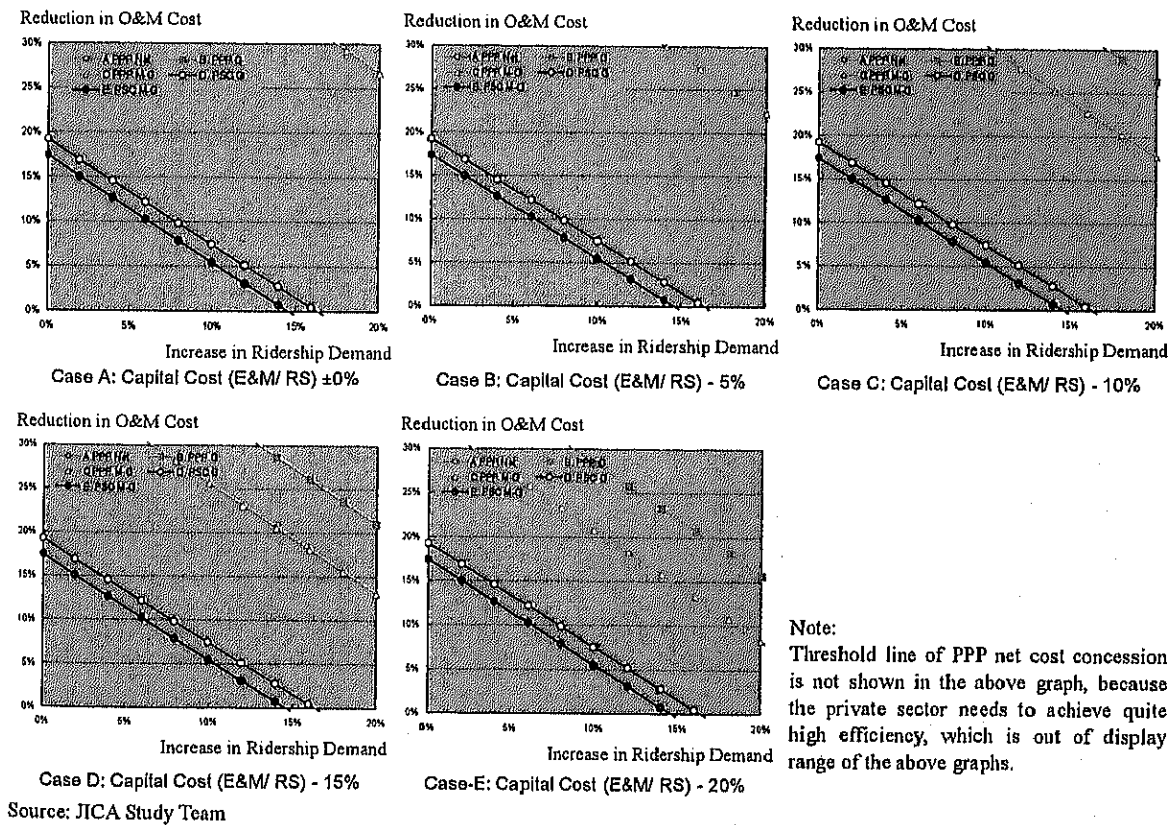


Figure 4.2-10: Results of the Simulation 2 for the Pink Line

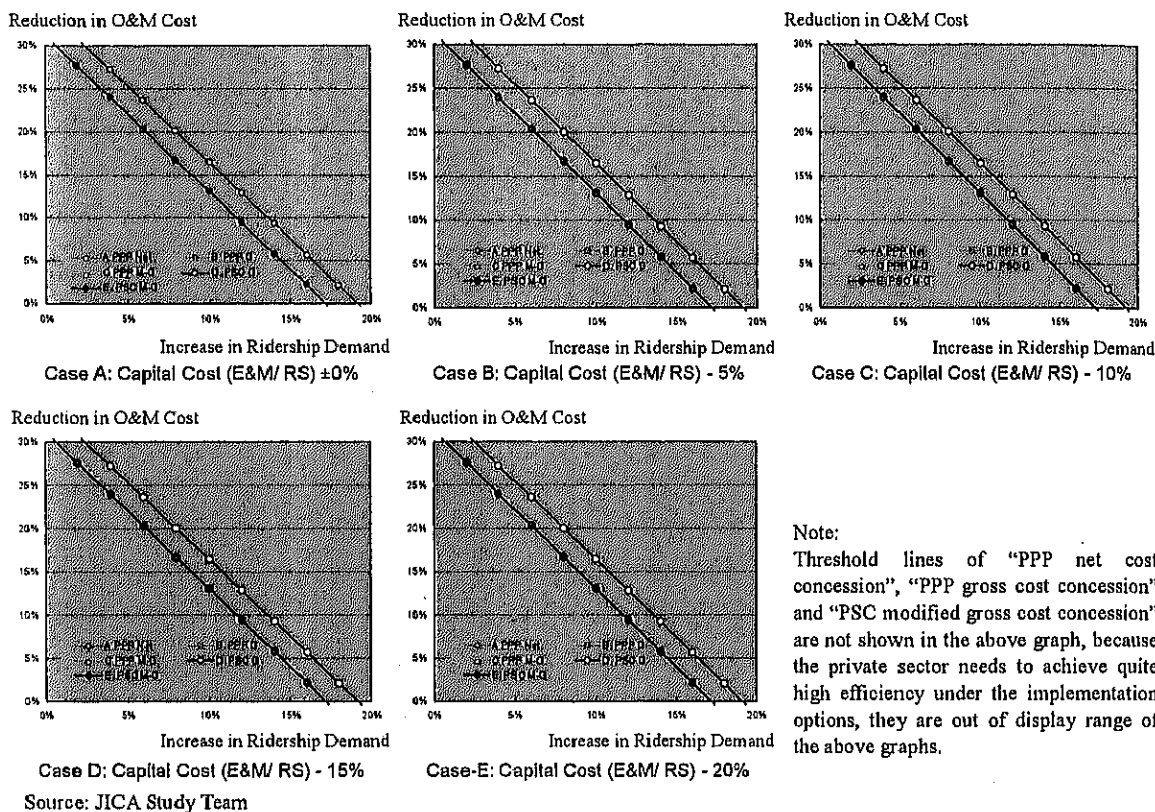
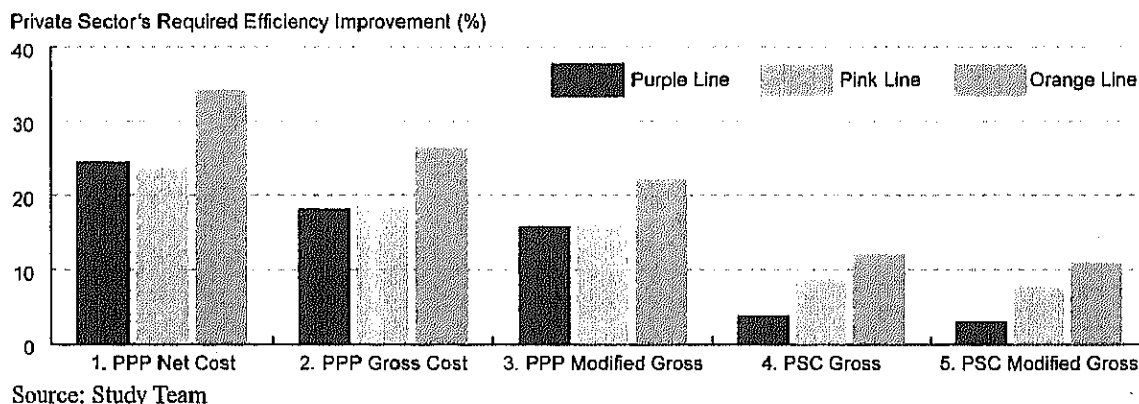


Figure 4.2-11: Results of the Simulation 2 for the Orange Line

Figure 4.2-12 illustrates the more simplified results of the Analysis 2. As shown in the figure, in case of the Orange line, required level of the private sector's performance is considerably higher than the others. When we focus on pattern of financial framework, the results indicate PPP schemes required private sector to achieve higher performance than PSC schemes. Particularly, in the case of PPP Net cost concession scheme, the private sector needs to achieve the highest level of performance among other schemes in order to achieve public sector's VfM. It would be very difficult for the public sector to achieve VfM particularly under PPP Net cost concession scheme.



Note: Private sector performance improvement indicate difference of in ridership demand increase, reduction in O&M Cost, and reduction in capital cost for E&M/rolling stock in comparison to public sector's implementation

Figure 4.2-12: Required Level of Improvement Achieved by Private Sector

Among the analyzed three lines, the Purple line seems most suitable for adopting private participation schemes. On the other hand, in comparison with the Purple and the Pink, the Orange line is not suitable for the private participation scheme.

Required private sector's performances under various private participation schemes examined by "Analysis 2" are summarized as follows;

1) PSC Gross, PSC Modified Gross

PSC gross cost and PSC modified gross cost have a greater likelihood of achieving public sector's VfM than other 3 private participation schemes. In the case of the Purple line, public sector will achieve VfM, if private sector success to improve ridership demand and O&M cost efficiency by 3.1~3.9% each than public sector. Private sector will bring about public sector's VfM under the Pink line, when they successfully improve ridership demand and O&M cost efficiency by 7.9~8.9% each. Public sector's VfM will be more difficult to achieve under the Orange line project (private sector's necessary performance will be, for example, 11.1~12.3% improvement in 2 variables).

If the public sector successfully attracts enough skilled and experienced private concessionaire, and given reasonable incentive and penalty to them, public sector's VfM can be reasonably achievable under the Purple line project and the Pink line project. Although it is considered that achievement of public sector's VfM under the Orange line project will be more difficult than the Purple and the Pink lines, but there are still enough chances to achieve it.

2) PPP Gross, PPP Modified Gross

Under the Pink and Purple line projects, public sector will achieve VfM if the private sector successfully brings about 15.9% ~ 18.7% improvement of each variable. In the case of the Orange line project, public sector will be failed to achieve VfM even if the private sector brings about 20% improvement of each variable (at least 22.4~26.6% improvement is required).

Accordingly, it seems difficult for the public sector to achieve VfM under the Purple and Pink lines. Also, the achievement of VfM under the Orange line is considered to be extremely difficult.

3) PPP Net

When PPP net cost concession model is adopted for the analyzed three lines, the public sector will be fail to achieve VfM even if the private sector brings about 23.9% ~ 34.4% improvement of each variable than public sector. However, such drastic improvement cannot be expected even if private sector has enough experiences and skills. Therefore, the achievement of VfM under the PPP net cost concession is considered to be almost impossible.

#### 4.2.3 Summary of Results of the Financial Analysis and its Consideration

(1) Summary of Results of the Financial Simulations

The results of financial simulations for the three lines are concluded as follows:

1) Private Sector Needs to Achieve High Level of Performance to enable Public Sector to Realize

## VfM

In achieving the public sector's VfM, the private sector should achieve high level of performance (such as increase in ridership demand, decrease in capital cost and O&M cost) than the public sector. If the private sector fails to achieve such efficiency, the public sector's financial burden under the private participation will be larger than that under state operation scheme.

### 2) Public Sector's VfM can be hardly achievable under PPP net, PPP gross and PPP modified gross

It is quite difficult for public sector to achieve VfM, when they asking private sector to invest capital cost for E&M equipment/rolling stock. Because, higher financial cost for E&M equipment/rolling stock levied on private sector eventually impose heavy burden on public sector in the form of subsidy paid to public sector. Thus, under PPP schemes, private sector needs to achieve higher performance than public sector. Public sector's VfM is considered to be difficult to achieve under PPP gross cost concession, and PPP modified gross concession. And, it is no exaggeration to say that public sector's VfM cannot be achieved under PPP net cost concession scheme.

### 3) Public Sector has Chance to Achieve VfM under PSC Gross Cost and PSC Modified Gross Cost

On the other hand, PSC gross cost and PSC modified gross cost have a greater likelihood of achieving public sector's VfM than other 3 private participation schemes. In the case of the Purple line and the Pink line under PSC gross or PSC modified gross, public sector will achieve VfM, only if private sector success to increase ridership by 5~8%, and decrease O&M cost by 5~8% than public sector. If public sector successfully attracts enough skilled and experienced private concessionaire, and given reasonable incentive and penalty to them, public sector's VfM can be reasonably achievable.

## (2) Considerations for the Results of Financial Simulation

In understanding above mentioned results, attention should also be paid for the allocation of risk between public sector and private concessionaire. In this analysis, private sector's risk is partially incorporated. For example, according to MAS guideline, private sector's ROE and financial cost (interest rate) is higher when private sector takes higher ridership risk (net cost concession), and is lower when private sector doesn't take ridership risk (gross cost concession). On the other hand, public sector's risk is not quantified in MAS guideline, and is not incorporated in this financial simulation.

Table 4.2-4 shows allocation of risk factor between public sector and private sector under six patterns of financial framework. As shown in the table, public sector's risk is the highest when selecting state operation scheme, and lowest when selecting PPP net cost concession. If state operation scheme is selected as financial framework, all the risks need to be taken by the public sector.

Following table also indicate relation between public sector's risk and public sector's probable NPV. The higher the public sector's business risk, the higher the public sector's NPV, and vice versa. Therefore, if the public sector wishes to reduce their financial burden, the public

sector needs to take greater risk. On the other hand, if the public sector wishes to reduce risk allocation, they have to shoulder higher financial burden.

**Table 4.2-1: Probable Risk Allocation between Public Sector and Private Sector**

Risk Factor	State Operation	PSC Gross Cost	PSC Modified Gross	PPP Gross Cost	PPP Modified Gross	PPP Net Cost
Funding, Construction Stage	High Financing Cost	●	●	●	■	■
	Inflation Risk during Construction activity	●	●	●	▲	▲
	Design Deficiency	●	●	●	■	■
	Construction Delay	●	●	●	■	■
	Insolvency of Suppliers/ Contractors	●	●	●	■	■
	Construction Cost Overrun	●	●	●	▲	▲
	Exchange Rate Risk for Construction Activity	●	●	●	▲	▲
Operation Stage	Quality of Workmanship/ Low Operating Productivity	●	■	■	■	■
	Forced Outage of Rolling Stock/ E&M Equipment	●	■	■	■	■
	Operation Cost Overrun	●	▲	▲	▲	■
	High Maintenance Cost	●	▲	▲	▲	■
	Low Ridership	●	●	▲	●	■
	Low Fare Level	●	●	●	▲	▲
	Low Non-rail Revenue	●	▲	▲	▲	▲
Exchange Rate Risk during Operation Stage	●	▲	▲	▲	▲	
Public Sector's Risk	← HIGH ————— LOW →					
Public Sector's probable NPV	← HIGH ————— LOW →					

Note: Risk on funding and construction stage in above table refers only to E&M equipment and rolling stock

Legend: ● = Public sector take risk, ■ = Private concessionaire take risk, and ▲ = Private and public shares risk or risk allocation will be decided by concession agreement

Source: JICA Study Team

### 4.3 Key Implications from Financial Simulation

As redefined in Chapter 1, financial framework is one of the four key elements of implementation scheme. Nevertheless, decision on financial frameworks still holds an important weight in successful implementation. The Study Team conducted financial simulation of 6 patterns of financial framework. These patterns are basically a combination of three factors; 1) funding, 2) concession model, 3) O&M. The Study Team used these patterns for simulation purposes because these patterns are widely used in Thailand, as MAS.

It is important to note that this study simulation did not use the 'optimism bias' included in MAS. Rather, the Study Team genuinely took the capital cost difference and private risk premium margin requirements to identify the government's NPV gap between a state operation scheme and five private

participation schemes. In other words, the NPV gap should be interpreted as the efficiency gain target to achieve positive VfM. NPV gap results are highlighted in Figure 4.2-1~4.2.3 Chapter 4.2.

As the results of “Analysis 1 (public sector’s NPV gap calculation)” shows, the public sector’s NPV is negative in all scenarios. This is not surprising for mass transit infrastructure. Smallest negative NPV is state operation because there are no private margins and the cost of capital is lowest. This is also obvious. What is interesting is the degree of NPV gap. Key question is whether such gap can actually be filled by private participation. The Study Team also conducted sensitivity analysis of cash flow in all scenarios for such factors as ridership, O&M, and E&M construction efficiency. The results show that much efficiency gain should be achieved to justify private participation from a VfM point of view. The so called “optimism bias” may require further review. Difference in financial framework alone may not realize such degree of efficiency gains.

Investment of MRT projects and its financial framework should not be decided merely by VfM comparison. In reality, there is no such thing as the best financial framework. As described earlier, there are so many factors regarding merits and demerits of financial framework, such as additional financing capacity, network controllability, government obligation for public transport (e.g. bail-out upon private party default), likelihood of private participation in early stages of network building, etc. Furthermore, successful implementation of MRT project has too many other factors beyond financial framework, as explained in Chapter 1.

Whichever pattern is selected, the most important is to understand the characteristics and consider upfront actions to maximize ‘pros’ and minimize ‘cons’.

#### 4.4 Characteristics of Financial Framework Patterns

As mentioned previously, the Study Team has adopted six likely future patterns of financial framework for financial simulation. These 6 patterns of financial framework was formulated by combining three dominant parameter choices, i.e., funding, concession model and O&M as shown in Table 4.4-1.

Table 4.4-1: Financial Framework Patterns

	Funding		Concession Model			O&M	
	100% Public	Partial Private	Net	Gross	Modified Gross	SOE	Private
<b>Pattern 1: State Operation Scheme</b>	●		●			●	
<b>Pattern 2: PPP Net Cost</b>		●	●				●
<b>Pattern 3: PPP Gross Cost</b>		●		●			●
<b>Pattern 4: PPP Modified Gross Cost</b>		●			●		●
<b>Pattern 5: PSC Gross Cost</b>	●			●			●
<b>Pattern 6: PSC Modified Gross Cost</b>	●				●		●

Source: Study Team

Choices of funding consists of i) 100% public investment and ii) public and private joint investment, into civil works, electrical and mechanical works, rolling stock and operation.



Choices of concession model consists of i) net cost concession, ii) gross cost concession and iii) modified gross cost concessions. Under a net-cost concession, revenue goes to a concessionaire and the concessionaire pays concession fees to the contractor. As for a gross-cost concession, revenues directly comes to the government contracting agency and the concessionaire receives a pre-agreed service fee in return for transport availability and service provision. A modified gross-cost concession is same as for gross-cost concession model other than part of the incentive payment from the contracting agency to the concessionaire, which is linked to the number of passengers carried or other indicator(s).

Choices of O&M consists of i) privately managed O&M and ii) SOE managed O&M

The Study Team has basically followed the classification of standardized financial framework used by the Thai Government. It should be noted that each pattern, except Pattern 1, has several variations according to how the funding of the private sector is defined.

The characteristics of proposed six financial framework patterns are as follow:

**Pattern 1: State Operation Scheme** will be similar to Singapore or Delhi case. In Thai context, this choice is bound by the ceilings of public debt set by the government.

**Pattern 2: PPP Net Cost** is same as the existing Blue Line. Given the historical instability of MRT network master plan, this choice contains too much ridership risk due to uncertain future development of the network.

**Pattern 3: PPP Gross Cost** is considered more attractive to private investor than Pattern 1 because the ridership risk belongs to the government. Private sector needs to bear capital cost for E&M equipment/ rolling stock as well as O&M Cost, and they aim to gain profit by receiving service fee payment from government. The government must be careful with service fee negotiation.

**Pattern 4: PPP Modified Gross Cost** is the most attractive to the private sector from the viewpoint of ridership risk and has incentive mechanism to increase ridership.

**Pattern 5: PSC Gross Cost** carries a lowest risk to private sector than other private participation patterns, and private sector can expect stable calculated returns. While this pattern carries low risk to private sector, their expected return is, usually, also low. On the other hand, government needs to shoulder higher risk (such as risk of ridership, risk of cost overrun for capital investment) than the other private participation patterns.

**Pattern 6: PSC Modified Gross Cost** is similar in financial framework pattern 5. This pattern gives incentive and penalty mechanism to private sector, which will be calculated based on ridership. Partial ridership risk will be allocated to private under this choice.

#### 4.4.1 Choice of Funding: 100% Public Fund or Partially Private Fund

Thailand has already gone down the path of partial funding by the private. However, the reason for such choice needs to be clear. In urban city MRT network, it is quite difficult to prove or disprove that private party can provide efficiency gains. As discussed in the latter part of this chapter, the case study results do not bring about any evidence to prove that private can provide efficiency gains.

Therefore, the merits of private funding are considered a) to prioritize the speed of MRT network development, b) to reduce the government debt burden and c) to share the risks

At the same time, private funding has its demerits. First of all, the cost of capital is much higher. More importantly, government controllability of the MRT network is compromised and the complexity of project implementation becomes much higher if private party is involved.

**Table 4.4-2: Comparison of Choices of Funding - Public and Private**

		100% Public Fund	Partially Private Fund
Additional Financing Capacity	Speed of MRT Network Development	- Slow	+ Fast
	Gov't Debt Burden	- High	+ Low
Gov't Risk		- High	+ Low
Gov't Controllability		+ High	- Low
Gov't Capacity Requirement		+ Low	- High
Value for Money	Construction and Operation Efficiency	Not Proven which is better	

Source: Study Team

#### 4.4.2 Provisional Comparison of Choice of Concession Model: Net or Gross or Modified Gross

Another important choice is concession model. There are three choices; Net or Gross or Modified Gross. The characteristics of each model are as follow:

**Net Cost:** The objective of concessionaire becomes an entrepreneurial profit generation. Both BMCL and BTSC operate under this choice. However, under the current uncertain economic situation, this choice may not attract private players to participate. The ridership risk is just too high. Also, this choice gave the government limited control over important topics such as signal system and AFC specification.

**Gross Cost:** This choice has the largest attractiveness to private investors since the government takes majority of risk and a concessionaire can expect stable calculated returns. For the Thai government, this choice must be coupled with a well defined concessionaire management contact and monitoring.

**Modified Gross Cost:** This choice balances out the largest demerit of Gross, which is the lack of concessionaire incentive to enhance ridership. This choice provides such incentive by sharing a portion of revenue flow with concessionaire.

**Table 4.4-3: Comparison of Choices of Revenue Model - Net or Gross and Modified Gross**

		Net	Gross	Modified Gross
Additional Financing Capacity	Attracting Private Investment (in early stage of network building)	- Difficult	+ Easy	+ - Med
Gov't Risk		+ Low	- High	- High
Gov't Controllability		- Low	+ High	+ High
Gov't Capacity Requirement		+ Low	- High	- High
Value for Money	Ridership Enhancement Incentive	+ High	- Low	+ - Med
	Operation and Maintenance Efficiency	Not Proven which is better		

Source: Study Team

**4.4.3 Comparison of Choice of O&M Model: SOE Operation or Private Operation**

The other choice is O&M. There are two choices; SOE operation or private operation. The characteristics of each model are as follow:

**SOE Operation:** Under this choice, operation and maintenance activities are wholly executed by state owned entity. It is easy for government to control implementation schedule of reinvestment & refurbishment of infrastructure, fare setting, and transport schedule. On the other hand, this choice requires government side to develop business acumen. As the case of SRT shows, this choice sometime resulted in rigidity of personnel system and payment system.

**Private Operation:** This choice asks private concessionaire to execute operation and maintenance activities. Introduction of performance-based payment system and personnel evaluation system is deemed easier under this choice. Private sector is believed to bring operational efficiency. However, in the case of urban railway project, the past experiences in other countries indicated that private operation does not necessarily show superior performance than SOE operation.

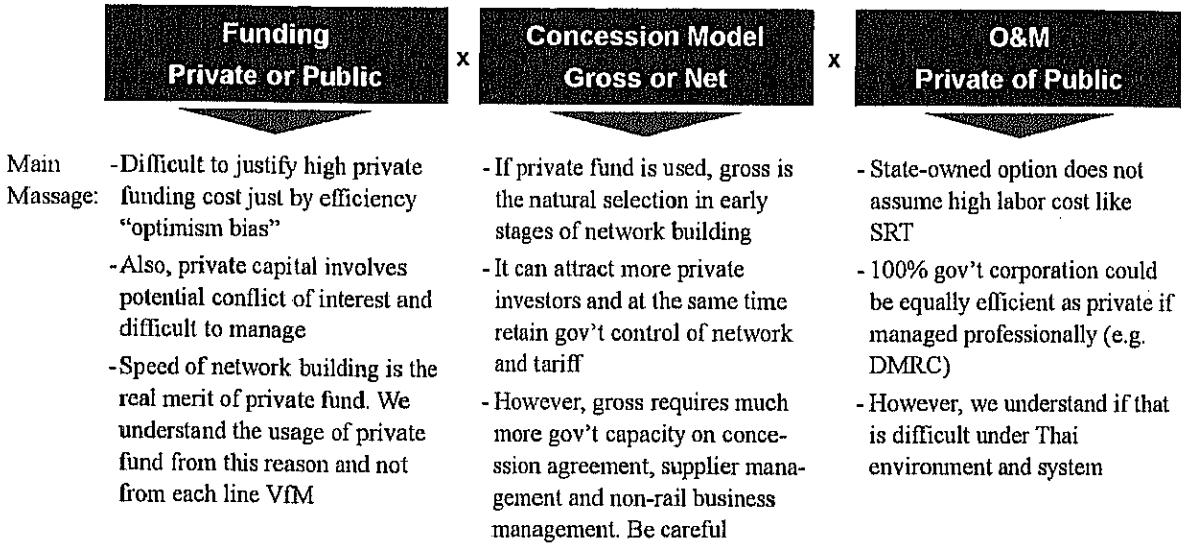
**Table 4.4-4: Comparison of Choice of O&M Model**

		SOE Operation	Private Operation
Additional Financing Capacity		- Low	+ Med
Gov't Risk		- High	+ Low
Gov't Controllability		+ High	- Low
Gov't Business Capability Requirement		- High	+ Low
Value for Money	Flexibility for Labor Management	- Low	+ High
	Operation and Maintenance Efficiency	Not Proven which is better	

Source: Study Team

### 4.5 Overall Message on Analysis of Financial Framework

Based on lessons from overseas cases and financial simulation exercise, the Study Team has synthesized overall message on analysis of financial framework. Messages are disaggregated based on the three factors of financial framework; 1) funding, 2) concession model, and 3) O&M.



Source: Study Team

Figure 4.5-1: Overall Message on Financial Framework

**Message on funding:** The simulation results indicate the difficulty of justifying private funding cost just by efficiency “optimism bias.” For example, how can private consortium achieve construction efficiency of 30% better than state operation. Key to construction efficiency is to ensure integration between design, construction and O&M. This is to ensure lifecycle cost perspective. This can be well executed by state operation as well. Case of Delhi Metro is a good proof. In addition, as seen in Kuala Lumpur and London case, private consortium can bring in conflict of interests and actually achieve construction inefficiency.

However, this does not mean Thai government should abandon PPP scheme. The real merit of PPP for large infrastructure is additional financing in addition to the government, which will speed up network building. Value of network building speed will benefit all players involved in each line implementation. In a network business, value of speed is significant. This is because network has a compounded effect on each line’s ridership. A virtuous cycle of increased convenience, increased ridership and non-rail business exists. Therefore, it is the study team’s view that PPP scheme could be justified from this point of view.

**Message on concession model:** If private fund is used for above reason, then, gross concession model is a realistic choice. This is not because “gross cost” is better than “net cost” indefinitely. This is because current situation in Thailand is still early stages of network building and ridership risk is uncontrollable by private party. The ridership is significantly affected by factors for which the government should be responsible, as Tier1 and Tier2 explained in Chapter 1. Therefore, as a matter of course, the government is expected to be an owner of ridership risk in early stages of network

building. In addition, “gross cost” allows government control on tariff and specifications related to network integration. This is again important in the early stages of network building.

Meanwhile “gross cost” has its disadvantages. It requires the government’s continuous management of concessionaire and suppliers. In other words, government cannot delegate everything to private party and lay back. This is because a concessionaire will be paid an annuity service fee from government with relatively low risk. Efficiency improvement needs to be monitored and managed carefully by government contracting agency. For example, specific KPI target need to be agreed upfront and included in the concession agreement. Also, government contracting agency needs to play a stronger supplier management role. This is because the cost of equipment and maintenance is included in the annuity service fee on a ‘cost plus’ basis. Therefore, stricter supplier cost management is an important government responsibility. Lastly, non-rail business requires attention. If government is taking ridership risk, then, government should be entitled to the revenue streams of non-rail business.

**Message on O&M:** It is a myth to assume that private company can manage O&M more efficiently than state operation company. When state operation company is referred, it is not proper to take for granted the high cost structure and inefficient mindset prevalent in SRT. There are ways to establish 100% government owned corporation with high efficiency, similar to the case of Delhi Metro Corporation. What is important is to hire professional top management team (preferably from the private sector) that can set the right corporate culture. Providing O&M concession to private company is also an attractive option if professional top management is guaranteed. Again, the key issue is not about a question of state operation company or private company. It is how to ensure conditions for professional top management team. If a option of operation by private company is easier to achieve such conditions under Thai environment and system, this option is understandable. However, in this case, it is important to make a parent company (or group parent companies) focus on O&M company’s profitability and success.



## CHAPTER 5 LEARNING FROM OVERSEAS CASES OF URBAN RAILWAY DEVELOPMENT

### 5.1 Lessons of Financial Framework Overseas Case

#### 5.1.1 Outline of six city cases in urban transport

For overseas cases, the Study Team looked at following six cases: Manila, Singapore, Kuala Lumpur, Delhi, Tokyo and London. The Study Team selected these cases with consideration of variety of PPP and state operation cases. Also, the Study Team tried to look into both success cases and failure cases basically from the financial point of view.

Table 5.1-1: Description of Overseas Cases in ITR1

City (Country)	Name of Railway	Operator	Type of Operation	ODA Project
Manila (The Philippines)	LRT 1	LRTA	State Operation	Yes (Belgium)
	LRT 2			Yes (Japan)
	MRT 3	MRTC	PPP	No
Singapore	LRT	SMRT / SBS Transit	State Operation/Private	No
	MRT	SMRT / SBS Transit	State Operation/Private	No
Kuala Lumpur (Malaysia)	LRT System I	STAR → RapidKL	PPP → State Operation	No
	LRT System II	PUTRA → RapidKL	PPP → State Operation	No
	Express Rail Link	Express Rail Link	PPP	No
	KL Monorail	KL Monorail → RapidKL	PPP → State Operation	No
Delhi (India)	Delhi Metro	Delhi Metro	State Operation	Yes (Japan)
Tokyo Metropolitan Area (Japan)	MIR (Tsukuba Express)	MIR	PPP	No
London (U.K.)	London Underground	Infracos (for Infrastructure Maintenance)	PPP	No

Source: JICA Study Team

#### 5.1.2 Comparison of Financial Performance in Six Cases

From the reports and data shown in the Appendix 5 and 6, the following can be extracted as the outline of urban transport in each city.

##### [Summary of Individual reports]

#### (1) Manila; Light Railway Transit Authority (LRTA, public) and Metro Rail Transit Corporation (MRTC, private)

LRTA had a big deficit in 2004. MRTC had a big deficit in 2003. Both Manila MRT (Line3, MRTC) and LRT (Line1 and2, LRTA) are governmental financial burden though they have been recognized as convenient means of transport in Metro Manila. This relatively high ridership brought reasonable revenue return but it is not enough to cover capital cost which is too heavy for the operator. In addition, low non-rail revenue (less than 1% of rail revenue) pressures

overall profitability. For LRT1 of Manila, with the existing number of passengers, its transportation capacity of train-sets is insufficient at peak time. Original capacity planning at design stage seems too conservative for large city like Manila.

**(2) Singapore; Singapore Mass Rapid Transit(SMRT, public)and SBS Transit(public)**

Singapore MRT (Other than North East Line, SMRT) and LRT (North East Line, SBS Transit) are successful case of 100% government development. Singapore MRT and LRT operated by government with its public entities are highly evaluated with its operational and financial efficiencies due to integrated transport planning by government.

Another salient feature is its implementation system by government agencies, i.e., MRTCC (Mass Rail Transit Corporation) to make efficient construction and SMRT and SBS Transit to manage operation under corporate governance system of global standard.

**(3) Kuala Lumpur; STAR Sdn Bhd (private), PUTRA (private) and KL Monorail (private)**

Malaysia PPP cases are negative examples for Bangkok urban transport system.

PPP operation for 4 lines were all facing deficit and, as a result, 3 lines were nationalized. The following are the main reasons of unprofitable operation.

- 1) Ridership were much lower than forecasted by the concessionaires
- 2) The government's failure to implement policies for promotion of public transport
- 3) Poor integration of urban railway systems and integration with other modes of transport

It is said that private parties, who are the shareholders of these companies, made profits during construction and did not pay much attention on operational profit

**(4) Delhi; Delhi Metro Rail Corporation(DMRC, public)**

DMRC is a success case. Key reasons are as follows:

Role definition between DMRC and government is clear. Government made full support to DMRC to ensure a defensible financial structure (e.g. tax exemption, land development rights and energy cost contracted).

DMRC built in-house capabilities by usage of consultants and suppliers (e.g. maintenance capability, system integrator role). DMRC set up corporate governance system of global standard and eliminated all political intervention.

**(5) Tokyo; Metropolitan Intercity Railway (Its major shareholders are public. Private sectors have a small portion of shares)**

The project is considered to be successful case, thus far. Key reasons for success are as follows.



- 1) Joint city and railway planning based on support by special law established for this project
- 2) Sound financial arrangements: Provision of fund without interests and large government equity amount
- 3) Introduction of advanced automation systems to minimize labor cost

**(6) London: London Underground (public) / Metronet (private)**

This is a unique case of PPP in which private sector does not operate railway itself but focuses on upgrading and maintaining infrastructure. One consortium has maintained profit every year. The other, Metronet, fell into financial difficulty and was nationalized. The main reason for the failure is said to be conflict of interest. The five shareholders of Metronet were suppliers to Metronet and had different interests. This also led to lack of management integrity.

**[Learning from foreign cases]**

**(1) PPP Cases**

From Successful Cases: MIR (Tokyo)

The size of deficit of MIR (Japan) is rather small. The major reason for this was the government special treatment to reduce the construction cost and provide interest-free loans. It should be noted that the share portion of private is small (10%). In reality mainly the governments (central and along the line) have taken care of this railway.

From Failure Cases: Kuala Lumpur LRT and London Metro

Most of urban railways under PPP scheme tended to suffer with a huge deficit. Structurally, just rail revenue may not justify high capital cost of private investment. High non-rail revenue and/or subsidy from government were needed. Specifically for KL and London, conflict of interests was observed as a critical reason of failure. KL case had conflict with construction and London case had conflict with suppliers.

**(2) Operation-by-government Cases**

From Successful Cases: SMRT (Singapore) & Delhi Metro

Commonly observed success factors are as follows:

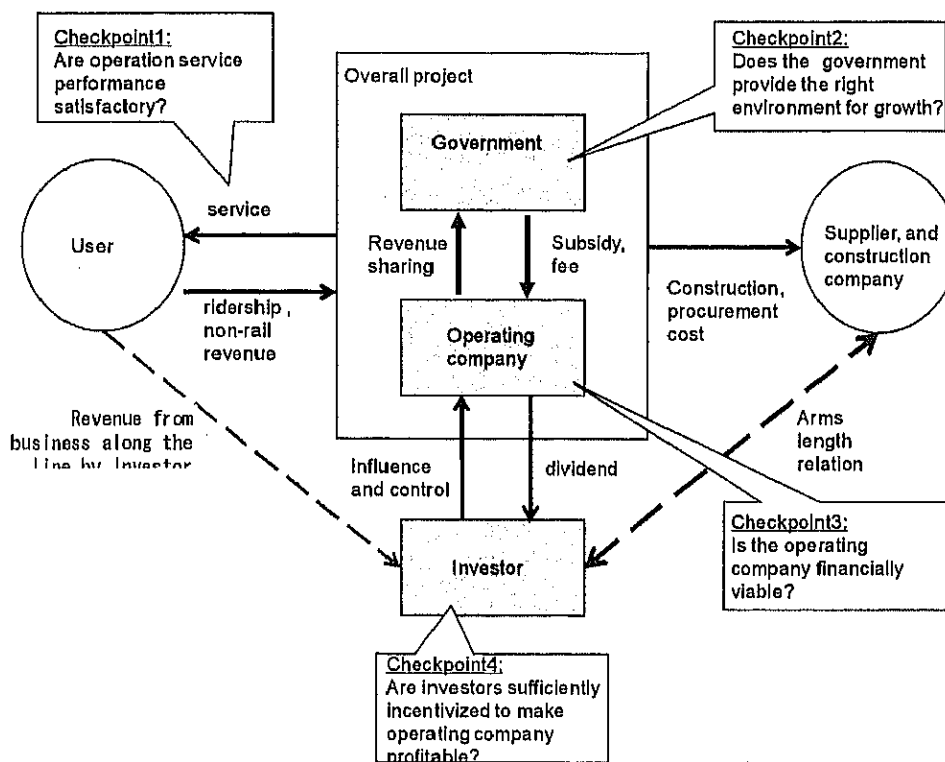
- 1) Integration of transportation and city planning.
- 2) Robust corporate governance, e.g. minimize political intervention
- 3) Government support, e.g. tax exemption, power supply contract.
- 4) High non-rail revenue ratio based on upfront planning

From Failure Case: LRT (Manila)

Government did not provide a defensible financial support despite maintaining relatively low tariff level. (In the LRTA's annual report of 2007, the government subsidized 1,034 Million Pesos to LRTA and its P/L turned a profit.) Capacity planning of rolling stock did not match the population density of large city like Manila

### 5.1.3 Key Lessons from Overseas Financial Framework Cases

The Study Team faced two key challenges in evaluating the overseas cases. First, a fundamental question on how to define success and failure of MRT project should be clarified. Second, there are natural limitations to what can be analyzed from publicly available information source. Nevertheless, the Study Team believes that examination of overseas cases has grave implications for Thailand.



Source: JICA Study Team

Figure 5.1-1: Checkpoints to Evaluate Success and Failure

In terms of how to define success and failure of MRT project, it is not an easy question to answer. This is because success can be different depending on the standpoint of stakeholder. For example, success for investor is the total return, which is not only dividends from the operating company but also could be in the form of their own business around the railways and construction/supplier margins if investors have such business portfolio. Therefore, a non-profitable operating company does not necessarily mean failure for the investors. For the governments, a non-profitable operating company would probably have negative effects. Government may need to bail out the company in order to maintain public transport operations. Perhaps, it is easier to grasp by looking at the diagram on

Figure 5.1-1.

The above diagram shows key players for MRT project, which are government, operating company, investors, users and suppliers/construction companies. In case of PPP, investors are private consortium. In case of state operation, an investor is the government. Since this is a public infrastructure project, the Study Team implicitly assumed that success should be defined for user and government. From this point, the Study Team has set four checkpoints to determine success/failure and synthesized case lessons from each of this view. The four check points are:

- **Checkpoint 1:** Are operation service performance satisfactory? This is clearly one of the critical factors to define success. After all, the infrastructure is made for the users. However, in the case study comparison of six cities, the Study Team could not clearly articulate differences in performance. This is partially due to limitations of data but also related to the characteristics of mass transit operation. MRT can be considered a huge centralized facility business with high degrees of technical automation. Therefore, service performance is typically stable and standardized. One potential failure case from this aspect is Manila. This is because trains are highly congested during peak hour with rather limited room to provide transportation capacity. Perhaps, the original capacity planning did not match the densely populated city like Manila.
- **Checkpoint 2:** Does government provide the right environment for growth? It is very often misunderstood that once PPP tender is finished and project is in the hands of private consortium, the government's role is complete. This is clearly not the case for mass transit. For example, shift from vehicle to public transport cannot be controlled well by the private. This is a policy matter. Also, in a network business model, one standalone line cannot survive without the rest of the network built. Changes in network planning and schedules due to political intervention can severely damage the original ridership assumptions. In the case study, two success cases, Singapore and Delhi, stand out in this aspect. Singapore is a great example of integrated planning. City plans are well aligned with MRT plans, in which real estate development is well planned and implemented surrounding stations. This will ensure stable ridership. Delhi is a great example of excellent corporate governance. Delhi Metro Corporation was given autonomy to make consistent and lasting decisions with minimal political intervention.
- **Checkpoint 3:** Is the operating company financially viable? This is perhaps the most obvious checkpoint. However, it is very important to note that negative profit does not necessarily mean poor operations. Actually, operating company's profitability is mostly determined during financial design, in the form of direct or indirect subsidy decisions. As already suggested, the fare level is decided by the affordability of passengers. It is not decided by the construction/operation cost. On the contrary, for the construction of urban railways, huge quantities of civil works are required and various computerized equipments and rolling stock need to be equipped. Hence operating companies cannot survive without some form of subsidy

in the early stages of network development when its ridership is low. A key is to set it at the right level. Too much subsidy will spoil operating company's own efforts to manage efficiency. Too little subsidy, on the other hand, will lead to red figures, which may damage staff morale and ultimately lead to some form of debt restructuring. In our case example, Tsukuba Express is a great case of government's funding support with high government equity ratio and interest-free loans. Delhi Metro had defensible financial structure with tax exemptions, access to low cost power supply and subordinated loans.

• **Checkpoint4:** Are investors sufficiently incentivized to make operating company profitable? This may sound like a strange question but the Study Team considers it quite relevant. In large infrastructure projects like mass transit, significant portion of cash-flow transactions are in the construction and installment of E&M facilities. In other words, from a genuine business point of view, this portion is much more attractive than potential profit gains from operations. Out of the six cities in the case study in the Study, Kuala Lumpur was a failure case in which the parent company of operating company was construction company and lacked construction efficiency. London is another such failure case, in which Metronet's parent company was supplier.

These checkpoints are not comprehensive and there are probably more points that define success. However, this is the Study Team's attempt to clarify the lessons from overseas and derive implications for Thailand. In theory, the notion of Value for Money should also be a part of measurement for success. However, especially in large infrastructure development projects, Value for Money calculations are made with too many assumptions and have the risk of misrepresenting what is really important in implementation design.

## **5.2 Learning from Overseas Cases on Governance/Law and Regulation Cases in Other Countries**

How to govern PPP scheme of the urban railway business? How to secure the safety of citizens who commute between their home and offices everyday as the government? In this section, from these two points of view, the foreign case studies were carried out.

### **5.2.1 Cases in other countries**

#### **(1) PPP in the Philippines**

Philippines' act to promote public-private partnership for development projects is Republic Act (R.A.) No. 7718 (May 1994, amendment of RA957), which is called the BOT Law. BOT is the abbreviation of Build-Operate-Transfer. The Philippine BOT Law consists of two main parts: "the Act" and "Implementing Rules and Regulations," and "Annex: Process Flow".

Section 1 of the Act, "Declaration of Policy" provides the following: "It is the declared policy of the State to recognize the indispensable role of the private sector as the main engine for national growth and development and provide the most appropriate incentives to mobilize private resources for the purpose of financing the construction, operation and maintenance of infrastructure and development projects normally financed and undertaken by the Government. Such incentives, aside from financial incentives as provided by law, shall include providing a climate of minimum government regulations and procedures and specific government undertakings in support of the private sector."

In Section 2 of the Act, "Definition of Terms" explains type of schemes to be applied, i.e., BOT, Build-Transfer (BT), Build-Owned-Operate (BOO), Build-Lease-Transfer (BLT), Build-Transfer-Operate (BTO) and other schemes.

Following the main body of the Act, "Implementing Rules and Regulations" stipulates detail terms of conditions of private sector participation for public projects. Section 2.2 is a list of eligible 18 sectors, e.g., highway, railway, non-rail mass transit, port, and airport. "Implementing Rules and Regulations" consist of 112 sections of 15 Rules<sup>27</sup>. Together with the Act and "Implementing Rules and Regulations," this BOT Law gives a comprehensive understanding of the government policy, definition of terms, eligible and priority sector/project, bidding and evaluation procedures of private sector participation in public project.

## **(2) Railway Business Act in Japan**

Railway is a business which is utilized by a lot of people everyday and required to maintain its system safe at a high level. A railway operator should not stop its service according to their financial situation alone. Once the line is constructed, the operator has the exclusive power for the transport along the line. In Japan, such businesses are designated as a "Public business" and the government has to regulate these business operators by a law. These businesses cannot be freely started without permission from the government. The railway business law is one of the laws for the regulation of public business operators. In this law, as is shown in the following table, the procedures for the permission to a designated business operator and various articles for security of railway safety as the government are stipulated. Under these law systems, Railway Bureau of MLIT has been established as an organization for the railway regulator.

Under this law, "Ministerial Ordinance on the technical standards for railways" is stipulated for the regulations on the structures of equipments and rolling stock. "Procedures and rules to ensure safe and sound railway businesses" and "Railway transport regulation" are also stipulated for the settlement of tariff levels and related condition of transport.

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<sup>27</sup> Major Rules: Rule 3 The BOT Pre-Qualification, Bids, and Awards Committee; Rule 4 Bid/Tender Documents; Rule 5 Qualification of Bidders; Rule 8 Evaluation of Bids; Rule 10 Unsolicited Proposals; Rule 12 Contract Approval and Implementation; Rule 13 Investment Incentives and Government Undertakings

**Table 5.2-1: Major Contents of Japanese Railway Business Law**

Issues	Main articles
Permission of railway Business	<ul style="list-style-type: none"> <li>• Permission of the railway business</li> <li>• Items required for application of permission</li> <li>• Criteria for permission</li> <li>• Disqualification causes</li> </ul>
Implementation and construction	<ul style="list-style-type: none"> <li>• Modification of basic business plan</li> <li>• Permission on commencement of construction</li> <li>• Modification of construction plan and railway facilities</li> <li>• Confirmation of rolling stock specification</li> </ul>
Operation	<ul style="list-style-type: none"> <li>• Fare and charges</li> <li>• Operation plan</li> <li>• Report of incidents</li> <li>• Order of business improvement</li> </ul>
Closing of business	<ul style="list-style-type: none"> <li>• Transfer and taking over of business</li> <li>• Halting and closing of the railway business</li> <li>• Dissolution of a corporation</li> <li>• Halting and cancellation of permission</li> </ul>

Source: Railway Business Law (MLIT, Japan)

### (3) Roles of Regulator

It is useful to observe other sectors to understand the role of regulator to govern one sector. For example, electric power industries are one of the business fields where PPP is introduced actively. Now in the PPP scheme of the power industries around the world, normally Regulators are established. Its roles are as follows.

#### a. Issuance of business license and supervision of electric power industries

By the nature of this business like railway business, power transmission and power distribution companies carry out their business exclusively inside their franchise areas. Hence especially regulation by the Regulator is required.

#### b. Provision of technical regulation and its supervision

In the electric power system, power supply is carried out through consolidated networks of power generation, transmission and distribution. It needs consolidation of the technical standards among these three businesses.

#### c. Establishment and regulation on price mechanism for end users and trade rate between power companies

The above issues in electric power industries are also common to those in the urban railway business industries. When construction and operation of railways are entrusted to a private sector, the government has to establish a function of the regulator. In the Japanese Railway Business Law, which is introduced in the previous paragraph, the issues on what the railway regulator has to do are stipulated.

### 5.2.4 Lessons learned on Governance Cases in Other Countries

For the improvement of governance systems on urban railways in Bangkok, the following were extracted from the experience of foreign countries;

- a. PPP Law should have articles on comprehensive understanding of the government policy, definition of terms, eligible and priority sector/project, bidding and evaluation procedures of private sector participation in public project.

- b. The organization for regulation of urban railways has to be established.

As the case study of the electric power industries shows, the government has to have an organization for regulation of urban railways and settlement of fare level.

The regulator suggested here is so called a sector regulator. It should be noted that , in a PPP scheme, an independent regulator from the line ministry is also required to settle the conflict between the government contracting agency and the concessionaire.

- c. Urban railway business act and the related ministry ordinance should be established.

Since urban railways are the public transport which citizens ride on everyday, the government has to supervise its safety from the viewpoint of security of passengers' safety. It should not be allowed for the operator to stop its service due to their financial situation alone. Passengers will be embarrassed if the fares level changes suddenly. Therefore, the conditions required to the public transport have to be clarified by the government.

The relationship between the conditions for public transport designated in the act and ministry ordinance and the contents in the PPP contract is expressed in the following table by setting the railway signal as an example.

**Table 5.2-2: The Relationship between the Conditions in the Act and Ordinance and the Contents in the PPP Contract**

Issues	Act and ministry ordinance	Contract with Concessionaires
Current situation of urban railways in Bangkok	There is no act for urban railways	General description for the signal system is only expressed on the Appendix and no specific specifications are expressed on the contract.
Recommended governance system	The signal performance allowed for urban railways should be shown in the act and ordinance. Several alternatives for them are also to be expressed as examples	Signal specifications to be installed on the line are expressed.

Source: JICA Study Team

## 5.3 Learning from Integrated MRT Planning in Other Countries

### 5.3.1 Formation of Comprehensive Urban Transport Master Plan

#### (1) Designation of High Floor Space Ratio along Public Transport Alignment

The BRT (bus rapid transit) transport system of Curitiba in Brazil is often given as an example of the most successful integration of transport and land use. Curitiba was organized into transport corridors very early in its history.

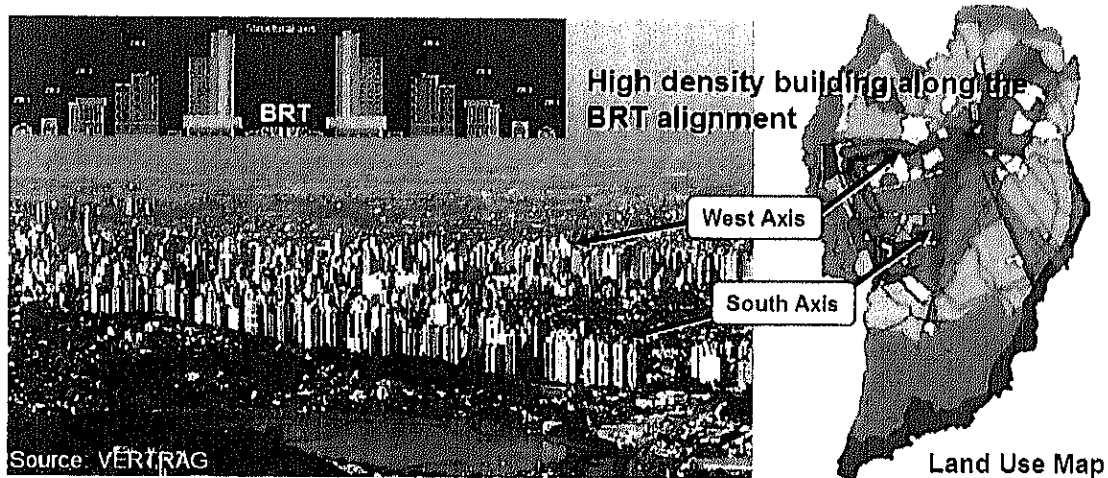


Figure 5.3-1: Relationship of Land Use Plan and MRT Alignment

Over the years, it has integrated its zoning and transportation to place high density development (designation of high space floor ratio to the area) along the alignment of public transportation. Since the failure of its first, rather ambitious, city plan with subway systems, due to lack of funding, Curitiba finally adopted more economical public transport, namely Bus Rapid Transit (BRT). Since then, high density development has been realized along the BRT alignment.

#### (2) Establishment of the Agency Responsible for Whole Urban Transport Policy and its Implementation

In September, 1995, the Singapore Government established the Land Transport Authority (LTA) as a statutory board of the Ministry of Transport by merging four agencies (Registry of Vehicles, Mass Rapid Transit Corporation, Roads & Transportation Division of the Public Works Department, and Land Transport Division of the then-Ministry of Communications). LTA is solely responsible for planning, developing and managing land transport in Singapore. In addition to formulation of road plan and urban railway plan, LTA recently took over the role of a central bus network planner from PTC (Public Transport Council). Since various urban transport related functions are gathered to LTA, LTA has been able to formulate comprehensive land transport master plan and coherent transport policy.



According to the Land Transport Masterplan, report issued in March 2008, LTA outlines the strategic thrusts to make the land transport system work for the people and the city. The three strategic thrusts are to: 1) Make Public Transport a Choice Mode, 2) Manage Road Use, and 3) Meet the Diverse Needs of Our People.

**(3) Singapore's Measures and Policies for Promotion of Use of Public Transport and Management of Road Traffic**

In Singapore, LTA formulated the strategy which consists of "promotion of use of public transport" and "restrict use of vehicle". The former includes expansion of urban railway network, increase in number of feeder buses operations, development of integrated multi-modal transport hub, introduction of bus priority traffic signaling system, expansion of bus lanes, and introduction of Integrated Multi-Modal Travel Information System.

"Restrict use of vehicle" includes introduction of electronic road pricing system (ERP), which charges fee on motorists based on the quantity, place or time of the use of their vehicles, introduction of high vehicle related taxes, limitation of number of private vehicle through Vehicle Quota System, and limitation of parking space.

Since urban railway systems has been well developed in Bangkok, the introduction of the above-mentioned measures needs to be examined.

**5.3.2 Physical Network Integration among Urban Railways, Bus, and Other Mode of Transport**

**(1) Integrated Transport Hubs for Seamless Connectivity among Public Transport**

LTA in Singapore has been introducing fully integrated transport hubs where bus interchanges and MRT/LRT stations are co-located with retail and commercial facilities. Such integrated transport hubs allow transfers to be done comfortably and provide additional convenience as commuters can do some shopping before transferring to their connecting bus or train.

There are four bus interchanges which are fully integrated with the MRT/LRT stations and adjoining commercial developments. Two more integrated bus interchanges are under construction and will be completed by 2011. Over the next 10 years, LTA plans to build another five integrated interchanges with re-development in the respective areas, to better integrate our transport hubs with the surrounding facilities.

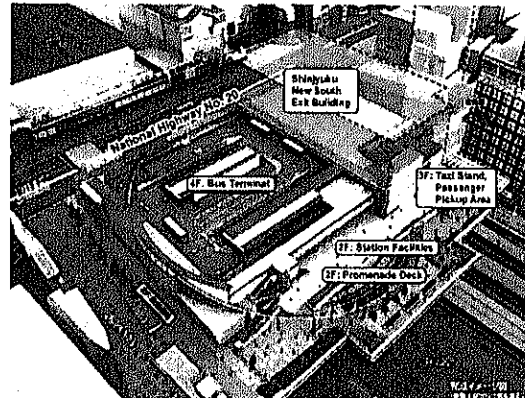
LTA is introducing more retail spaces to induce more passengers into these transport nodes. According to Land Transport Masterplan, LTA plans to transform these places into lifestyle hubs, making them fun and exciting places and accessible meeting points among friends and family.

## (2) Shinjuku South Entrance Re-development Project

Shinjuku station is located in the major commercial and administrative center of Tokyo, and is served for 8 urban railway lines (4 JR lines and 4 private railway lines). After the development of new JR Line (Saikyo Line), lots of large-scale commercial buildings have been developed around station's south entrance. Along the development of surrounding areas of the south entrance, the number of passengers using the south entrance has sharply increased. Although the station's south entrance was congested, since the station's south entrance faced onto the road bridge maintained by Tokyo Metropolitan government, there was no space for station square and/or pedestrian deck.

When reconstruction of the decrepit road bridge project was raised, the Tokyo Metropolitan government and JR formulated re-development project around the south entrance area through discussion, to ease congestion at the area.

Central government and the Tokyo Metropolitan government are responsible for constructing the new road bridge as well as developing station square and bus terminal on the newly constructed artificial ground above JR's existing rail track. While construction of artificial ground usually needs huge capital investment, since JR provides right of way above rail track to Tokyo Metropolitan government for free, project cost for artificial ground was substantially reduced.



Source: JR East

On the other hand, JR plans to relocate the existing station building on the newly constructed artificial ground, and then construct high rise commercial building at the land where currently a station building is situated. JR expects to earn profit from non-rail business at the new commercial building.

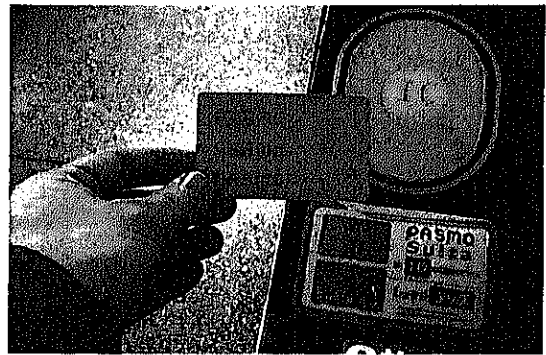
In this case, both JR and the Tokyo Metropolitan government obtain benefits. Corporation and Joint development among stakeholders enabled to bring about win-win outcome. Passengers are also received benefits from convenient station square and integrated station and bus terminal building. Now reconstruction of the road bridge and construction of artificial ground have already completed. Station square and bus terminal on the artificial ground are currently under construction. Construction of JR's high rise building will be started after completion of new station building.

In the case of Bangkok, while construction of artificial ground above rail track may not be required, role sharing between public sector and railway operator in Shinjuku station serves as a useful reference for Bangkok's station square development.

### (3) Fare Integration and Common Ticket System among Urban Railways and Other Public Transport

Urban railways in Tokyo are operated by various railway operators, including JR East, Tokyo Metro, the Tokyo Metropolitan Government and other private railway operators. As same as the fare structure adopted for Blue line and SkyTrain, the fare of urban railways in Tokyo consists of boarding charge and distance charge. In the past, passengers needed to purchase ticket and pay boarding charge whenever they transfer between the lines operated by different companies. Passenger suffered inconvenience in such different ticketing system. Moreover, the systems also imposed higher financial burden on passengers.

To ameliorate these problems, a rechargeable contact-less smart card ticketing system for public transport called SUICA has been introduced since November 2001 by JR East. Also, in March 2007, the private railway, bus, and subways operators in the Tokyo metropolitan area introduced a similar smart card system (PASMO card) using same radio frequency identification (RFID) technology of SUICA to replace the former magnetic card system (Passnet). Through the collaboration between JR East, private railways and bus operators, passengers can use SUICA cards wherever PASMO cards are accepted to ride any railway or bus. In addition, after the introduction of PASMO/SUICA system, boarding charge at transfer has been partially reduced. In order to introduce common ticketing system, urban railways and bus operators established a joint equity holding company.



PASMO and PASMO Reader on the Ticket Gate



Soft Drink Vending Machine compliant with PASMO/SUICA System

In Bangkok, IC card ticketing system has already been introduced by BTSC and BMCL. To introduce common ticketing system and common fare structure, establishment of a joint equity holding company among railway operators will be expected.

#### 5.3.4 Lessons Learned on Integrated MRT Planning

##### (1) Coherent Network Development

It is recommended that overall MRT/LRT network should be planned with enough consideration of feeder bus services, so that passenger's can reach the transfer MRT/LRT stations quickly. Also, it is recommended to develop integrated transport hub where MRT, LRT and bus

stations are co-located with retail and commercial activities. Integrated transport hubs are expected to contribute not only to increase in ridership of public transports, but also to increase in the non fare revenue of railway operators.

To encourage the use of public transit, it is recommended to formulate strategic urban planning covering both land use plan and transport plan. In making land use plan along the line, appropriate zoning ordinance needs to establish to maximize ridership of urban railway and revenue from : development.

## **(2) Establishment of the Agency Responsible for Whole Urban Transport Policy**

In order to make public transport more attractive and competitive with car, it is recommended to formulate policy to promote the use of public transport. The policy should include not only improvement of service level of each public transport and their integration, but also management of demand for road use by controlling vehicle growth and restraining usage.

In order to formulate comprehensive urban transport planning, it is recommended to strengthen functions of existing agency (such as OTP) or to establish the new agency in charge of making whole urban transport policy and responsible for its implementation

## **(3) Introduction of common ticketing system and fare structure**

Common ticketing and fare integration between urban railways have already been examined in Thailand. As same as Tokyo, the establishment of joint equity holding companies among railway/bus operators for managing ticket system is one of the effective solutions. Introduction of gross model concession in Bangkok is expected to facilitate fare/ticket integration.

## **5.4 Learning from Concession Agreement and Supplier Management in Other Countries**

For establishment of the sound operation, what the contracting agencies have to do in preparation for the Concession? From these points of view, the case studies in other countries were done as shown in the following sentences. It should be noted that in the Gross concession, as all risks will be shouldered by the governments, the contracting agencies will have to directly manage suppliers in effect.

### **5.4.1 Cases in other countries**

#### **(1) Decision makers of specifications in Asian successful urban railways**

In successful urban railways in Asia, decision makers for specifications were General consultant on behalf of the project owner or invited railway experts involved in their project. In failure cases in Asia, railway operators select specifications from those provided by suppliers.

- a. Since there was no urban railway in Singapore when their first project was implemented, foreign experts of General Consultant planned and managed the project on behalf of the project owner. Nowadays as Singapore metro has fully acquired the technology for urban railways, they arrange the specifications of their Metro project by themselves and procure required products for their specifications from suppliers.
- b. In the Delhi Metro case, railway experts from Indian Railways have taken leading parts in the project. They listened to the explanations of the experts from Hong Kong Metro which was employed as an advisor to Delhi Metro. Then, Delhi Metro selected specifications after careful consideration by themselves.
- c. In Japan, railway operators select the specifications of equipments and rolling stock for their railways by themselves. Japanese suppliers produce equipments and rolling stock based on the specifications issued by railway operators. Hence, railway operators' experience obtained in the course of their operation and maintenance are fully reflected on the specifications of Japanese equipments and rolling stock.
- d. In Line 1 of Manila, the LRTA selected their specification from those recommended by the fund donor. This is similar to a selection system in procurement of automobile or aircraft. As the result, they have been suffered with the lack of capacity of rolling stock.

The selection system of urban railways' specification in Bangkok seems similar to Manila's case. Of course, in Bangkok, the shortage of capacity has not been brought about. However, since they adopted the full turnkey system, even a selection of specifications was handed to suppliers. By referring to the methods in other countries, the problems, which urban railways in Bangkok have, can be overcome.

## **(2) Controllable cost in urban railway operation**

Direct operation cost in urban railways tends to be in proportion to the operation factors, such as a traveling kilometer. Only the replacement costs of equipments or rolling stock or its parts for maintenance can be varied in coordination to the cost management policy.

In Japanese railways, when a big profit is foreseeable in the mid course of the year, front loaded replacement of aged or frequently troubled parts of equipments/rolling stock is planned actively in order to reduce the replacement cost in coming years and the corporate tax of the year. When a profit volume seems to be smaller than expected, planned replacement of parts of equipments/rolling stock is postponed. As seen in the above instances, these replacement costs of aged equipments/rolling stock parts are controllable expenditures which are rare within operation expenditure.

Replacement timing of equipments or rolling stock also can be postponed or front loaded from the long term financial viewpoint and safety/service level.

Suppliers to whom maintenance tasks are outsourced may utilize this method for increasing their own profit. When designing the structure of annuities for Gross model for PPP Concession, checking system against excessive expenditures should be carefully prepared.

### **(3) Technical knowledge transfer**

#### **a. Dispatching staff to a maintenance outsourcer**

Technology is possessed by the staffs involved in real maintenance tasks. Normally, the salaries of engineers in foreign companies are higher than those in local companies. Hence if workers are directly employed by foreign suppliers' company, skilled engineers may not come to the local railway operators after the completion of maintenance outsourcing.

Cairo metro outsources their maintenance tasks to the suppliers in order to carry out good maintenance. In this scheme, the local staffs for the maintenance tasks have been dispatched from Cairo metro. With this system, basically Cairo metro can secure staffs with good maintenance skill even after completion of maintenance outsourcing.

It is worth for Bangkok urban railway operators to consider the adoption of this measure for a technology transfer.

#### **b. Exchange of information with other railway operators**

Railway is an empirical technology of experience and a railway operator cannot obtain every experience for all cases by themselves.

Generally speaking, suppliers who cherish their own technology tend to stick to keep their technology secret. On the contrary, the railway operators are not competitors each other, but are good information resources. Railway operators should exchange their technical specifications, operation and maintenance data mutually.

In Japan, railway technical journals are issued for each railway technical field. On these journals, outlines of construction projects and newly developed technical methods for construction works are introduced, moreover, specifications on newly installed equipments /rolling stock are also described in detail.

In Japan, Ministry of Transport requires each railway to report their revenue and expenditure in detail to the Ministry for estimation of a proper fare level and the Ministry publishes these data as the annual railway statistics.

Experiences which each railway operator can have are limited. By consolidating other railway operators' experience to their own experience, each railway operator can make more proper decision.

Since each urban railway in Bangkok has adopted “Full turnkey system”, railway operators have depended upon suppliers and they have followed the suppliers’ policy to keep information secret. In the coming years, the railway operators have to get out of “Full turnkey system” and step up to the next stage where consideration of the technical specifications by themselves is required. From this viewpoint, it is indispensable to establish the experience changing system with other railway operators and it is also important to carefully check up the articles in the contract with suppliers on keeping the information secret.

#### **5.4.2 Lessons Learned on Concession Agreement and Supplier Management from the cases in the other countries**

##### **(1) Stepping up from Full turnkey system**

The railway operators in Bangkok have to step up to the next stage from “Full turnkey system” and make a plan and selections on specifications for sound management scheme by themselves.

BTSC and BMCL have adopted “Full turnkey system” since they did not have any experience on urban railways. Adoption of this system has been successful from the viewpoint of the realization to secure operation, but it brought about the conflict around “the excessive additional cost for extension of their line” between suppliers and railway operators. After all, it has been identified that “Full turnkey system” is not proper at the stage where evolutionary network formation is carried out.

Singapore Metro and Delhi Metro, successful urban railway operators in Asia, have invited foreign urban railway operators as an advisor to their projects respectively. These cases show the fact that for establishment of the sound operation scheme, it is important to select specifications after consideration of not only the operation cost but also the financial burden of the asset cost on the operation stage. It is suggested that even on the construction stage, involvement of experts from urban railway operators are required.

Bangkok urban railways have operated their railways for ten years and they have accumulated much knowledge through these experiences. Now it is important for the railway operators to step up to the next stage, where they have to consider the specifications by themselves for the realization of the sound management, from “Full turnkey system”.

When there is anxiety on the lack of experience for the railway operator, they tend to hire the foreign consultant. It is agreeable, but it is important to select experts who have enough experience in sound urban railways from the human resource stock of consultants.

##### **(2) Proper replacement of equipments/rolling stock and its spare parts**

One of important lessons from other countries is the controllable cost on maintenance.

It suggests that in the maintenance cost, there are costs which suppliers/operators can control their volume according to their own interest.

When maintenance tasks are outsourced to suppliers, suppliers may recommend an employer to replace the equipments/rolling stock or its parts at an early stage for the enhancement of safety. It is important to consider on the maintenance of the safety but it is also important for Contracting agency, i.e., MRTA, and Concessionaire, i.e., BMCL, to have ability to clarify if it is truly aimed for enhancement of safety, or enhancement of increase in sales.

For clarification of the real aim to replace aged or frequently troubled equipments/rolling stock or its parts earlier than the scheduled plan, provision of various maintenance data and elaborate hearing from the operators/suppliers may be major tools.

### **(3) Localization of maintenance**

It is effective to transfer the maintenance tasks from the companies with foreign engineers to the local engineers of the railway operator or local companies without foreign engineers for the reduction of operation cost.

For this purpose, it is important to secure not only manuals and maintenance data but also local staff who have been engaged in the maintenance tasks under supervision of foreign engineers and have acquired maintenance skills to themselves.

Cairo case suggests to us the importance of securing skilled staff on maintenance for transferring of maintenance technology to their side.

In case of Bangkok urban railways, the purpose for the outsourcing of the maintenance tasks to suppliers was to secure stable operation at the initial stage. At the same time, from the viewpoint of establishment of the sound financial frame work, the establishment of the scheme, where maintenance tasks can be carried out only by local staff, is required. From such a point of view, outsourcing of maintenance tasks can be regarded as the On-the-job Training for transferring of maintenance skill to local staffs. Since nowadays in Bangkok, maintenance has been carried out without trouble, the railway company can carry out maintenance tasks by themselves if they can take over the following from the suppliers

- 1) Maintenance manuals
- 2) Historical maintenance data
- 3) Local staff who have been engaged in maintenance tasks daily.

### **(4) Disclosure of information**

Railway is an empirical technology and it is important to select better decision based on plenty of information gathered from other railway activities. To acquire information from other



railways, it is required to disclose its original information positively since mutual exchanging of information is normally required.

Urban railways in Bangkok have been obliged to keep their information, especially that on maintenance, secret strictly in the contracts with suppliers. Therefore, most of their specifications and operational information are not disclosed.

To disclose their own information, it is important to get rid of obligation in the contract with suppliers for keeping secret. Of course, the information protected by the law, for example, source code of software, has to be excluded.

Through positive information disclosure and exchanging of opinions, information and data with other railway operators, the railway operators in Bangkok can step up to the new stage from the "Full turn-key system" without big risks.

When Gross cost model is adopted for revenue share scheme at PPP, annuity designing is important.

Annual reports are issued by the operators in Bangkok since they are listed or to be listed. However, these reports are aimed for investors. The figures on this report are too rough for annuity estimation, and more detailed ones are required.

Japanese reporting system of detailed cost for fare level settlement, which is introduced as an example of information disclosure in (3) b of the previous section, can be utilized for this issue.

## **5.5 Learning from Non-rail Business in Other Countries**

### **5.5.1 Cases in other countries**

With the purpose of benchmarking non-rail business, non-rail businesses of eight MRT operators in six cities in the Asian countries were studied. The results are shown in Appendix 6.

#### **(1) Types of Non-rail Business**

The non-rail business of MRT business can be largely classified into the following three types:

- i) Business based on MRT operation,
- ii) Diversification of transportation business, and
- iii) Business related to MRT business.

Table 5.5-1: Major Types of Non-rail Business

Type		Examples
Business Based on MRT Operation	Use of Railway Facility (Rental of Space or Own Operation)	Advertisement at stations and trains Operation of shops at stations and related facilities Operation of food service at stations and related facilities Operation of parking lot Rental of space at stations Telecommunication service
	Use of Holding Technology & Hard Equipment	Lease of railway track Civil work and & electrical works for external customers E& M and rolling stock maintenance service for external customers Telecommunication service
	Use of MRT Management Capability	Consulting of MRT management Management of other MRT projects
Diversification of Transportation Business		Horizontal diversification (provision of transportation service such as bus) Vertical diversification (travel agency, etc.)
Business Related to MRT Business		Real estate development (idle land, station vicinities, theme park, shopping mall, etc.), Card business Good sales & service to railway users

Source: JICA Study Team

## 5.5.2 Learning from Non-rail Business

### (1) Lessons Learned on Non-rail Business from the cases in the other countries

Major findings from the benchmarking study are as follows:

- i) Advertisements and space rental of railway facilities are very common source of revenue from non-rail business.

All the MRT operators studied engage in advertisement business and rental of space for shops.

- ii) Some operators engage in other mode of transportation.

One reason for transportation business of other mode is that a public corporation responsible for urban transportation engages in MRT operation as well as bus and/or taxi (SMRT and SBS Transit in Singapore, Tokyo Metropolitan Bureau of Transportation in Tokyo). Another reason is that the provision of feeder bus service increases the convenience of passengers and contributes to the increase in ridership. DMRC (New Delhi) has supplied buses for feeder bus service.

- iii) Some operators adopt the rail + property business model.

MTR Corporation (Hong Kong) and DMRC (New Delhi) engage in large-scale property development. Other operators engage in small-scale property development such as the construction of station building and/or office building for own-use, construction of underground

shopping mall. For MTR and DMRC, the major purposes of this model are to stabilize the financial position of operator in the long run and keep fares at competitive market prices.

iv) Some operators engage in consultancy service.

MTR (Hong Kong), SMRT (Singapore), and DMRC (New Delhi) provide engineering and consultancy services for MRT projects in other cities/countries. Especially, MTR (Hong Kong) has invested in MRT projects in China and undertaken the operation concessions from other countries.

v) Business through subsidiaries is common method of business diversification.

Many operators have established subsidiaries to manage and operate affiliated businesses. The major reasons for establishing subsidiaries are to promote the specialization according to the nature of each business.

vi) The share of revenue from non-rail business to total revenue varies according to the difference in scope of affiliated business.

The share of revenue from non-rail business to total revenue is significantly high, over 40%, for Tokyu Corp. (Tokyo), MTR (Hong Kong) and DMRC (New Delhi) which engage in large-scale property development. As for other operators, the ratio ranges from 2.6% to 11.0%.

**Table 5.5-2: Comparison of Non-rail Business of MRT Operators in Major Asian Countries**

	Thailand		Singapore		Hong Kong	Taipei	Seoul	Tokyo		New Delhi
	BMCL	BTSC	SMRT	SBS Transit	MTR	TRTC	SMRT	Tokyo Metro	Tokyu Corp.	DMRC
Ratio of Revenue from Non-rail Business to Total Revenue	12.9	11.2	10.6	6.1	48.6	11.0	9.4	2.6	86.4	45.2
Share of Property Development	-	-	-	-	20.9	-	-	-	16.4	34.1
Type of Affiliated Business	Advertising	X	X	X	X	X		X	X	X
	Rental of Shop Space or Other Real Estate within/ around Stations	X	X	X	X	X		X	X	X
	Engineering & Consultancy			X		X		X	X	X
	Property Development					X			X	X
	Operation of Bus, Taxi, etc.			X	X		X		X	
Remark: Year	2008	2008/09	2008	2008	2008	2008	2008	2008/09	2007/08	2007/08

Source: JICA Study Team

## (2) Rail + Property Business Model

The major purpose of “rail + property business model” is to cover large project cost of new MRT line by raising funds from the development and sales of properties such as station building and residential estates along the line. Another reason for “rail + property business model” is that

more integrated city development is possibly achieved with the property development by MRT operator.

MTR in Hong Kong has adopted the “rail + property” business model. Under this model, MTR is granted the rights to develop own and manage properties adjacent to/along rail lines. The major purpose of this model is to sustain MTR’s profitability, to enable investment in new rail lines, and to keep fares at competitive market prices as long-term financial strategy. MTR’s properties include shopping centers, residential, office and hotel developments.

In such countries as Hong Kong and Singapore, the government acts as a developer of city. Therefore, the parallel implementation of urban development and urban transportation development can be realized. Moreover, New Delhi has also introduced the “rail + property” business model.

In the case of DMRC, 6% of project cost was to be sourced from revenue from property development in the approved financial plan. Necessary land of government ministries and agencies was transferred to DMRC.

From the cases of “rail + property” business model of MRT project, the following lessons can be obtained.

The development business has the following constraints:

- i) Necessity of large funds to acquire land
- ii) Diverse ownership of land in the center of city
- iii) Long run up period for development
- iv) Susceptibility to business cycle and higher business risk
- v) Necessity of planning and development capability for property development

Therefore, the requirements for successful property development by MRT operator are as follows:

- i) Formulation of MRT master plan integrated with urban development planning and urban transportation planning

The well-planned property development linking MRT construction and urban development lowers the risk of property development and increases the return. With a construction of a MRT line, business opportunity along the line is expected to raise land prices. Urban development planning in advance of or in parallel with the preparation of MRT construction is necessary.

- ii) Introduction of laws and regulation which facilitate property development

A legal system which is important for apt property development includes land use regulations, regulations regarding land procurement, traffic regulations, tax incentives, etc.

- iii) MRT-related laws and regulations which enable a MRT project implementation body or a MRT operator to engage in property development

It is also necessary to give a MRT project implementation body, e.g., public authority in charge of urban transportation, city development authority, etc., a legal basis to undertake property development. For example, in Korea, the law regarding urban railway prohibits a rail operator from engaging in non-railway business.

- iv) Availability of land for property development

In the center of city, the ownership of land is segmented and complicated. In most cases, a large part of land is owned by the private. Therefore, the areas from the center of city to the suburb are more potential for integrated property development.

- v) Collaboration with the private sector

Property development requires a big funds and capability of managing the development process. In Hong Kong, MTR collaborates with private developers to share financial burden and project risk.

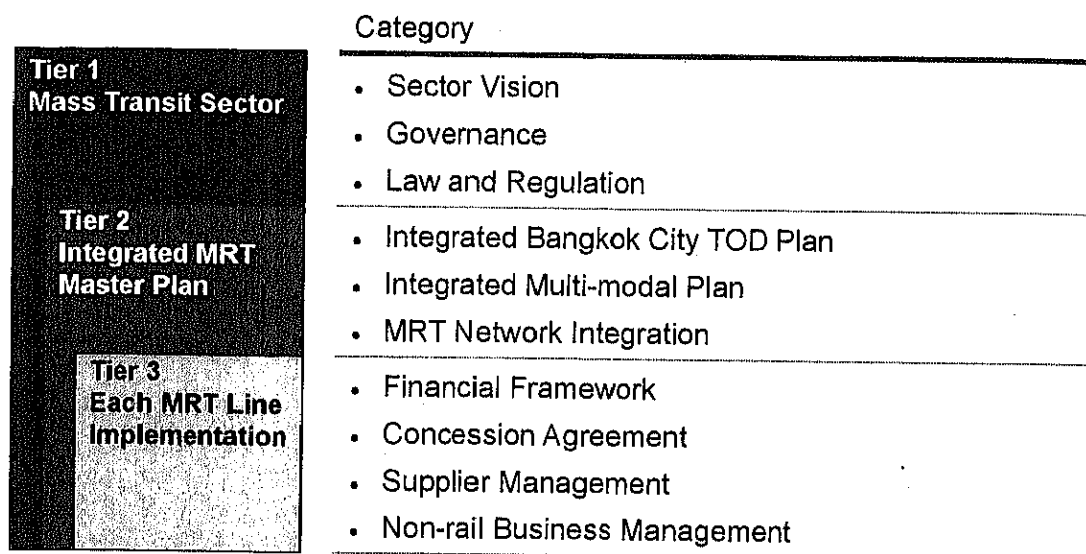
- vi) Profit sharing between the public and private sector

An appropriate organization which undertakes property development is a MRT project implementation body. A project implementation body may be public authority in charge of urban transportation, city development authority, etc. When an implantation body collaborates with private developers, the appropriate profit sharing should be considered.

When a project implementation body carries out a MRT project on a PPP scheme, the concession of property development becomes a method to make a project viable. In the case of MRT3 in Manila, the concession of the project was given to the private sector on a build-lease/operation-transfer (BLT) basis. The commercial development right was also awarded to the private sector to make the project commercially attractive though the financial result of the railway is not profitable in reality.

## 5.6 Overall Implication for 3 Tiered Structure

Overseas case studies, both successful and failure cases, have provided abundant reference and hints on implications for Bangkok's urban railway development. As a summary of Chapter 5, we have described implications along the 3 tiered structure introduced earlier in this report. Categories within the 3 tiered structure are described again in figure 5.6-1 for reference.



Source: JICA Study Team

Figure 5.6-1: Categories within 3 tiered structure

### 5.6.1 Implications for Tier 1: Mass Transit Sector

Tier1 is the fundamental basis for mass transit sector to prosper. Mass transit is clearly different from inter-city railway and requires its own sector environment. It consists of sector vision, governance and law & regulation.

**Sector Vision:** Urban railway, the so called mass transit, for large city like Bangkok will ultimately grow to a scale and network of a distinct sector. Overseas cases indicated different patterns of sector growth and evolution. In Europe, the sector has been pre-dominantly shaped by selected M&E supplier groups, with operators focusing on day-to-day operations. In Japan, the sector has been shaped by the railway operator, which develops own system specifications and ask suppliers to comply. This is the same for cities like Hong Kong, Singapore and Delhi. For Bangkok, the trial and error phase is over. Now is the time to proactively think through the sector vision and shape its own path.

**Governance:** Mass transit sector will need to be governed by a clearly defined set of independent organizations; planning agency, sector regulator, contracting agency and concessionaire. In many of overseas cases, we observed issues related to organizational silos between city planning and transport planning. Such sub-optimal governance structure leads to unnecessary friction and inconvenient mass

transit network. Singapore is a role model with organization that can truly provide integrated planning function. For Bangkok, without a conscious effort to shape ideal governance structure, the city can easily fall under sub-optimal case.

**Law & Regulation:** Inter-city railway and urban railway (mass transit) are different in characteristics. A general railway law is just not good enough. As seen in overseas cases such as Delhi, successful countries developed MRT Act. This provides standards in terms of safety, security, service and environmental requirements. Also, integration with city planning should be supported by a robust legal framework. As seen in the Tsukuba Express case, joint city and railway development law can trigger and accelerate TOD. PPP related regulations for station and surrounding development is also important. DMRC was able to absorb the value created from urban railway infrastructure by managing concession rights for private property development. For Bangkok, this is the ideal time to refine and add appropriate law & regulations for mass transit sector, as new line designs and constructions will further proceed in the coming years.

### **5.6.2 Implications for Tier 2: Integrated MRT Master Plan**

Tier2 is all about integrated planning. Without it, mass transit infrastructure will be 'sub-optimal' in terms of efficiency, convenience and sustainability. There are three types of integration: 1)Integration between city planning and transport planning: "Integrated Bangkok City TOD Plan", 2)Integration between different modes of urban transport: "Integrated Multi-modal Plan", 3)Integration across different MRT lines: "MRT Network Integration".

**Integrated Bangkok City TOD Plan:** Integration between city planning and transport planning is perhaps the most obvious but often neglected area when it comes to implementation. This is because city planning is typically under municipal government and transport planning is under central ministry. Lack of coordination between these organizations must be overcome. In Singapore, perhaps due to the size of the country, this coordination works very well. Also, as seen in the case of Curitiba, strong TOD vision led by the city mayor can make a difference in overcoming organizational barriers. For Bangkok, organizational mechanisms to integrate between transport planning by OTP and city planning by BMA will need to be considered.

**Integrated Multi-modal Plan:** Integration between different modes of urban transport (e.g. LRT, BRT, feeder bus, park & ride, waterways) is an essential part of making mass transit successful. One of the key is to plan for a well designed terminal station. In the newly planned Shinjuku station case example, there are dedicated floors for feeder bus, pedestrian path, JR and Odakyu/Keio line, Tokyo Metro and Toei. Cost sharing scheme between Tokyo municipal government, central government, JR and Odakyu was necessary to enable such implementation. We also observed failure cases in countries such as Malaysia and Philippines. Line transit is sometimes more than 500metres apart with inconvenient feeder bus access and limitation of park & ride capacity. Bangkok has three implementing agencies for MRT (MRTA, BMA, SRT) with plans for BRT and various feeder bus

underway. Without strong mechanisms to integrate, for both organization and funding, the city could end up with a rather inconvenient network.

**MRT Network Integration:** Integration across different MRT lines are often seen to be rather simple and the efforts required are underestimated. This includes areas such as fare integration, common ticketing and signage standardization. This could also include more technical areas such as performance and functional specification for rolling stock, signal and telecommunication systems. In Japan's SUICA/PASMO case, joint equity holding company was created to manage common ticketing across so many different railway operators. Tokyo Metro network has its own performance and functional specification shared across multiple lines. Based on PPP scheme for each different lines, Bangkok may need to deal with many concessionaires with different ownership structures. In addition, SRT has its own plans. Without strong mechanisms to integrate, Bangkok's MRT network may not have the appropriate integrated features required for users.

### **5.6.3 Implications for Tier 3: Each MRT Line Implementation Scheme**

Tier3 is about each MRT line implementation scheme. As defined in this study, implementation scheme consists of financial framework, concession agreement, supplier management and non-rail business management.

**Financial Framework:** There are three key components to financial framework, which are funding, concession model and O&M.

In terms of funding, the key reason for private sector funding is for government to have additional financing capacity, which will speed up the overall network building process. Conventional wisdom that private entity can generate more business efficiency does not seem to be applicable in mass transit. Delhi Metro case has proven that state-owned entity could be equally efficient if managed well. Also, as seen in Kuala Lumpur and London case, private consortiums can bring in conflict of interests and achieve various inefficiencies.

In terms of concession model, selection of "net cost" or "gross cost" depends on the circumstances of the city. There have been many overseas "net cost" model failure cases due to low ridership in early stages of network building. It is the study team's belief that, in early stages of network building (first several line nodes), ridership risk is too big for private parties to absorb. Therefore, "gross cost" model is a natural choice. However, this model requires MRTA to play a much more active role in managing the installation, operation and maintenance by concessionaire.

In terms of O&M, the high cost structure and inefficiency prevalent in SRT cannot be replicated. However, this does not mean state-owned operation is poor. Our overseas case analysis did not indicate service level or operational inefficiency difference between private and state-owned. For Bangkok, under PPP scheme, it is important to make sure that the shareholder of O&M concessionaire has an interest in the long-term operational excellence and maintenance sustainability.



**Concession Agreement:** Key aspect of concession agreement is that it defines the responsibilities and rights, commercial structure and risk allocation between concessionaire and the contracting agency. Overseas success cases indicated the importance of defining the details, but at the same time, maintaining flexibility to revise the content in case of unforeseen findings. Bangkok's lessons from BTS/BMCL also indicate the need for significant improvements in this area. For example, current concession agreement does not include specific KPIs for operation reliability, availability or maintenance efficiency. Going forward, if Bangkok decides to shift to "gross cost" model, importance of concession agreement will further increase. Key items to be carefully described are: annuity calculation method, risk allocation, capacity adjustment responsibility, KPI, incentives and penalties, supplier management guidelines, non-rail business treatment, network integration, revision clause and conditions precedent.

**Supplier Management:** Suppliers play a key role in the implementation of urban railway. This is especially true for rolling stock, signal, telecommunications, OCC and AFC system suppliers. For line extension, similar signal and communication specification need to be used. This means suppliers need to commit to sufficient information disclosure to allow for competitive tender based on similar system specification. Alternatively, fair price agreements could be reached for line extension. Another important area is technology transfer arrangements. For example, maintenance management and workflow should be handled by local concessionaire staff overtime. Methodologies and KPIs should be defined to ensure this is done within a given timeframe. Overseas success cases indicated the importance to specify the details in this area. Bangkok has relied heavily on suppliers in the past. In the early stages of network building, this was perhaps the natural choice. Going forward, Bangkok needs to shift from 'supplier reliance' to 'supplier management'.

**Non-rail Business Management:** Financial sustainability is an important element of urban railway success. Operations are not healthy if it needs to rely on continuous government subsidy. Non-rail business management will be a critical factor in achieving financial sustainability. Overseas success cases, such as HK MTR, Delhi Metro and Tokyu Railways, showed a benchmark of non-rail revenue ratio that is higher than 40%. For Bangkok, BTS and BMCL levels for non-rail revenue ratio are less than 15%. There is still much room for improvement. Going forward, if Bangkok decides to shift to "gross cost" model, treatment of non-rail business rights must be chosen. Thereafter, the organization responsible for non-rail businesses must be fully incentivised to maximize revenue and contribute to reduce government's subsidy burden.



## CHAPTER 6 SUGGESTED SOLUTION DIRECTION AND ROADMAP

Thus far, the Study Team have reviewed the current urban railway situation in Thailand (chapter2), synthesized the issues of urban railway in Thailand (chapter3), analyzed the financial framework (chapter4), and extracted lessons from overseas cases (chapter5).

In this last chapter, the Study Team will bring all findings from this study and suggest recommendations on solution direction and describe the action roadmap on Thailand's path forward. Three-tiered structure will be used as a common framework.

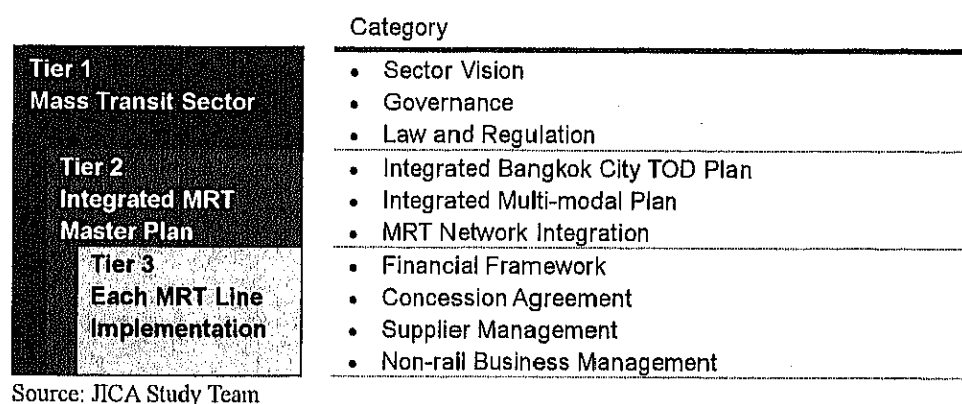


Figure 6.1-1: Three-tiered structure

### 6.1 Tier1: Issues, Solution Direction and Potential Support

Tier 1 is the fundamental basis for mass transit sector to prosper. Starting from sector vision, governance of the sector as well as law and regulations need to be refined and upgraded in Thailand.

#### 6.1.1 Sector Vision (Tier1)

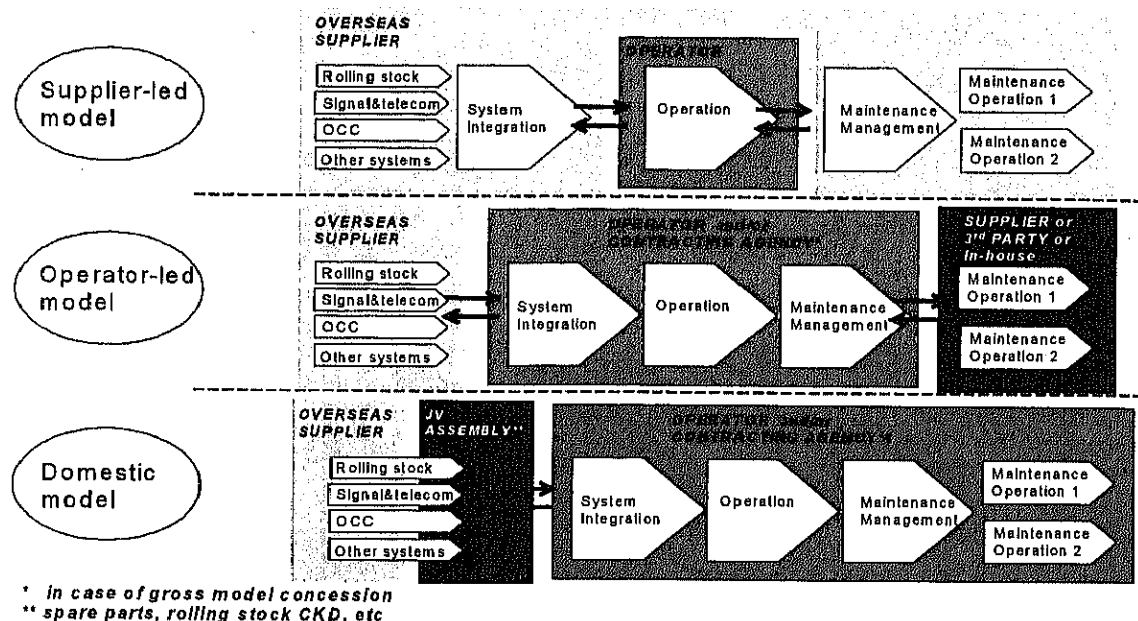
**Issues:** Lack of clear vision on future mass transit sector structure.

The sector value chain, in simple terms, consists of system components sourcing, system integration, system operation, maintenance management and maintenance operation. In the past, Thailand value chain has been shaped by suppliers (supplier-led model). This is natural in the early stages of network building. The key question is "what is the future vision?" This needs to be clarified going forward.

**Solution Direction:** Shift out from supplier-led model.

As indicated below (Figure 6.1.1), there are various options for value chain structure. The supplier-led model is perhaps not suitable for large cities like Bangkok, with plans for large network with many different lines. The operator (concessionaire) and contracting agency (e.g. MRTA) will need to build capacity to take more control of system integration and maintenance

management. This is because of the characteristics of urban railway network. For example, line extension needs to be managed in a way that has similar signal, telecommunication and rolling stock systems. Also, AFC system needs to be common across multiple lines. To achieve such network integration, supplier-led model is inflexible.



Source: JICA Study Team

Figure 6.1-2: Models of sector value chain

#### Necessary next steps:

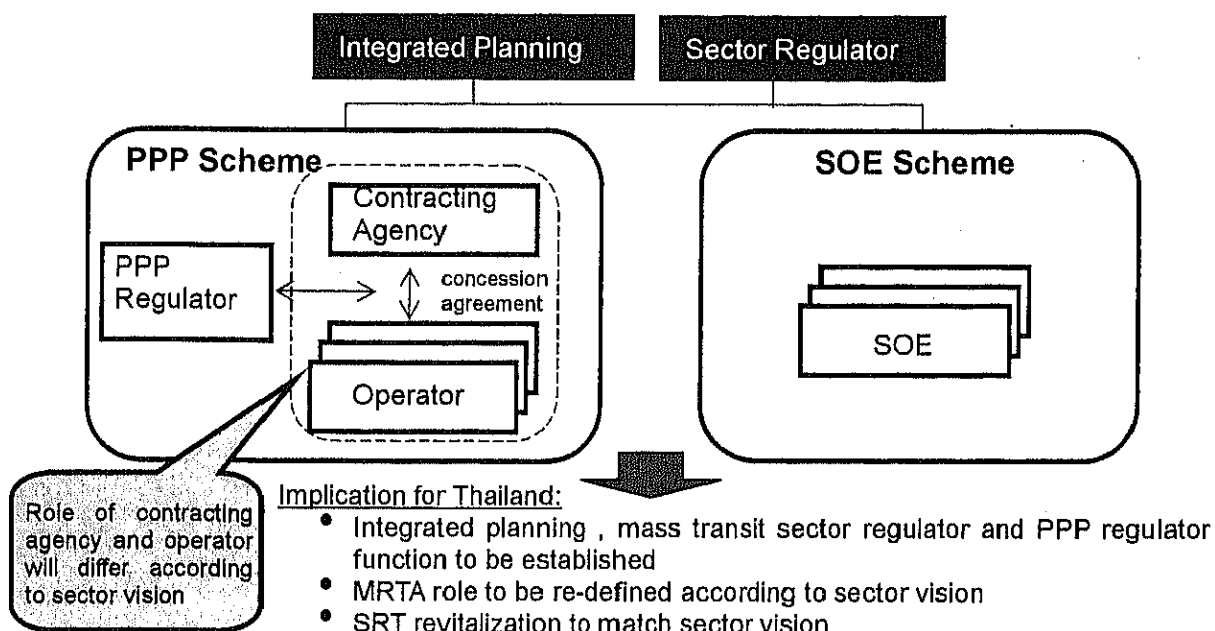
- **Research and Analysis: Overseas value chain study.** Research on different patterns of sector vision; 1) Study overseas mass transit value chain structure and synthesize merits/demerits for each model pattern, 2) Analyze cases of overseas industry players in the value chain, 3) Estimate economic size for each value chain component in Thailand and neighboring countries
- **Workshops: Sharing workshop of overseas value chain.** Share overseas research results and discuss sector vision options for Thailand.
- **Thailand Action Plan Development: Develop Thailand sector vision.** Assess options and develop recommendations for sector vision. Describe action programs to reach sector vision and derive implications for how tender preparation, concession agreement and supplier contract should be changed based on selection of vision.
- **Implement and Build Capacity: Decide and agree on implementation.** Reach broad stakeholder consensus on sector vision and commit to specific implementation activities.

#### 6.1.2 Governance (Tier1)

Issues: Weak governance structure of mass transit sector. In the past, this sector has been

developed in a mode of trial and error. It is an opportune timing to shift gears and strengthen the governance structure of the sector.

**Solution Direction:** Establish sector regulator, PPP regulator and integrated planning function. Strengthen contracting agency (MRTA) function and revitalize SRT. Organizationally, below figure 6.1.3 describes the governance structure improvement points. Needless to say, organizational functions must be aligned with the selection of sector vision.



Source: JICA Study Team

Figure 6.1-3: Governance improvement view

#### Necessary next steps:

- **Research and Analysis:** Overseas governance study. Study detail cases of overseas regulator functions, contracting agency functions and SOE functions for urban mass transit
- **Workshops:** Sharing workshop of overseas governance cases. Hold discussions between stakeholders and decide on ideal governance structure to achieve sector vision
- **Thailand Action Plan Development:** Develop Thailand governance organization plan. Conduct detail design of sector regulator organization and clarify its roles and functions in Thailand context. Design revision of MRTA's function to achieve sector vision, especially with a view to operate under "gross model".
- **Implement and Build Capacity:** Establish new organization and revise current organization. Implement and monitor action programs to 1) establish new sector regulator/PPP regulator organization, 2) strengthen MRTA's function and 3) revitalize SRT organization division (or its subsidiary) that manages urban mass transit lines.

### 6.1.3 Law and Regulation (Tier1)

**Issues:** Sector specific law and regulation for urban mass transit does not exist. PPP Act and MRTA Act are existing laws that are critically important for the success of urban mass transit development. However, neither Act provides detail regulations on the actual implementation (i.e. design, construction, operation and maintenance). Also, PPP act does not provide sector specific guidelines on PPP scheme, including government support. In addition, MRTA Act may need to be refined based on how the sector vision will be shaped.

**Solution Direction:** Develop MRT Act, refine PPP Act and MRTA Act. Urban mass transit is different in characteristics from inter-city railway. It is centrally controlled at OCC (Operation Control Center) with minimum headway that could be 2-3min during peak hour. Hence, current SRT law does not apply to the urban mass transit construction and operations requirements (e.g. station and surrounding development, safety, security, environmental aspects). Development of MRT Act should be considered from this point of view.

In addition, the current PPP Act does not provide sufficient details specific to urban mass transit sector. As described before, PPP in mass transit has unique characteristics such as 1) the separation of civil and M&E, 2) the gross cost model with government taking ridership risks and 3) the importance of integration in Tier2. With these characteristics in mind, detail guidelines should be developed on how the government should think about areas such as risk allocation, control of tariff/non-rail business and subsidies.

Lastly, if sector vision and governance were to be changed and improved, then, the role of MRTA would also need to be refined. MRTA Act, which defines MRTA's role should be refined accordingly.

	Key Points of Improvement
MRT Act	<ul style="list-style-type: none"> <li>• Clarify difference between urban mass transit and inter-city railway</li> <li>• Position integrated master plan to be stable and limit political intervention</li> <li>• Consider legal support for station and surrounding development (e.g. special land acquisition treatment)</li> <li>• Provide details tariff policies, safety/security/ environmental standards)</li> </ul>
PPP Act	<ul style="list-style-type: none"> <li>• Generate sector-specific regulations (e.g. non-rail business rights, government's tariff control)</li> <li>• Commitment of government support/subsidy guidelines (e.g. political risk guarantee)</li> <li>• Define PPP process guidelines in more detail (e.g. tender process, concession agreement)</li> </ul>
MRTA Act	<ul style="list-style-type: none"> <li>• Clarify re-definition of MRTA's future functions according to sector vision</li> </ul>

Source: JICA Study Team

Figure 6.1-4: Key improvement points on law and regulation

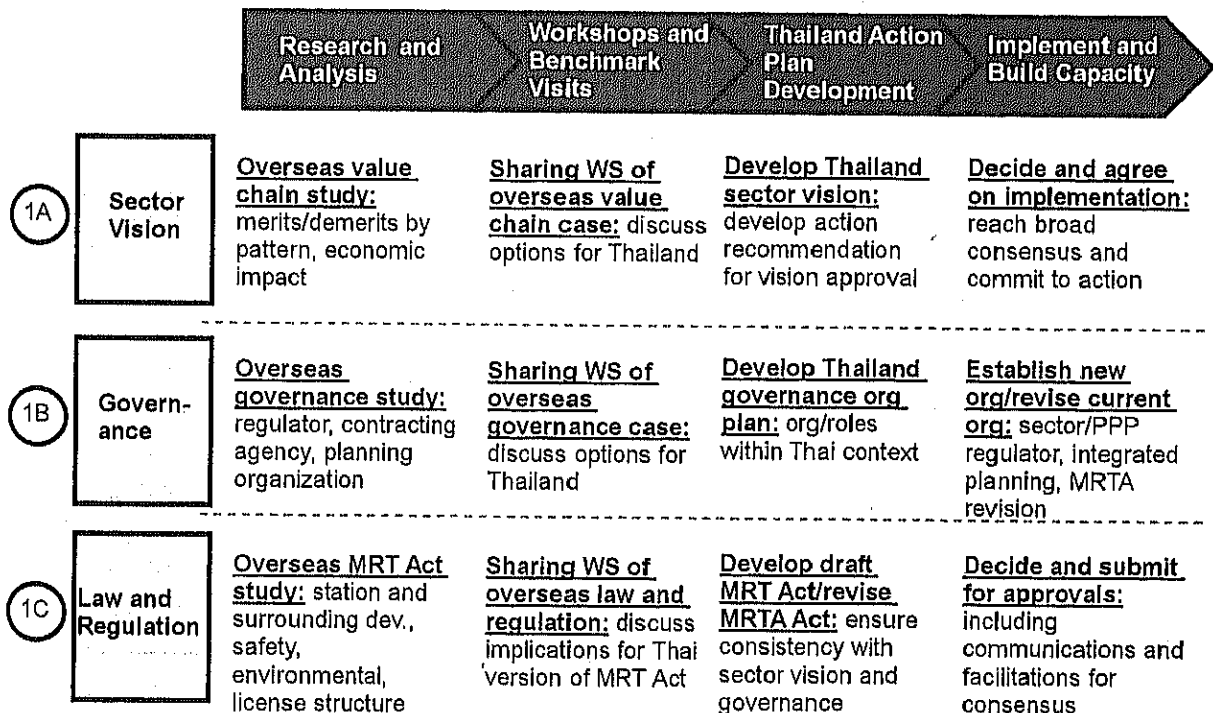
**Necessary next steps:**

- **Research and Analysis: Overseas MRT Act study.** Study details of MRT Act in other countries, especially on station and surrounding development (e.g. joint development law in Japan), safety regulations, environmental regulations and implications for construction and operation licenses
- **Workshops: Sharing workshop of overseas law and regulation.** Discuss key points of MRT Act cases and derive implications on Thailand version of MRT Act.
- **Thailand Action Plan Development: Develop draft MRT Act, revise MRTA Act.** Refer to overseas case and develop draft of MRT Act and discuss between stakeholders. Monitor decisions on sector vision and governance improvements, especially on the future role of MRTA. Derive implications for refinements required for MRTA Act. Also, review latest version of PPP Act guideline. Take a sector-specific view and extract implications on further improvements, if any.
- **Implement and Build Capacity: Decide on changes and submit for approval.** Conduct necessary communications and facilitate consensus for approval.

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For Tier1, in summary, there are three streams of necessary next steps.

A) Sector Vision, B) Governance, C) Law and Regulation. Figure 6.1-4 describes the next steps overview for Tier1.



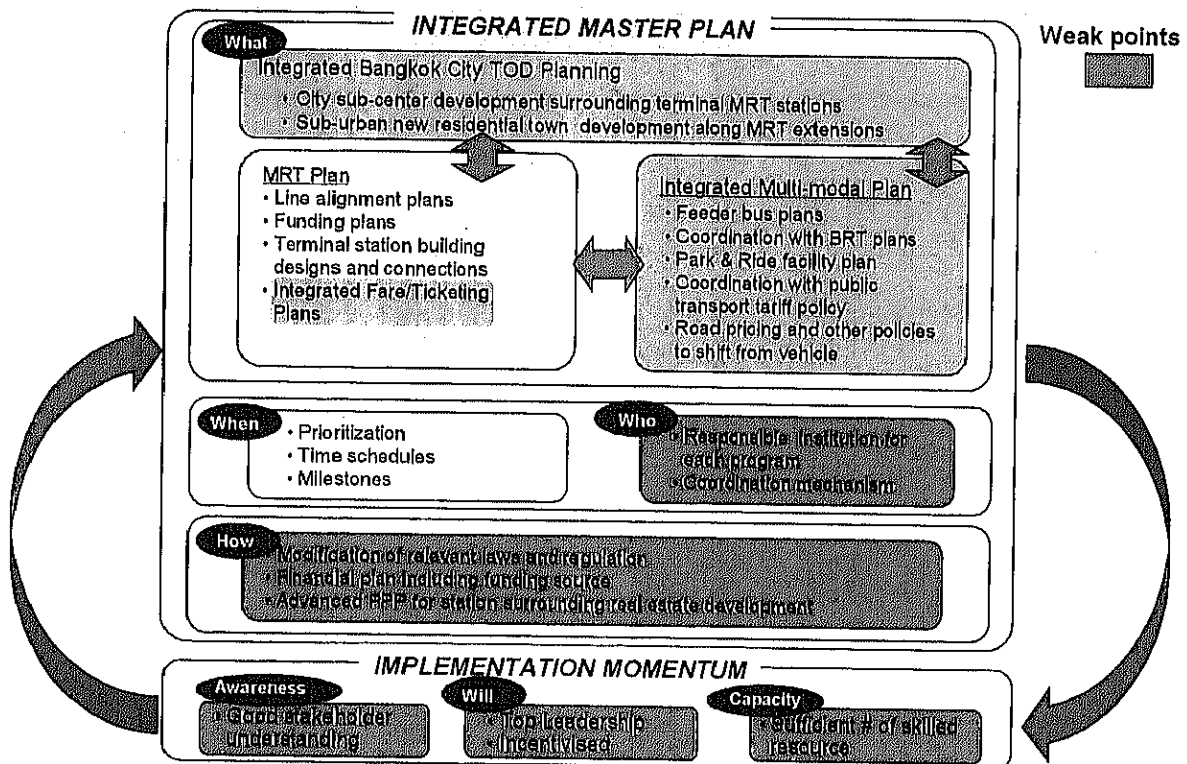
Source: JICA Study Team

Figure 6.1-5: Tier1 Next Steps

## 6.2 Tier 2: Integrated MRT Master Plan

Tier2 is all about integrated planning. It is not just about plans for each mass transit lines. It is about how mass transit lines integrate with each other, with other modes of transport and with city planning. The overall view of integrated MRT Master Plan is described in Figure6.2. The blue shaded areas are where it is weak in the current situation. As you can see, most areas are weak on integration as well as on 'who', 'how' and 'implementation momentum'.

Thailand should take actions to ensure true integration of planning and implementation in order to reshape the capital city of Bangkok into the ideal next horizon. Solution directions will typically include elements of organization, financing and policy.



Source: JICA Study Team

Figure 6.2-1: Overall view of Integrated Master Plan

### 6.2.1 Integrated Bangkok City TOD Plan (Tier2)

**Issues:** Degree of integration is weak between MRT plan and city plan

**Solution Direction:**

- 1) Organization: Set up an oversight committee with neutral secretariat function to ensure integration between MRT plan and city plan
- 2) Financing: Establish a PPP scheme for station and surrounding city development



- 3) Policy: Special development zones around station allowing easier land consolidation (e.g. tax breaks)

**Necessary next steps:**

- **Research and Analysis: Stock take past studies, overseas TOD case study.** Conduct stock take of past studies and reports on city planning and MRT plan integration and make refinements. Study overseas cases of 1) Transit-Oriented Development (TOD) organization coordination mechanism, 2) PPP financing scheme for station and surrounding city development, 3) Policy framework for joint station and surrounding city development
- **Benchmark Visits: TOD benchmark visits.** Hold stakeholder discussions and organize benchmark visits to raise awareness and enlighten the need for Integrated Bangkok City TOD Plan
- **Thailand Action Plan Development: Develop action plan on organization, finance and policy regarding TOD.** Facilitate stakeholder discussions on set up of oversight committee and design its role with regards to Integrated Bangkok City TOD Plan. Decide on pilot project to develop financing scheme and supporting policy for PPP station and surrounding development.
- **Implement and Build Capacity: Implementation of PPP station and surrounding development pilot.** Initiate pilot implementation of joint station and surrounding development in Bangkok.

### 6.2.2 Integrated Multi-modal Plan (Tier2)

**Issues: Degree of integration is weak between MRT plan and other modes of transport**

**Solution Direction:**

- 1) Organization: Set up an oversight committee with neutral secretariat function to ensure integration between MRT plan and plans for other modes of transport
- 2) Financing: Establish cost sharing schemes government and transport operators for multi-modal access facilities such as pedestrian deck, park and ride facilities and bus bay
- 3) Policy: Strengthen policy guidelines for multi-modal accessibility and convenience requirements to avoid adhoc planning

**Necessary next steps:**

- **Research and Analysis: Stock take past studies, overseas multi-modal studies.** Conduct stock take of past study and reports on areas such as feeder bus routes, BRT plans, park and ride facility, station bus bay, road pricing and other demand management. Make necessary

refinements and upgrade integrated plan. Study overseas cases of 1) multi-modal planning organization, 2) cost sharing schemes for multi-modal access facilities, 3) multi-modal related policies

- **Benchmark Visits: Multi-modal terminal station benchmark visits.** Hold stakeholder discussions and benchmark visits on multi-modal terminal station design and its effects
- **Thailand Action Plan Development: Develop action plan on organization, finance and policy regarding multi-modal integration.** Facilitate stakeholder decisions on set up of oversight committee and its role with regards to Integrated Multi-modal Plan. Decide on pilot project to develop financing scheme and supporting policy for multi-modal terminal station development.
- **Implement and Build Capacity: Implementation of multi-modal terminal station development pilot.**

### 6.2.3 MRT Network Integration (Tier2)

**Issues: Degree of integration is weak between different MRT lines**

**Solution Direction:**

- 1) **Organization:** Set up an oversight committee with neutral secretariat function to ensure integration within different MRT lines (i.e. integration between SRT, MRTA, BMA). In the long-term, consider setting up joint equity holding company to manage common assets such as common ticketing system and smart card business
- 2) **Financing:** Establish cost sharing schemes between different lines on investment and management of common assets (e.g. depot, transit access facilities)
- 3) **Policy:** Strengthen policy guidelines for areas such as fare integration and technical performance specification of M&E systems

**Necessary next steps:**

- **Research and Analysis: Stock take past studies, overseas network integration studies.** There are already various studies and discussions regarding network integration for Bangkok MRT. It is important to update/upgrade the latest thinking into a network integration plan.
- **Workshops: Sharing workshop on overseas network integration cases.** Take specific themes such as common ticketing and smart card business.
- **Thailand Action Plan Development: Develop action plan on organization, finance and policy regarding network integration.** Recommend organization for common ticketing and smart card (e.g. joint equity holding co.). Develop cost and revenue sharing mechanisms.

- **Implement and Build Capacity:** Take actions for common ticketing, smart card and fare integration. Build on Purple Line /Red Line development activities and coordinate with existing Blue Line/Green Line.

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For Tier2, in summary, there are three streams of necessary next steps.

A) Integrated TOD, B) Multi-modal integration, C) Network integration. Figure 6.2-2 describes the next steps overview for Tier2.

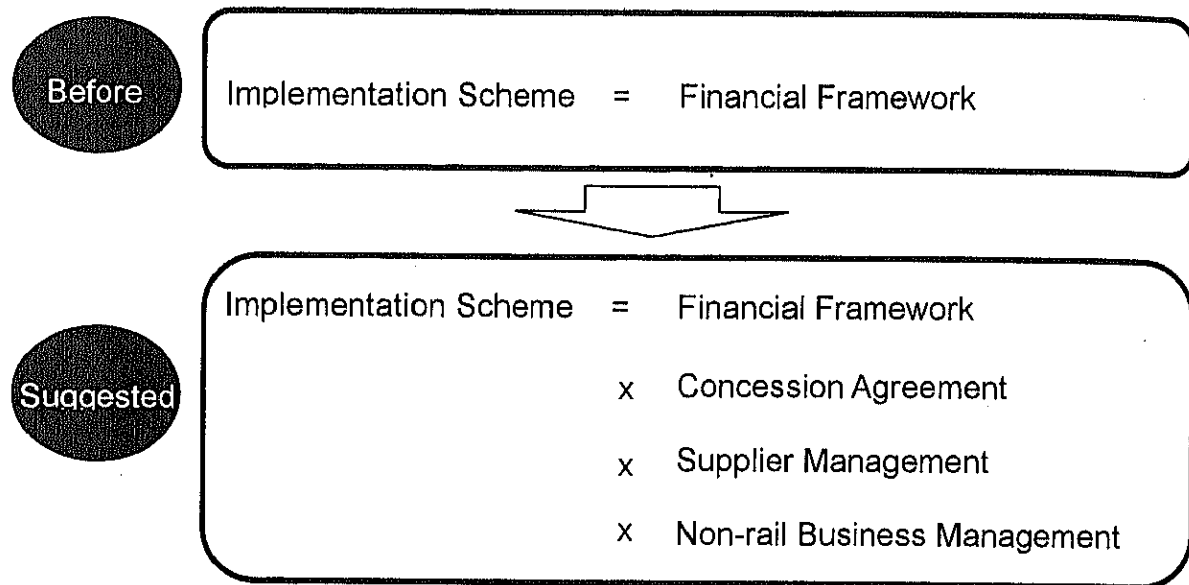


Source: JICA Study Team

Figure 6.2-2: Tier2 next steps

### 6.3 Tier3: Each MRT Line Implementation Scheme

Tier3 is about the implementation scheme of each MRT line, which consists of financial framework, concession agreement, supplier management and non-rail business management. These four elements are inter-related. For example, if ‘gross cost model’ is selected as financial framework, concession agreement/supplier management and non-rail businesses will need to tailored to match the ‘gross cost’ characteristics. Thailand should build on the lessons from the past and improve on the packaged set of all four elements.



Source: JICA Study Team

Figure 6.3-1: Four elements of each MRT line implementation scheme

### 6.3.1 Financial Framework (Tier3)

Issues: There seems to be several “myth and realities” regarding PPP financial framework for urban railway in Thailand.

- 1) Myth: Best financial framework exists  
Reality: There is no such thing as a best financial framework. Merits and demerits exist for each financial framework option. (refer to Chapter 4)
- 2) Myth: Selection of financial framework can solve many of the issues in the past  
Reality: Financial framework alone cannot solve much. Financial framework selection needs to be packaged with concession agreement, supplier management and non-rail business management
- 3) Myth: Involvement of private party will achieve better construction efficiency and operation efficiency  
Reality: For urban mass transit, there is no evidence that private can achieve better efficiency. The “Optimism Bias” used for current value for money calculation is not recommended.

Solution Direction: Refine the assessment guideline. Financial framework option comparison should be made more on government trade-offs between additional financing capacity/controllability versus additional business risks. It is not recommended to use value-for-money calculations based on current ‘optimism bias’ assumptions. Practically speaking, there is no such thing as the best answer. Each option has its merits and demerits. If government decides to adopt ‘gross cost’ model, it is a natural choice in the early stages of

network building because the ridership risk is too big for private investors and government can have more control for network integration purposes. However, under 'gross cost' model, government's capacity requirements are much higher and the other elements of Tier3 (i.e. concession agreement, supplier management, non-rail business) will need to be carefully implemented.

**Necessary next steps:**

- **Thailand Action Plan Development:** Refine the current assessment guideline. Provide detail descriptions of merits and demerits of each option.
- **Implement and Build Capacity:** Specify implications for next series of FS calculations. Especially for 'gross cost model', highlight the trade-offs and raise awareness on the importance of government's tighter management of concessionaire and suppliers. Ensure inputs into MRTA's capacity building activities on handling of financial calculations.

### 6.3.2 Concession Agreement including Tender Preparation (Tier3)

**Issues:** Tender preparation and concession agreement were not optimal in the past. Going forward, under 'gross cost' model, level of sophistication will further escalate.

**Solution Direction:** Develop a 'gross cost' model tender document and concession agreement template for M&E system installation, operation and maintenance. This template should take into account the following lessons from the past as well as 'gross cost' model specific considerations:

Lessons from the past:

- Conflict of interest should be avoided between shareholders and operating company
- Contract should specify 1) action commitments from both government and private, 2) conditions for capacity adjustment investments, 3) requirements for network integration such as common ticketing with other lines, 4) conditions to trigger revisions and concession extensions
- Contract should include incentives for sustainable operations, even towards end of concession period
- Contract should include guidelines on supplier management and contracts

'Gross cost' specific considerations:

- Annuity calculation method: specify method for each cost component (i.e. capital cost, system installation cost, operation cost, maintenance cost)
- Risk allocation: clarify who will take risks for annuity cost fluctuation factors such as FX, energy cost, re-financing interest rate, project delays, etc.

- **KPI setting:** Clarify KPI targets and how to measure indicators such as operational availability, reliability and customer satisfaction
- **Incentives and penalty:** Include incentives to improve operation and maintenance efficiency overtime (e.g. with local technical transfer) and penalties for not achieving KPI performance

**Necessary next steps:**

- **Thailand Action Plan Development:** Develop template for tender document and concession agreement, which is tailored to 'gross cost' model. Ensure lessons from past and 'gross cost' considerations are fully taken into account.
- **Implement and Build Capacity:** Pilot implementation in Purple Line. Invest enough resources on tender preparation as well as concession agreement negotiation. Ensure inputs into MRTA's capacity building activities on tender preparation, contract negotiation and performance management.

### 6.3.3 Supplier Management (Tier3)

**Issues:** Supplier management was not optimal in the past. Areas such as technical transfer, information disclosure and line extension conditions were not managed well.

**Solution Direction:** Develop a 'supplier management guideline' to be included in the concession agreement. This guideline should take into account the following lessons from the past.

- Technical and knowledge transfer should include KPI for both 'input' (e.g. amount of resource investment on training) and 'output' (e.g. #of qualified maintenance engineers developed within 5years)
- Information disclosure requirements of technical specifications regarding key systems (e.g. signal, telecommunications, rolling stock) should be included
- Fair price formula for line extension to be specified in advance
- Penalties for not achieving KPI performance as well as contract conditions to be included

**Necessary next steps:**

**Thailand Action Plan Development:** Develop template for supplier guideline. Ensure that lessons from past are fully taken into account.

**Implement and Build Capacity:** Pilot implementation in Purple Line. Invest enough resources in including supplier management guidelines into the tender document as well as concession agreement. Monitor actual supplier contract between concessionaire and supplier. Ensure inputs into MRTA and concessionaire's capacity building activities to take initiative on technical

specification, system integration and maintenance management.

#### 6.3.4 Non-rail Business Management (Tier3)

Issues: Government has not exploited the full potential of non-rail business revenue sharing in the past

Solution Direction: Decide on roles and responsibilities of MRTA and concessionaire for each of the following business types. If MRTA were to be responsible, then, a new organization division with sufficient capacity should be formed. If concessionaire were to be responsible, then, a fair share of revenue should become an income to MRTA. This will be net-off to reduce the annuity payment. The decision needs to be reflected into the tender document and concession agreement.

##### **Type 1: Business that comes together with railway infrastructure development (e.g. advertising, and space rental for retail)**

###### Implication of Type 1:

Under the gross cost model, concessionaire or MRTA could lead business for advertising and retail space rental. Concessionaire would be in a better position to manage the interface with day-to-day operations. If rights were given to the concessionaire, however, tight negotiation on how to adjust the government's service fee payment will need to be managed.

##### **Type 2: Business that requires investment on top of railway infrastructure development (e.g. telecom service business, smart card business, feeder bus business)**

###### Implication of Type 2:

The value of business rights for this type of business is difficult to calculate. If rights were given to concessionaire, financial sharing mechanism will need to be thought through. Alternatively, MRTA could lead this business type and seek funding.

##### **Type 3: Property development surrounding station and along alignment**

###### Implication of Type 3:

Following actions will need to be considered:

- 1) To clarify the transfer of land from government ministries and agencies
- 2) To acquire a legal basis for property development and the responsibility and right to engage in property development.
- 3) To closely cooperate with central and/or local government bodies in charge of urban planning and development.
- 4) To initiate PPP concession scheme to involve private developers for station and surrounding

development.

**Necessary next steps:**

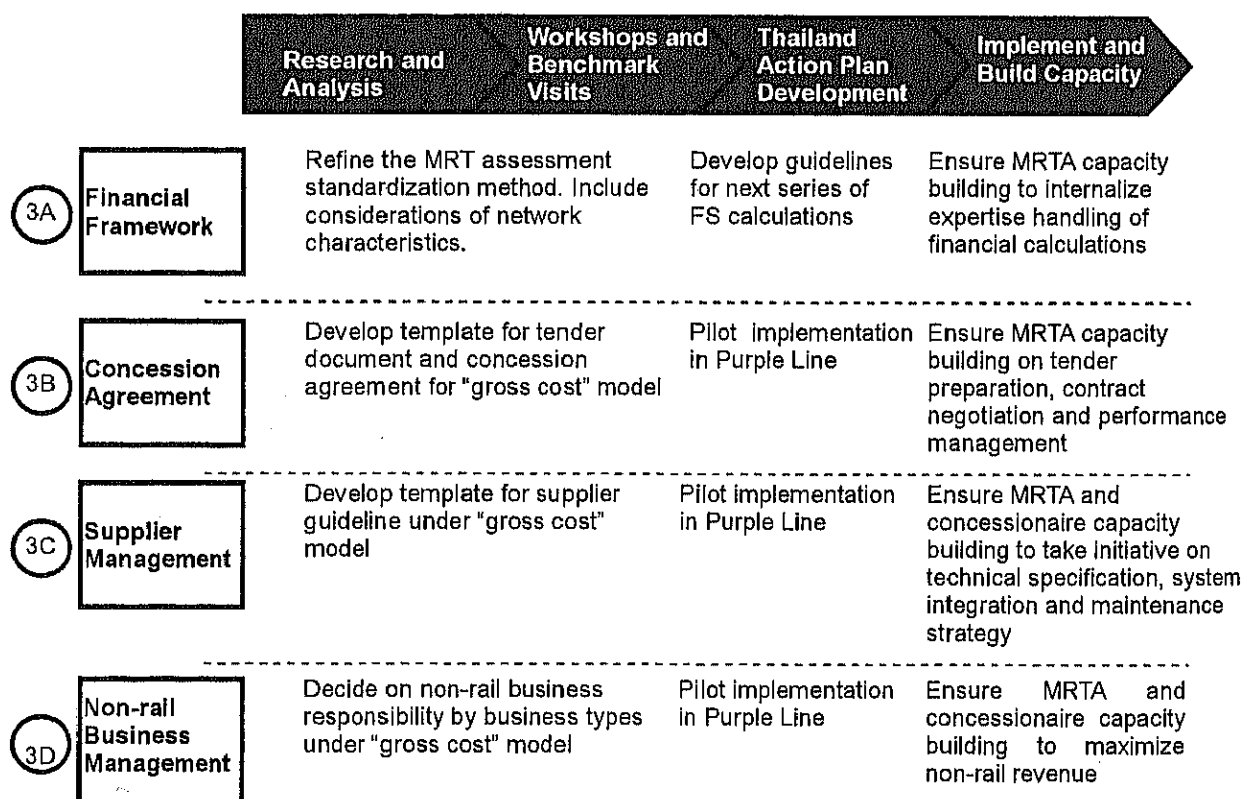
**Thailand Action Plan Development:** Decide non-rail business responsibility by business types. Develop non-rail business management guidelines for 'gross cost' model by business types.

**Implement and Build Capacity:** Pilot implementation in Purple Line. Include non-rail business management guidelines into the tender document as well as concession agreement. Invest enough resources for contract negotiation on non-rail business. Ensure inputs into MRTA and concessionaire's capacity building activities.

\*\*\*\*\*

For Tier3, in summary, there are four streams of necessary next steps.

A) Financial framework, B) Concession agreement, C) Supplier management, D) Non-rail business management. Figure 6.3-2 describes the next steps overview for Tier3.



Source: JICA Study Team

Figure 6.3-2: Tier3 next steps

**6.4 Suggested roadmap for Thailand**

Thus far, we have explained the issues, solution direction and suggested next steps for each of the



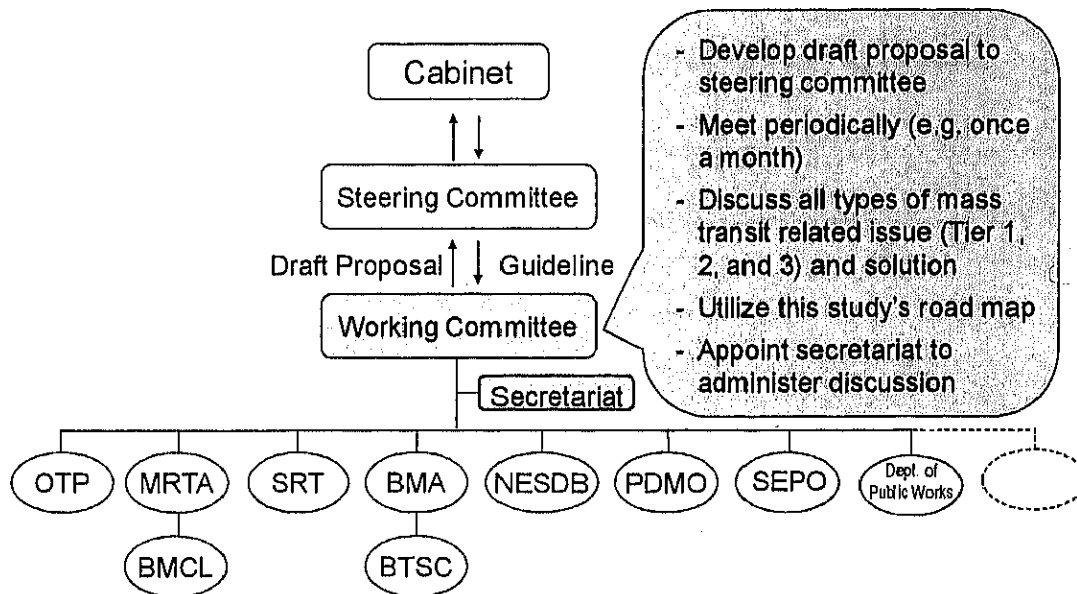
components within Tier1, Tier2 and Tier3. To put everything into perspective, we have developed a suggested roadmap for Thai stakeholders. It is in three steps:

**STEP1: Establish a mass transit committee with neutral secretariat function**

The committee should have a working committee and steering committee, supported by secretariat. It consists of all related stakeholders on urban mass transit development. This includes not just transportation but also city planning related stakeholders. The objective of this committee is to set-up, refine and maintain all elements related the successful implementation of mass urban transit infrastructure development. In the context of this report, it is about setting up and maintaining Tier1, Tier2 and Tier3.

The working committee should meet periodically (e.g. once a month) and discuss 1) prioritization of issues to be solved, 2) launch of action programs to solve issues, 3) progress of existing initiatives, 4) overseas cases and Thai implications. Also, the working committee should organize expert speaker sessions and benchmark visits, as appropriate. Key decision items will be proposed to the steering committee for guidance and decisions.

Activities of the working committee should be supported by a neutral secretariat function. This secretariat works with external experts and consultants to prepare materials for working committee discussions. It will administer all activities required to hold a periodic working committee.



Source: JICA Study Team

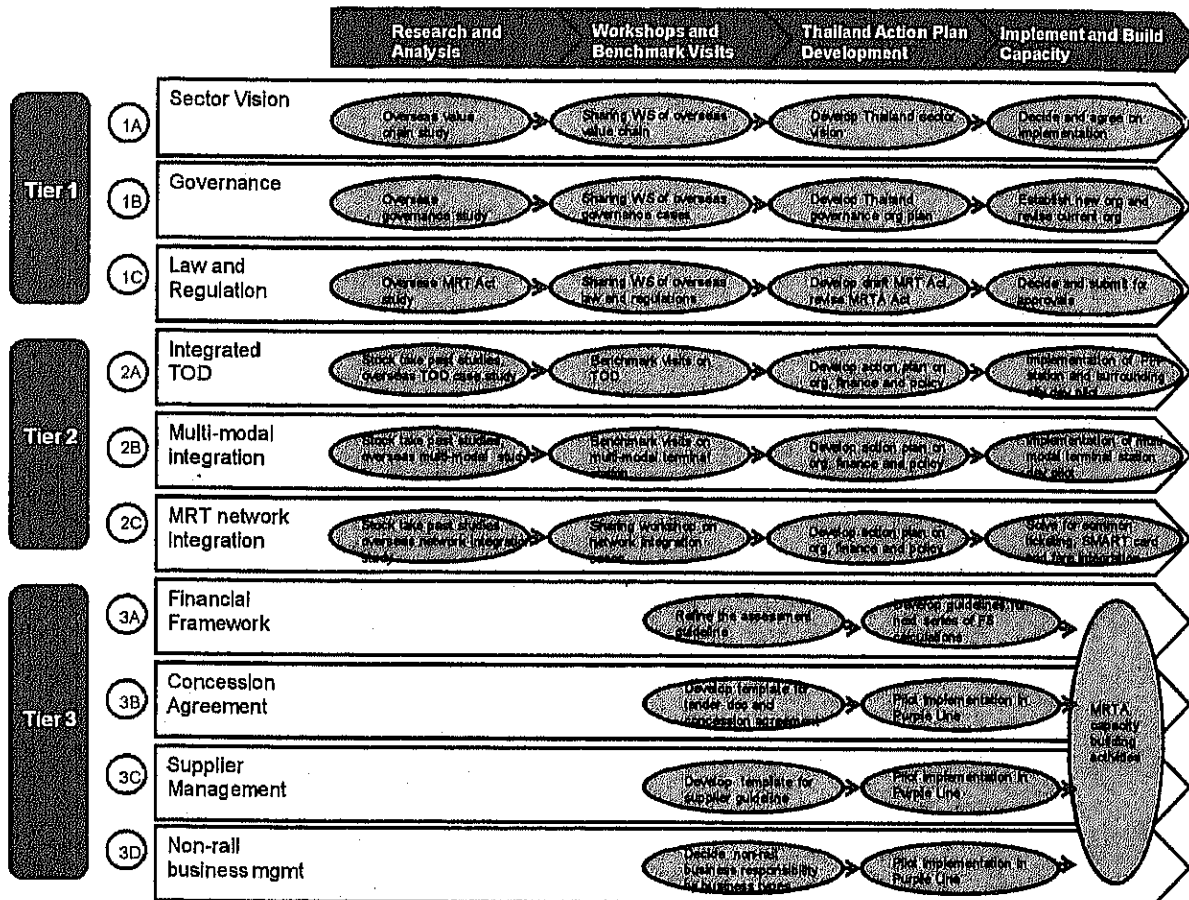
Figure 6.4-1: Image of mass transit committee

**STEP2: Hold first working committee meeting and decide on priorities on the following 10 action streams along the three tiered structure.**

As described above, each element of Tier1, Tier2 and Tier3 has clear next step action streams. In

total, there are 10 action streams (Figure 6.4-2).

The first role of the working committee will be to discuss the 10 action streams and decide on priorities and relations to all existing initiatives. Thereafter, the committee should develop an annual activity schedule to clarify annual objectives and set the pace.



Source: JICA Study Team

Figure 6.4-2: Ten action streams

**STEP3: Launch series of action programs and monitor progress.**

After the first working committee, the secretariat should prepare to launch series of action programs. Actions could be in various forms. For example,

- Pilot initiatives within committee member organizations
- Sub-committee discussions
- Research projects by consultants

Each action should have clear output, deadline and resource. Leader of each action program should be appointed from working committee members. Leader is responsible to the output quality and to report back to the working committee on progress and results.