3.11 Requirements for St.10, depot, and St.8

3.11.1 Outline

Requirements for St.10, connecting line, and depot are as follows:

- St. 10 shall enable turn back operation at the west-end of Line 5 in phase 1.
- Connecting line from St.10 shall be constructed to connect between main line and depot.
- The depot utilized for both Line 5 and Line 8 shall be constructed in the area 2 km north from main line.

3.11.2 St.10

(1) Required facilities

Basic facilities for St. 10 are as follows:

- An island platform which allows trains to turn back in short time
- A scissors crossing at the east side of St.10 which guides trains into both sides of the island platform
- The scissors crossing must be installed in straight section for safety reason.
- It is preferred to install the platform in straight section; however, it can be installed in curve section as well.

(2) Scissors crossing

The vicinity of proposed site is located on the Thang Long with large radius of curvature. By combining curves with a small radius and straight lines, therefore, a straight section shall be created in the median strip of Thang Long road to enable the installation of scissors crossing.

The smaller format number is, the easily scissors crossing can be installed in short, straight section; in the meantime, train operating speed is suppressed.

The difference in train speed between No. 12 and No.10 is 10 km/h, and it makes a difference of 5 seconds in entering and leaving of train, resulting in a difference of 10 seconds in total as the interval of train operation. Shortest interval of train operation should be considered in the line section with 90 to 120 seconds of train interval, and these 10 seconds are equivalent to approximately 6 to 10 % of the shortest interval.

In the Line 5, it is planned to install scissors crossing with No.12 at St.1 where similar facilities of turning back shall be installed. Therefore, turnout No.12 shall be adopted, considering the balance with capacity of arriving and departing at the St.1 and the saving of supplementary components by utilizing scissors crossings with same number.

(3) Platform

Curved platform has several disadvantages such as short optical distance. However, since proposed station site is located in curved section of Thang Long road, installation of the curved platform is inevitable. Therefore, supplementary measures such as platform surveillance cameras must be introduced.

The platform length is 170 m for eight-car train set with 20 m of a rolling stock, and the length shall be applied to all stations.

3.11.3 Connecting line to depot (refer to Figure 3.11.1)

(1) Required condition

In the section between the branching point from the main line at west side of platform and the depot, the following requirements need to be considered:

- Two turnouts between main line and connecting line and a scissors crossing between two connecting lines in west and east bound tracks
- Grade line to cross over west-bound track and Thang Long road
- Horizontal curve at the section to cross over Thang Long road
- Grade line to go down to depot

(2) Turnouts and scissors crossings

Turnouts and scissors crossings with large numbers are desirable for high speed train operation. In order to make connecting line consistent with land use planning, the No.8 turnouts and scissors crossings shall be adopted even though it is ideal to adopt those of No.12 as well at the ending

point of St.10 since the line shall be a part of main line if Line 8 starts operation.

By adopting the scissors crossing, train operation becomes smoother so that accidents and difficulties can be coped with flexibly.

(3) Gradient

10 m of height difference is required between elevated connecting line to depot and the ground level, west-bound mainline track and Thang Long road. Total length of up-hill grade section shall be 423 m in case allowed gradient is 3 %, required gradient length is 333 m, and vertical curves with the radius of 3000 m at both sides of the grade section.

It is known when the lower part of the steep gradient section has a curve, risk of derailment increases. The reason of derailment is as follows. Gravity acts on vehicles. Reactive force is caused in the upward direction in curve section. These forces generate the force which makes middle vehicle lift. As a result, wheel load is decreased. When wheel load is small, wheels of vehicle goes on rail surface by lateral force generated between wheel and rail. Namely flange climbing is caused. In this case, scissors crossing which is located at lower part of gradient section has sharp curve. Therefore it is necessary to avoid steep gradient or turnout of lower number as much as possible.

At current stage, track alignment is planned by using standard value. It is expected that detail plan is elaborated at the stage of detail design including local detail survey.

(4) Curved section

At the peak point of grade section, connecting line turns toward north and crosses over west-bound main line and Thang Long road. The bigger radius of curve becomes, the higher construction cost would be since length of bridge at intersection point becomes longer.

Moreover, radius of curve has influence on train operation speed. Train speed is 55 km/h in case of curve with radius of 160 m and 60 km/h in case of 200 m. By considering the possibility of through operation between Line 5 and Line 8 in the future, curve with radius of 200 m shall be adopted.

In Japan, Tokyo Metro Co., Ltd. experienced accident of derailment, and there was serious damage in 2000. The derailment occurred at the grade section of 3.5 % with curve of radius 160 m near transition curve. There was no infringement of approved standards; however, repeatability of the accident is confirmed after being studied by specialists with relevant knowledge and experience.

This is the reason why JICA study team tries to avoid friction between vertical and transition curves.

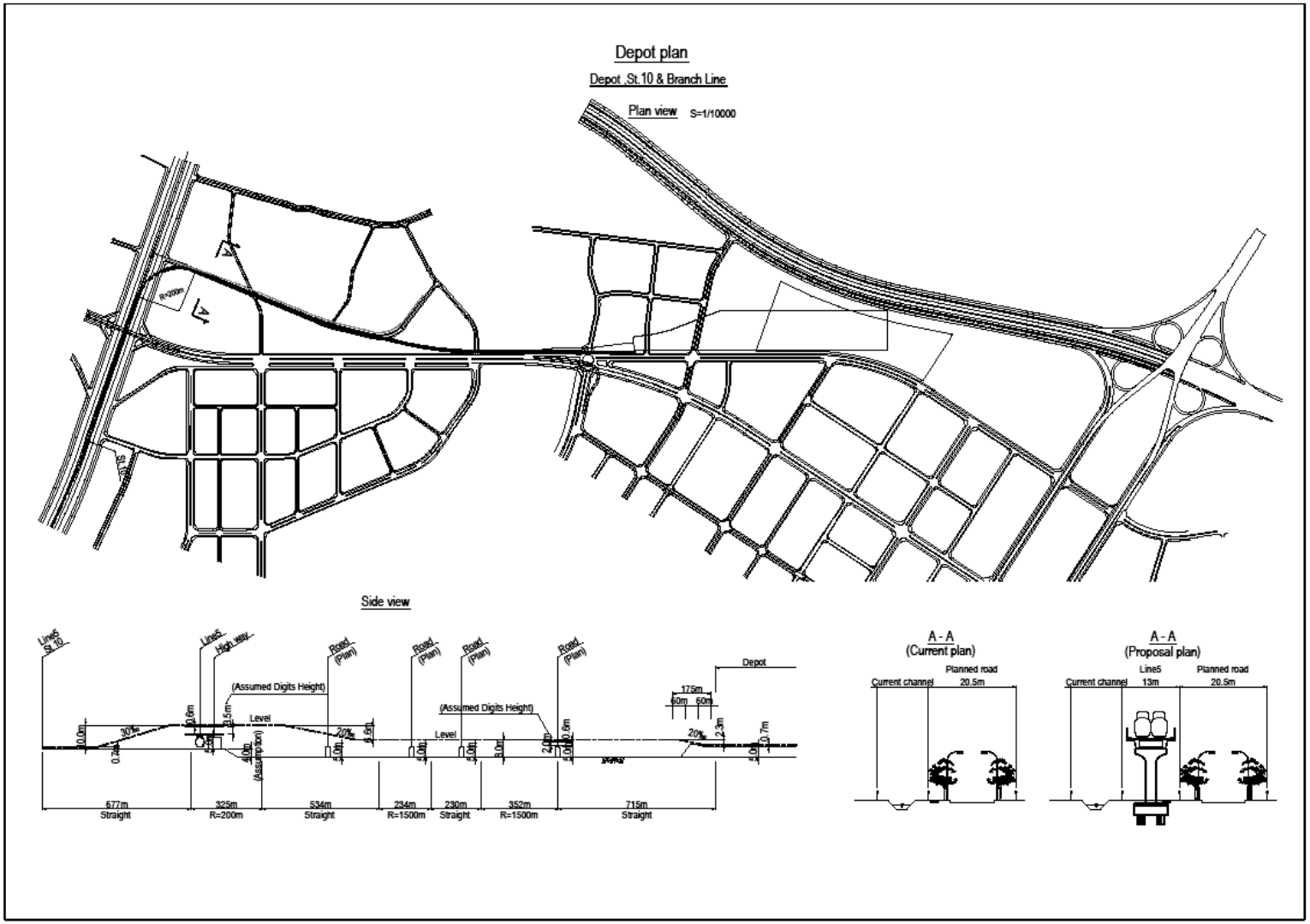
(5) Grade line going down to depot

There would be no technical problems from the view point of railway in the section from the point to cross west-bound main line and Thang Long road to depot. Therefore, gentle downhill gradient and curve with huge radius can be applicable.

Consistency with the urban planning in the vicinity of the connecting line is one of the challenges. However, as one of advantages, since ground elevation of the depot is assumed as almost same with that of Thang Long road and shall be constructed around 4-5 m higher than the peripheral area, the connecting line to depot shall be able to cross surrounding roads with an overpass. Interconnect line between Line 5 and Line 8 shall be approximately 8 m higher than the connecting line.

Desirable location of the connecting line is on the eastern side of existing waterway as there is little traffic to cross the waterway. Green House project is planned in the vicinity, and there is a need to diagonally traverse the project site to the depot. The planning is regarded as adjustable since the project is considered to be in study stage of drawings.

First priority on urban planning is rivers and waterways. This is because no one can go against the law of nature. The second is railways since adaptation of sharp curves lines and steep gradient is extremely difficult. Roads, parks, factories, and housing come next. It is highly recommended for urban planners to proceed the planning with the above-mentioned concept.



Source: JICA Study team

Figure 3.11.1 Connecting line to depot 1

3.11.4 Depot for common use of Line 5 and Line 8

(1) Basic conditions

Regarding depot for common use, followings are the considered presupposition if the planning of Line 8 has not been confirmed yet.

- Location of the depot shall be extended toward south from the position stipulated in the Hanoi Capital Master plan.
- Compared with the case of using depot only for Line 5, there is no big difference in factory and inspection equipment, and only storage facilities shall be approximately doubled.
- In this study, showing required land for railway is the first principal.

(2) Location of depot

Depot shall be shared by both Line 5 and Line 8 and located in western side of the two lines stipulated in the Master plan. The lines shall be connected with elevated, double-track interconnect line allowing direct operation between the lines in the future.

Entry to depot can be achieved from both Line 5 and Line 8 by crossing the interconnect line with an overpass. Because of this, location of the depot shall be extended toward south compared with the area stipulated in the Hanoi City Master plan.

Distance from St.10 of Line to entrance of depot is 2.4 km.

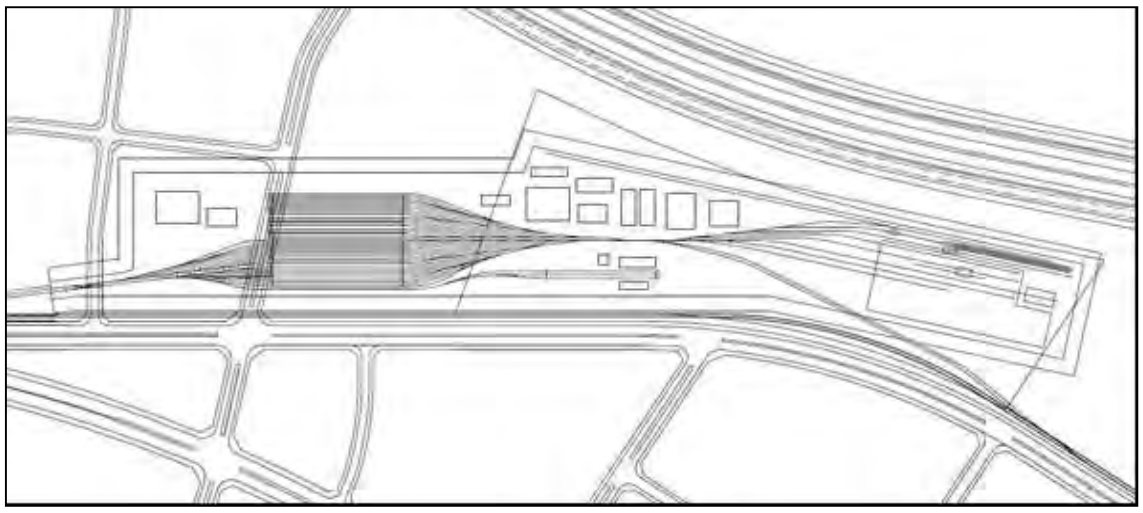
(3) Track alignment (refer to Figure 3.11.2)

Among the depot facilities, factory and inspection equipment shall be shared by both Lines 5 and 8. In terms of scale of the facilities, there is no great difference in comparison with the scale utilized only for Line 5.

Storage tracks are expected to be operated in common by Lines 5 and 8. Operation planning of Line 8 is not clear at this moment, but a certain storage track should be ensured: in addition, possibility of expansion should be considered.

(4) Land used for railway

Depot area is approximately 27.9 ha excluding connecting line and includes the area for elevated, double-track interconnect line between Lines 5 and 8.

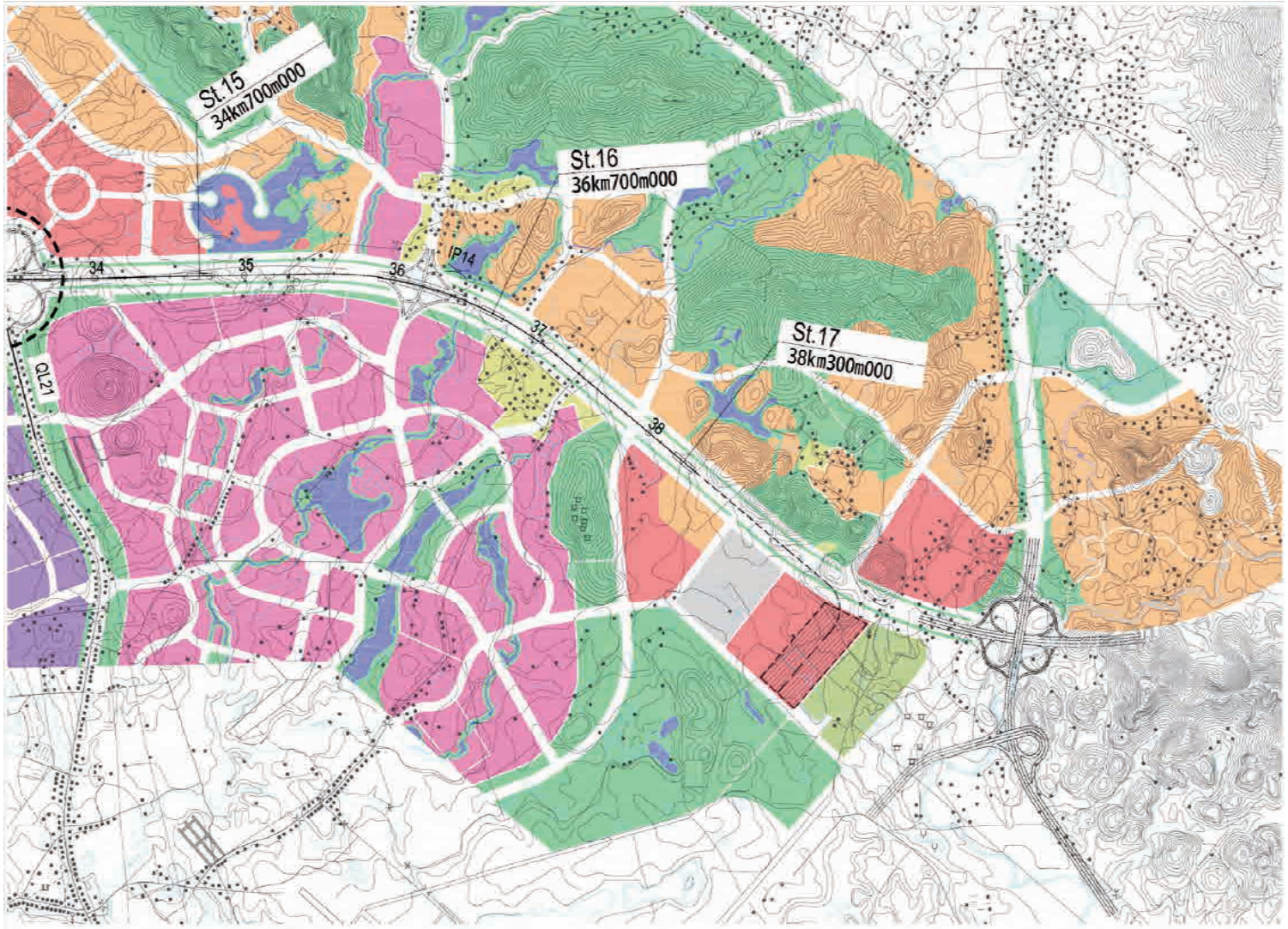


Source: JICA Study team

Figure 3.11.2 Alignment diagram of depot shared by Lines 5 and 8

3.11.5 Depot 2

It seems not necessary to construct the second depot as the above-mentioned shared depot shall have functions which are applicable for both Lines 5 and 8. However, if it is figured out that a large number of rolling stocks are required after studying Line 8, capacity may become insufficient. In order to prepare for such situation, land is needed to be secured in the location indicated in the following figure, by considering the construction of depot which consists of storage tracks only near the ending point of Line 5.



Source: JICA Study team

Figure 3.11.3 Location of the second depot

3.11.6 Location of St.8

As shown in the figure below, St.8 of Line 5 shall be situated right above the intersection with Line 6.

In terms of station layout, the first floor (ground level) has the tracks and platform of Line 6, the second floor has a concourse shared by Lines 5 and 6, and the third has the tracks and platform of Line 5. By adopting this layout, it becomes possible to shorten travel distance of transferring between the lines. Passengers in the vicinity of the station shall pass the concourse at the second floor and select a platform depending on destination.

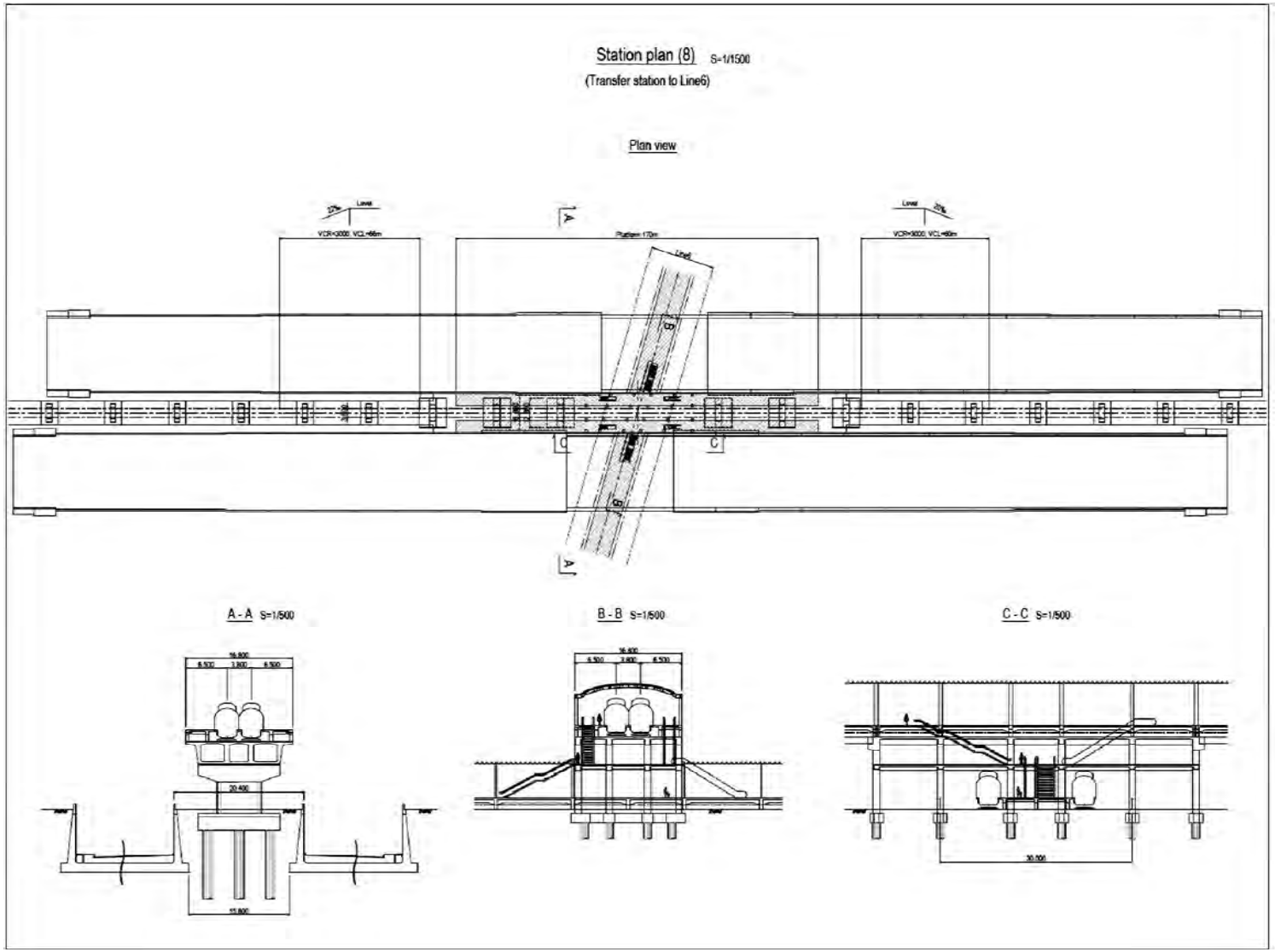


Figure 3.11.4 Diagram of St.8 Source: JICA Study team

Chapter 4 Project Implementation Plan

4.1 Equipment/materials procurement plan

4.1.1 Equipment/materials

(1) Basic policy

Among the materials required for railway construction, study team will locally procure those available in Vietnam including import items as far as possible from view point of reduction in construction cost, except those that will not potentially be obtainable in the specified period of time in consideration of quality, delivery time and market prices, which will be procured from Japan or third countries.

(2) Present state of procurement of equipment/material

Study team indicates the state of procurement of the following equipment/materials required for the project.

Table 4.1.1 Plan of equipment/materials procurement

Equipment/materials	Source of procurement			Remarks
	Vietnam	Japan	Third countries	
Steel frame	△(only processing)		○	
Reinforcing bar	○			
Cement	○			
Aggregate	○			Gravel, etc.
Admixture	○			High-performance water reducing agent, AE water reducing agent
Asphalt mixture	○			
Framework material	○			Locally available
Viaduct girder	○	○		PC girder, steel girder
Truss pole, steel pipe pole	△(only processing)		○	Import, processing is partly possible in Vietnam.
Rail (50N, 60)		○	○	From Japan, etc.
Optical cable (SM)		○	○	
Power cable	○			
Signaling cable		○	○	
Insulator		○	○	
Trolley wire		○	○	
PC sleeper	○	○		vibration-free
Turnout		○		Simple turnout, scissors
Raw concrete	○			
Rail fastening device		○	○	
Ballast	○			
Sand/soil (improved soil, ballast)	○			
Steel sheet pile	△			
H steel	△			
I steel	△			
Wire gauze	○			Weld wire gauze, etc.
PC material	○		○	PC steel wire, joint, etc.
Support		○	○	Rubber support

Equipment/materials	Source of procurement			Remarks
	Vietnam	Japan	Third countries	
Earth retaining support material	○			Strut, wale It is used by processing usually H steel, etc.
Wooden sheet pile	○			
Waterproof agent	○			
Secondary concrete product	○			Concrete trough, etc.
Discharge pipe	○			Polyvinyl chloride pipe, etc.
Scaffolding board, support material	○			Unit section, cramp, etc.
Decking plate	○			
Safety material	○			Fence barricade, color cone, etc.
Grouting material	○			
Sound insulating wall	○		○	
Entry prevention track fence	○			
Covering plate	△	○	○	Not sure the availability in Vietnam.

Source: JICA Study Team

4.1.2 Construction machine

(1) Basic policy

General-purpose construction machines will be procured in Vietnam as far as possible, when they are locally available. However, large-size and special machines, which will significantly influence construction work and construction schedule in case of malfunction, will be procured from Japan.

(2) Present state of procurement of construction machines

Study team indicates the situation of procurement of main construction material required in the construction plan in the following.

Table 4.1.2 Plan of equipment/materials procurement (draft)

Construction machines	Source of procurement			Remarks
	Vietnam	Japan	Third countries	
Pile driver	○	○		In case of special machine, procured from abroad.
Auger for bore pile	○			
Tower crane	○			
Mobile crane	○			
Road roller	○			
Concrete pump car	○			
Bulldozer	○			
Machine drill	○			
Shield machine		○	△	
Grader	○			
Dump truck	○			
Concrete breaker	○			
Compactor	○			
Concrete mixer car	○			
Generator	○			
Air compressor	○			
Rough terrain crane	○			Depends on capacity, but available in Hanoi and Ho Chi Minh city.
Crawler crane	○			
Back hoe	○			
Silent piler		○	△	It seems available only in Japan and not sure availability in third countries.
All-round machine drill	○			
Earthy drill	△	○	○	Not sure the availability in Vietnam.
Welding machine	○			
Submerged pump	○			
Lighting apparatus	○			
Vibration roller	○			
Tamper, rammer	○			

Source: JICA Study Team

4.2 Project cost estimation

4.2.1 Overview

Using a cost estimation support system, the cost of project is estimated separately for the cost of the main construction works, consultation, land acquisition, reserve fund, and other expenses. The costs of materials, devices, and construction that can be procured locally are calculated based on Vietnamese dong (VND), and imported materials and devices are calculated based on Japanese yen (JPY).

The values of the “Tokyo market (the JPY-dollar rate)/central exchange rate (b)/monthly average” (March 2012) released by the Bank of Japan are adopted for the calculations of foreign currencies (JPY-dollar rate). The values from the latest available date before FF in the inter-bank average exchange rate of the State Bank of Vietnam (as of 27th of April 2012) are adopted for calculations of domestic currency (the VND/USD rate).

Exchange rate: US$1 = 82.4 JPY, US$1 = 20,828 VND, 1 JPY = 252.8 VND

4.2.2 Share of public and private procurement

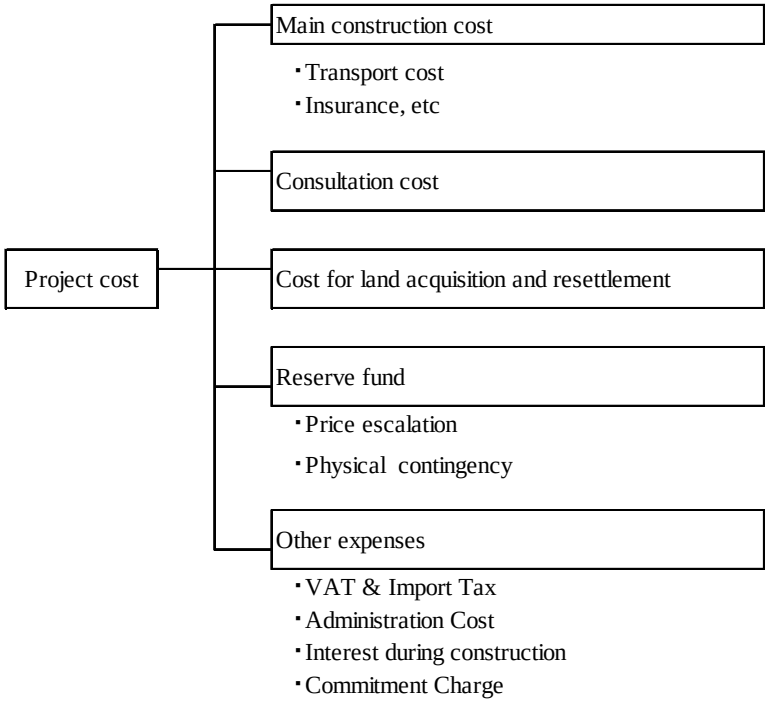
According to PPP scheme proposed in this survey, study team has proposed that private sector shall supply rolling stock and AFC. The reason is as follows. Share rate of funds between public and private is shown in table.4.2.12 and 4.2.13.

- As for construction and maintenance of facilities of overground parts, it is appropriate to be performed by package as an infrastructure. Infrastructure refers to the civil structure, the station building built as the appurtenance of it, the track structure, substation, the transmission equipment, the signal device, and the train operation control center.
- Signal system including Automatic Train Stop, Automatic Train Operation, Interlocking device, Automatic Train Protection, CBTC system, Signal cables and Platform gates should be maintained by the package when considering about safety. Normally, as signal systems are closely related with the rails and turnouts which are generally prepared by the government, they shall be indivisible.
- Under current plan, signal systems are not unified in the railway tracks approved by Hanoi city. Moreover, the train operation control centers are planned to be installed for each railway line. According to feasibility study about establishment of the Hanoi Urban Rail Corporation (tentative name), research to integrate the train operation control centers of each line in the future has been proceeding so that the whole service information of train operation control can be obtained and the operation control effectively can be conducted. Hanoi city can hold the signal equipment, like other lines, by integration of the train operation control centers. In this case, the design specifications at the time of renewal of the system can be unified. It is not necessary to set the staff of the train operation control center corresponding to each line. As the result, total cost can be reduced.
- Meanwhile, rolling stock is business facility which passengers get on directly and stay comparatively long in. Rolling stock shall be procured by private sector in order to satisfy passenger's needs. When the obstacle and accident of the equipment occur, the facility can be separated from train operation control system above ground.
- Similarly, AFC device is also business facility. Furthermore, since it does not link directly to safety of train operation, it shall be procured by private sector.

4.2.3 Breakdown of the project cost

The breakdown of the project cost includes the main construction cost, consultation cost, cost for land acquisition and relocation, reserve fund, and other expenses. The breakdown includes portions based on foreign currencies and domestic currency. The main construction cost includes construction of elevated or underground structures in urban areas, interior work in stations, construction of tracks, electrical work, construction of train depots, etc. The consultation cost includes investigation, design, documents for ordering construction, the construction supervision cost, etc.

The breakdown of the project cost is shown in Fig. 4.2.1.



Source: JICA Study Team

Figure 4.2.1 Breakdown of the project cost

(1) Main construction cost (not including consultation and services)

The main construction cost includes devices and equipment, materials, construction machinery, labor cost, fuel cost, and other relevant expenses used to construct structures and electrical facilities.

Details of transport cost and insurance fee are shown in Tables 4.2.1 and 4.2.2. Transport cost includes cost for marine transport and land transport. Regarding the insurance fee, marine insurance, insurance of works, Protection & Indemnity Insurance, and liability insurance are included. In addition, trade insurance and bond cost are included.

Table 4.2.1 Transport cost

Item	Transport cost
Rolling stocks	6 million JPY per car
A set of signaling equipment	30 million JPY
A set of transforming equipment	30 million JPY
A set of AFC devices & communication equipment	30 million JPY
Martials for railroad track including rails, etc.	500 million JPY (In case underground structure is adopted for urban area, the cost is 700 million JPY.)

Source: JICA Study Team

Table 4.2.2 Cost of insurance Transport cost

Item		Cost
Insurance fee	Marine insurance	[total cost of imported materials] × 0.5%
	P&I insurance	300 million JPY
	Insurance of works, liability insurance	[total cost of construction and materials] × Elevated: 1.0%, Underground : 1.8%, On ground: 0.8%
	Trade insurance fee	contract amounts × 1% *NEXI, Japan Overseas Rolling Stock Association (JORSA), Japan Machinery Center for Trade and Investment (JMC)
Bond cost	Performance Bond	[total cost of construction and materials] × 0.5% × term of contract (years) (from conclusion of contract to completion of warranty period) *Warranty period is 2 years
	Advance Payment Bond	down payment ([total cost of construction and materials] × 15%)× 0.5% × construction period

Source: JICA Study Team

(2) Consultation cost

The consultation cost includes general consultations concerning railroad construction, and expected consultation services include the management of the overall project, investigations, designs, preparation of documents for ordering construction work, supervision of construction, and inspection upon completion. The types of consultants include international consultants, local experts, and local support personnel. Local experts are engineers with at least five years of experience and the same level of work experience as international consultants. Local support personnel are people who are not categorized as local experts. The costs of international consultants, local experts, and local support personnel employed for this project are calculated based on their allowances and other costs. Allowances include labor cost, lodging cost, and daily allowances, while costs other than allowances include the cost of air tickets, cost for local transportation, cost for renting offices, communication cost, cost for using vehicles, and cost of office supplies. Billing rates for consultants are 2,591,000 JPY, 49 million VND, and 15 million VND per month each for international consultants, local experts, and local support personnel, respectively.

(3) Cost for land acquisition and relocation

Costs for land acquisition and relocation are calculated. Cost of land acquisition is set at 2,850,000 VND per 1 square meter by referring to the information of market price near entry/ exit of train depot. Cost of land acquisition for depot is excluded on the assumption that Hanoi city is ready.

(4) Cost for preparation of inauguration

Railway operation outsourcing company, which performs operation and maintenance of Line.5, shall undertake the advance preparation such as the employment of local employees, the education and training, and the creating of various manuals, before inauguration of Line 5. As for such cost, the contract of the cost-on system which is estimated prepayment and settling up of actual cost is assumed (Refer to Chapter 5). As operation fund, 1 billion yen which is a part of cost of preparation of inauguration is appropriated. Here, operating fund is equivalent to fund of three months to be settled up. The breakdown of 1 billion yen is self-fund 300 million yen, and JICA PISF is 700 million yen.

(5) Reserve fund

The reserve fund is associated with two factors: a fund for price escalation and a fund for unexpected events or an increase in the amount of procedures and construction work. Price escalations, including the consultation cost, are 1.6% per year for foreign currencies and 7.3% per year for domestic currency based on the producer price index (2000) and the consumer price

index (2000) (provided by the General Statistics Office of Vietnam), which are associated with construction products in general. The reserve rate for physical contingency is 5% for the main project cost and consultation cost.

(6) Other

Other costs to be considered are the value-added tax (VAT), import tax, general management cost, interest during construction and commitment charge.

- VAT: 10%, it is imposed on the costs of main construction, consultation, and land acquisition and relocation.
- Import tax: 20%, it is applied to rolling stocks and AFC devices. However, it is exempted for equipment and facilities which are related to ODA (with the exception of rolling stocks and Automatic Fare Collection devices).
- Administration cost: 10%
- Interest during construction:
  0.2%, for the main construction cost related to Japanese yen loan
  0.01%, for consultation cost related to the Japanese yen loan
  2.5%, for rolling stocks and AFC devices
- Commitment charge: 0.1%, it is applied to objects of Japanese yen loan.

However, in the project implementation scheme of Chapter 5, and financial analysis of Chapter 6, the trial calculations of objects of Japanese yen loan, rolling stocks, and AFC devices are performed as targeted items of the loan by JICA.

4.2.4 Quantity of construction and breakdown of operation cost

(1) Quantity of procurement package

The procurement package is divided into five portions by considering about the experiences of managing the installation of new railroads in Japan in addition to referring to plans of constructing other lines in Hanoi and similar projects in Asia. Packages 1, 2, and 3 are associated with civil engineering and construction work and the construction of train depots. Package 4 is associated with the construction of electrical facilities. Package 5 is for procuring rolling stocks and AFC devices.

1) Plan 1 (for elevated tracks in urban areas)

Table 4.2.3 Package 1 Civil engineering work in urban areas

Category	Unit	Quantity	
		Phase 1	Phase 2
1. Construction of elevated bridges			
-Rigid frame, elevated bridges in stations	m	875	
-Elevated bridges in general sections	m	2,970	
-Special bridges	No.	3	
-Sections with embankment	m	200	
2. Construction of tracks			
-Construction of elastic directly fastened track	m (single line)	11,560	
-Turnout (number 12)	No.	2	
3. Construction work			
-Construction of station building	LS	1	
-Interior work of stations	LS	1	
-Lighting installation	LS	1	
4. Equipment fitting work			
-Elevator	No.	5	
-Escalator	No.	15	
-Air conditioning system and water supply/wastewater system	LS	1	
-Power distribution room	No.	5	
-Platform screen door (PSD)	Platform	10	
-Lighting equipment	LS	1	
-Firefighting equipment	LS	1	
5. Construction of entrance/exit	LS	1	
6. Reconstruction of roads	LS	1	

Source: JICA Study Team

Table 4.2.4 Package 2 Civil engineering work in the suburbs

Category	Unit	Quantity	
		Phase 1	Phase 2
1. Overbridges, bridges, and special bridges	No.	9	25
2. Special bridges	No.	3	4
3. Foundation improvement work in general sections	m^2	124,800	472,000
4. Construction of elevated bridges (at entry/exit of train depots)			
-Elevated bridges	m	1,900	0
-Sections with embankment	m	400	0
5. Construction of tracks			
-Construction of elastic directly fastened track	m (single line)	1,040	1,620
-Construction of ballast tracks	m	15,200	47,880
-Turnout (scissors number 12)	No.	4	4
-Turnout (single-swing number 12)	No.	12	0
6. Construction work			
-Construction of stations on bridges	LS	1	1
-Interior work of stations	LS	1	1
-Lighting installation	LS	1	1
7. Installation of electrical facilities			
-Elevator	No.	9	12
-Escalator	No.	10	14
-Air conditioning system and water supply/wastewater system	LS	1	1
-Power distribution room	No.	5	7
-Platform screen door (PSD)	Platform	10	14
-Fire-fighting equipment	LS	1	1
8. Construction of entrance/exit	LS	1	1
9. Reconstruction of roads	LS	1	1

Source: JICA Study Team

Table 4.2.5 Package 3 Construction of train depots

Category	Unit	Quantity	
		Phase 1	Phase 2
1. Construction of roads	LS	1	0
2. Preparation work	ha	17	0
3. Reinforcement of foundation	ha	17	0
4. Construction of tracks			
-Construction of ballast tracks	m (single line)	10,200	0
-Turnout (number 8)	No.	43	0
5. Construction of buildings			
-Building for inspecting trains	LS	1	0
-Offices	LS	1	0
-Warehouse for materials	LS	1	0
6. Construction of facilities			
-Power distribution room	No.	2	0
7. Exterior work	LS	1	0
8. Depot facilities	LS	1	1
9. Maintenance car	LS	1	1

Source: JICA Study Team

Table 4.2.6 Package 4 Electrical and mechanical work

Category	Unit	Quantity	
		Phase 1	Phase 2
1. Railroad substation			
-Railroad substation (receiving power, ancillary, DC)	No.	2	1
-Railroad substation (ancillary, DC)	No	0	2
-Railroad substation (DC)	No	1	1
-Switching station	No.	1	0
-Electric power dispatch	LS	1	0
2. Signaling equipment			
-Train operation control (ATS)/central	No.	1	0
-CBTC	LS	1	1
-Electronic interlocking device	Station	3	1
-Train operation control (ATS)/station	No.	3	1
-ATP (on the ground)	LS	1	1
-ATO (on the ground)	LS	1	1
-ATO (on a train)	LS	11	4
-Track circuit system (for backup)	LS	1	1
3. Communication system			
-Compound digital train radio (main unit)	No.	1	0
-Compound digital train radio (extension unit)	No.	6	5
-Station communication system (telephone, broadcasting in stations, theft alarm, guides for passengers, etc.)	No.	11	7
-Optical transmission device	Station	3	3
-Telephone switchboard	No.	3	3
-CCTV system	No.	11	7
-Information communication network system	LS	1	1
4. Electric power line			
-Special high voltage wire, high voltage wire	LS	1	1
-Feeder messenger railroad wire (including supporting structures)	LS	1	1
5. Communication wire			
-Copper cables for communications	LS	1	1
-LCX cable	LS	1	1
-SM optical cable	LS	1	1

Source: JICA Study Team

Table 4.2.7 Package 5 Rolling stocks and AFC devices

Category	Unit	Quantity	
		Phase 1	Phase 2
1. Rolling stocks			
-Rolling stock	No.	44	46
-Spare parts for maintenance	LS	1	1
-Train maintenance facilities	LS	1	1
2. AFC devices			
-Transport calculation system	No.	1	0
-Station server	No.	10	7
-Ticketing gate	No.	80	56
-Ticket vending machine, ticket office machine	LS	1	1
- Add value machine	LS	1	1

Source: JICA Study Team

2) Plan 2 (underground portions in urban areas)

Table 4.2.8 Package 1 Civil engineering work in urban areas

Category	Unit	Quantity	
		Phase 1	Phase 2
1. Underground work			
-Cut-and-cover work at stations	m	1,460	
-Shield tunneling	m	3,280	
-Cut-and-cover work in general portions	m	610	
-Ditches	m	510	
2. Construction of tracks			
-Construction of elastic directly fastened track	m	12,760	
-Turnout (number 12)	No.	2	
3. Construction work			
-Interior work of stations	LS	1	
-Lighting installation	LS	1	
4. Installation of electrical facilities			
-Elevator	No.	14	
-Escalator	No.	25	
-Air conditioning system and water supply/wastewater system	LS	1	
-Power distribution room	Station	5	
-Platform Screen Door	Platform	10	
-Fire-fighting system	LS	1	
5. Construction of entrance/exit	LS	1	
6. Reconstruction of roads	LS	1	

Source: JICA Study Team

*Contents of Packages 2 to 5 of the Plan 1 for the Plan 2 are similar with those of the Plan 1.

(2) Breakdown of costs based on domestic and foreign currencies

Using the prepared project plan, costs are calculated by construction categories based on the experience of constructing new lines in Japan while referring to the urban railways construction plan that is now in progress in Hanoi and similar project cases in Asia. Procurement of equipment and materials and the labor cost for construction are divided into a domestically supplied portion and imported portion based on the following conditions to take into account of price escalation.

1) Civil engineering work

Various infrastructures have been constructed in Vietnam, and there are many records of building road structures such as bridges. Since VNR has a record of constructing railroad structures, materials and construction machines can be obtained in Vietnam. If underground structures are to be constructed in urban areas, however, tunnel boring machines and tunnel engineers must be obtained from overseas in addition to some construction machines depending on the selection of retaining walls. Thus, the ratio of foreign currency is set at about 10% in the portion of general civil engineering and about 60% in the portion of shield engineering.

2) Construction of tracks

Rails and railway sleepers can be locally obtained in Vietnam, since railways are already operating in Vietnam. Because this project is proposing environmentally friendly railway tracks, such as reduced vibration through the use of heavy rails and elastic directly fastened tracks, however, these parts and turnouts are to be purchased overseas. The ratio of foreign currencies is set at 50% to 80% because some aspects, such as ballast and installation workers, are locally obtained.

3) Construction of train depot

Construction of train depot is expected to involve preparation work, track installation, and construction work. The details of construction are diverse in Vietnam as well, including common construction methods and track installation work. Therefore, the ratio of foreign currencies in the portion of general civil engineering and construction work is set at approximately 10%, while the ratio is set at 50% to 70% for the construction of tracks.

4) Electric facilities and related aspects

Referring to the ratio of domestic and foreign currencies in the unit construction price for the F/S investigation in Line 2, the ratio of foreign currencies is set at 90% for the construction of railroad substations and electric wire work because the materials for electric cables and installation workers can be locally obtained. Local procurement for other construction, mostly system devices, is difficult; thus, the ratio of foreign currencies is set at 95% to ensure the quality of the installation.

5) Cost for design and supervision, reserve fund

About two-thirds of these costs are calculated based on foreign currencies.

Table 4.2.9 Construction cost of phase 1 [elevated-ground plan]

FC & Total: million JPY
LC: million VND

Item		Total		
		FC	LC	Total
A. ELIGIBLE PORTION				
Ⅰ)	Procurement / Construction	76,600	43,540,364	248,855
	Civil	10,100	17,970,160	81,193
	Track	6,231	1,033,915	10,321
	Depot	8,536	5,966,732	32,142
	Electricity	37,845	609,008	40,254
	Maintenance car	2,487	0	2,487
	Base cost for JICA financing	65,198	25,579,814	166,397
	Price escalation	7,755	15,887,199	70,608
	Physical contingency	3,648	2,073,351	11,850
Ⅱ)	Consulting services	5,370	180,536	6,085
	Base cost	4,613	108,160	5,041
	Price escalation	501	63,779	754
	Physical contingency	256	8,597	290
Total (Ⅰ+Ⅱ)		81,971	43,720,900	254,940
Ⅲ)	PSIF portion	14,829	0	14,829
	Rolling stock	9,342	0	9,342
	AFC	2,998	0	2,998
	Price escalation	1,783	0	1,783
	Physical contingency	706	0	706
Total (Ⅰ+Ⅱ+Ⅲ)		96,800	43,720,900	269,769
B. NON ELIGIBLE PORTION				
a	Land Acquisition	0	67,575	267
	Base cost	0	51,600	204
	Price escalation	0	12,757	50
	Physical contingency	0	3,218	13
b	Administration cost	0	6,825,624	27,004
c	VAT	0	6,825,624	27,004
d	Import Tax	0	749,655	2,966
Total (a+b+c+d)		0	14,468,478	57,240
TOTAL (A+B)		96,800	58,189,378	327,009
C. Interest during Construction		2,080	0	2,080
	Interest during Construction(Const.)	1,519	0	1,519
	Interest during Construction (Consul.)	2	0	2
	Interest during Construction (PSIF)	559	0	559
D. Commitment Charge		2,308	0	2,308
GRAND TOTAL (A+B+C+D)		101,188	58,189,378	331,397
E. JICA ODA Finance portion incl. IDC (A-Ⅰ + A-Ⅱ + C+ D)		85,800	43,720,900	258,769
JICA PSIF portion incl. IDC (A-Ⅲ + C)		15,388	0	15,388

*Besides the above table, 1 billion yen of JICA PSIF portion are added up as a part of cost for preparation of inauguration.

*Automatic Fare Collection devices and rolling stocks will be procured by railway operation contractor (private SPC).

(Excluding) cost of excessive soil improvement, approach road to depot, cost of equipment reinforcement and repair works in EVN substations, and cost of constructing station plazas.

Source: JICA Study Team

Table 4.2.10 Construction cost of phase 1 [underground-ground plan]

FC & Total: million JPY

LC: million VND

Item		Total		
		FC	LC	Total
A. ELIGIBLE PORTION				
Ⅰ)	Procurement / Construction	110,382	61,863,610	355,128
	Civil downtown	29,399	17,265,176	97,704
	Civil suburb	4,391	7,774,712	35,149
	Track	6,262	1,028,387	10,330
	Depot	8,536	5,966,732	32,142
	Electricity	40,488	640,270	43,021
	Maintenance car	2,487	0	2,487
	Base cost for JICA financing	91,562	32,675,276	220,832
	Price escalation	13,564	26,242,448	117,385
	Physical contingency	5,256	2,945,886	16,911
Ⅱ)	Consulting services	7,388	268,940	8,452
	Base cost	6,215	146,176	6,793
	Price escalation	821	109,958	1,256
	Physical contingency	352	12,807	402
Total (Ⅰ+Ⅱ)		117,770	62,132,551	363,580
Ⅲ)	PSIF portion	15,066	0	15,066
	Rolling stock	9,342	0	9,342
	AFC	2,998	0	2,998
	Price escalation	2,009	0	2,009
	Physical contingency	717	0	717
Total (Ⅰ+Ⅱ+Ⅲ)		132,836	62,132,551	378,646
B. NON ELIGIBLE PORTION				
a	Land Acquisition	0	67,575	267
	Base cost	0	51,600	204
	Price escalation	0	12,757	50
	Physical contingency	0	3,218	13
b	Administration cost	0	9,577,685	37,891
c	VAT	0	9,577,685	37,891
d	Import Tax	0	761,650	3,013
Total (a+b+c+d)		0	19,984,595	79,063
TOTAL (A+B)		132,836	82,117,146	457,709
C. Interest during Construction		3,046	0	3,046
	Interest during Construction(Const.)	2,474	0	2,474
	Interest during Construction (Consul.)	3	0	3
	Interest during Construction (PSIF)	568	0	568
D. Commitment Charge		4,027	0	4,027
GRAND TOTAL (A+B+C+D)		139,909	82,117,146	464,782
E. JICA ODA Finance portion incl. IDC (A-Ⅰ + A-Ⅱ + C+ D)		124,275	62,132,551	370,085
JICA PSIF portion incl. IDC (A-Ⅲ + C)		15,634	0	15,634

*Besides the above table, 1 billion yen of JICA PSIF portion are added up as a part of cost for preparation of inauguration.

*Automatic Fare Collection devices and rolling stocks will be procured by railway operation contractor (private SPC).

(Excluding) cost of excessive soil improvement, approach road to depot, cost of equipment reinforcement and repair works in EVN substations, and cost of constructing station plazas.

Source: JICA Study Team

Table 4.2.11 Construction cost of phase 2

FC & Total: million JPY
LC: million VND

Item		Total		
		FC	LC	Total
A. ELIGIBLE PORTION				
Ⅰ)	Procurement / Construction	63,024	38,455,669	215,163
	Civil	4,548	9,122,198	40,638
	Track	8,408	1,753,751	15,346
	Electricity	32,576	560,898	34,795
	Maintenance car	552	0	552
	Base cost for JICA financing	46,083	11,436,847	91,330
	Price escalation	13,940	25,187,600	113,587
	Physical contingency	3,001	1,831,222	10,246
Ⅱ)	Consulting services	3,480	191,335	4,237
	Base cost	2,582	59,904	2,819
	Price escalation	733	122,320	1,217
	Physical contingency	166	9,111	202
Total (Ⅰ+Ⅱ)		66,505	38,647,005	219,400
Ⅲ)	PSIF portion	11,419	0	11,419
	Rolling stock	7,752	0	7,752
	AFC	617	0	617
	Price escalation	2,506	0	2,506
	Physical contingency	544	0	544
Total (Ⅰ+Ⅱ+Ⅲ)		77,924	38,647,005	230,819
B. NON ELIGIBLE PORTION				
a	Land Acquisition	0	0	0
	Base cost	0	0	0
	Price escalation	0	0	0
	Physical contingency	0	0	0
b	Administration cost	0	5,834,353	23,082
c	VAT	0	5,834,353	23,082
d	Import Tax	0	577,269	2,284
Total (a+b+c+d)		0	12,245,975	48,448
TOTAL (A+B)		77,924	50,892,980	279,267
C. Interest during Construction		1,050	0	1,050
	Interest during Construction(Const.)	618	0	618
	Interest during Construction (Consul.)	1	0	1
	Interest during Construction (PSIF)	431	0	431
D. Commitment Charge		1,100	0	1,100
GRAND TOTAL (A+B+C+D)		80,074	50,892,980	281,418
E. JICA ODA Finance portion incl. IDC (A-Ⅰ + A-Ⅱ + C+ D)		68,224	38,647,005	221,120
JICA PSIF portion incl. IDC (A-Ⅲ + C)		11,850	0	11,850

*Automatic Fare Collection devices and rolling stocks will be procured by railway operation contractor (private SPC).

(Excluding) cost of excessive soil improvement, approach road to depot, cost of equipment reinforcement and repair works in EVN substations, and cost of constructing station plazas.

Source: JICA Study Team

4.2.5 Rate of private burden

According to the scheme proposed in Chapter 5.1, the trial calculation was performed about the rate of the private sector portion. The result is shown below.

Table 4.2.12 Cost and rate of private burden (in case of elevated construction)

Unit: million USD

	Item	Phase1 (elevated)	Phase2	Total
Maintenance by government burden	Civil	1,111	679	1,790
	Electricity	489	422	911
	Depot, maintenance car	420	7	427
	subtotal	2,019 (3,140)	1,108 (2,683)	3,128 (5,824)
Maintenance by private burden	Rolling stock	113	94	207
	AFC	36	7	44
	subtotal	150 (187)	102 (143)	251 (330)
Total		2,169 (3,327)	1,210 (2,827)	3,379 (6,154)
Rate of private portion		**6.9% (5.6%)**	**8.4% (5.1%)**	**7.4% (5.4%)**

*Numbers in parenthesis include consultant cost, price escalation, physical contingency and interest during construction.

*VAT and ancillary work cost such as land acquisition are excluded.

Source: JICA Study Team

Table 4.2.13 Cost and rate of private burden (in case of underground construction)

Unit: million USD

	Item	Phase1 (underground)	Phase2	Total
Maintenance by government burden	Civil	1,738	679	2,417
	Electricity	522	422	944
	Depot, maintenance car	420	7	427
	Sunbtotal	2,680 (4,491)	1,108 (2,683)	3,788 (7,175)
Maintenance by private burden	Rolling stock	113	94	207
	AFC	36	7	44
	Subtotal	150 (190)	102 (143)	251 (333)
Total		2,830 (4,681)	1,210 (2,827)	4,039 (7,508)
Rate of private portion		**5.3% (4.1%)**	**8.4% (5.1%)**	**6.2% (4.4%)**

*Numbers in parenthesis include consultant cost, price escalation, physical contingency and interest during construction.

*VAT and ancillary work cost such as land acquisition are excluded.

Source: JICA Study Team

4.3 Alleviating the government debt burden

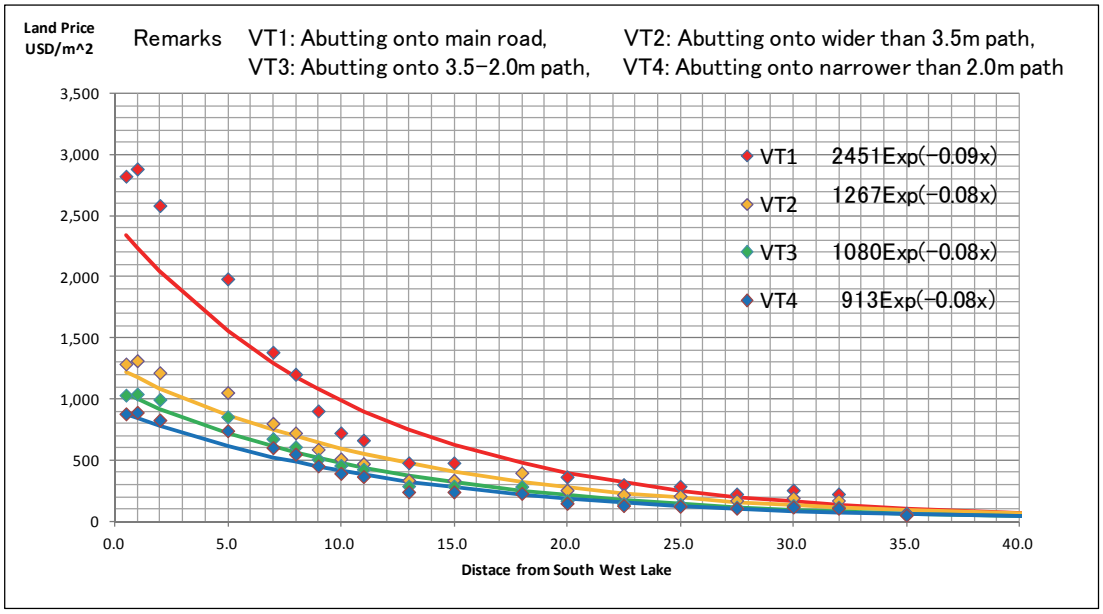
While there is concern that adoption of a scheme that requires the project to be entirely government funded could increase Vietnam's government debt, adoption by the Vietnamese government of certain strategies that have been tried and tested in Japan and other countries will allow the burden of government debt to be alleviated. These strategies are described below.

4.3.1 Rise in land prices along Hanoi Line 5 and diversion of betterment gains into project

(1) Trends in land prices along Hanoi Line 5

1) Land prices at present

Figure 4.3.1 below shows land prices along Hanoi Line 5 in 2010. The horizontal axis represents distance westward along the line from the center of Hanoi, and the vertical axis shows the price of land. VT1-VT4 indicate the width of road on which land abuts. Land prices decrease exponentially according to distance from the city center. If the functional equation is known, then the price of land in suburban areas can be calculated from the price of land in central urban areas and the distance from the city center. The functional equation obtained by the least-squares method from actual data is represented in the graph by VT1-VT4.



Source: Regulated Price List 2011- issued by HPC under Decision 89/2001 QD-UBND on December 28, 2010.

Figure 4.3.1 Land price trends along Hanoi Line 5 in 2010

2) Line-side land prices

Study team considers the price of a 38 km^2 strip of land measuring 1 km in width and 38 km in length from the city center. It is assumed to be VT4 land abutting on a narrower than 2.0 m path. The land price may be obtained by integrating the price for VT4 from 0 to 38 km, yielding a result of USD 10 billion. Dividing this figure by the area (38 km^2) gives an average land price of USD 270/m^2. Reading this against the graph shows this to be the average land price at a point around 14 km from the city center. The area benefiting from railway construction is assumed to extend a total of 2 km (1 km each side of the railway), which covers an area of 82 km^2. The total value of this land is USD 20 billion. Imposing a land price tax of 0.5% on this land would generate USD 100 million of tax revenue for the government, which is around three times the annual operating cost of Line 5.

3) Rise in land prices due to railway

Using the functional equation, it is possible to calculate the total value of land in the event that travel time to the city center is reduced. If travel time is halved, the rate of reduction in the functional equation is one half, and the total value of land obtained by integrating this is doubled.

(This does not mean that the price of land doubles at each point. If travel time is halved, the land price at the 40 km point becomes that at the 20 km point, the price at the 20 km point becomes that at the 10 km point, and the price at the 10 km point becomes that at the 5 km point. The total value of land along the entire length of the line obtained by integrating the resulting new land price curve is thus doubled.) If the line opens, travel times along the line to the city center will definitely be at least halved from what they are present. Assuming travel times are halved, the total increase in land prices over an area extending 2 km in width and 38 km in length is estimated to be USD 20 billion. This amount is approximately three times the total cost of construction estimated in this chapter. A mechanism for channeling an amount equivalent to this increase in the price of land into covering the cost of railway construction is therefore required. Below study team describes examples of how increases in land prices resulting from railway construction and the associated betterment gains have been used to fund construction.

(2) Means of diverting betterment gains into railway projects and past cases

1) Appropriation based on taxation measures such as increased revenue portion of fixed assets tax

The price of land of which the utilization value is enhanced due to the development of railways will rise. This process is shown in Figure 4.3.1, but the total amount of the estimated increase within a certain range that will benefit from development will be able to cover all the project costs sufficiently, and if a mechanism that can allocate this to railway development is reflected in the tax system, it will be possible to recoup government funds at an early stage. Profits from a rise in land prices in a usual situation are enjoyed only by land owners, and do not materialize immediately. As the convenience of land is enhanced by the development of railways, etc., the form of land use changes; for example, agricultural land changes to residential land, this is passed on to a rise in land prices, and until profits are realized, investment and time is required for the development of the environment, including infrastructure. Using this project as an opportunity, the development of land beside the railway should be promoted, and in tandem with this, the government should assess and evaluate land price trends in a study of criteria for the assignment of development rights and transaction cases, and also impose an appropriate fixed asset tax. This will enable the profits generated by rising land prices to be returned to public works project expenses. Furthermore, based on the assumption of an increase in future fixed asset tax revenues, it will also be possible to issue credits for railway development. This is called tax increment finance (TIF), and it is a method of raising funds to appropriate as transfer infrastructure development funds through bond issuance by government institutions that is secured by the increase in fixed asset tax revenues in peripheral areas resulting from infrastructure development. This is a system in which the total appraisal amount of fixed assets taxes within a specific area designated by a local government is decided, bonds are issued where the amount of difference from the appraisal amount resulting from subsequent development is designated as funds with secured redemption, and infrastructure is developed with these funds. Overseas, this system has been used in the United States in San Francisco and Los Angeles (the Red Line Phase 1). In addition, in regard to LRT development in recent years in the United States, there have been cases where local governments have raised the consumption tax rate based on ordinances and appropriated the funds for development expenditure.

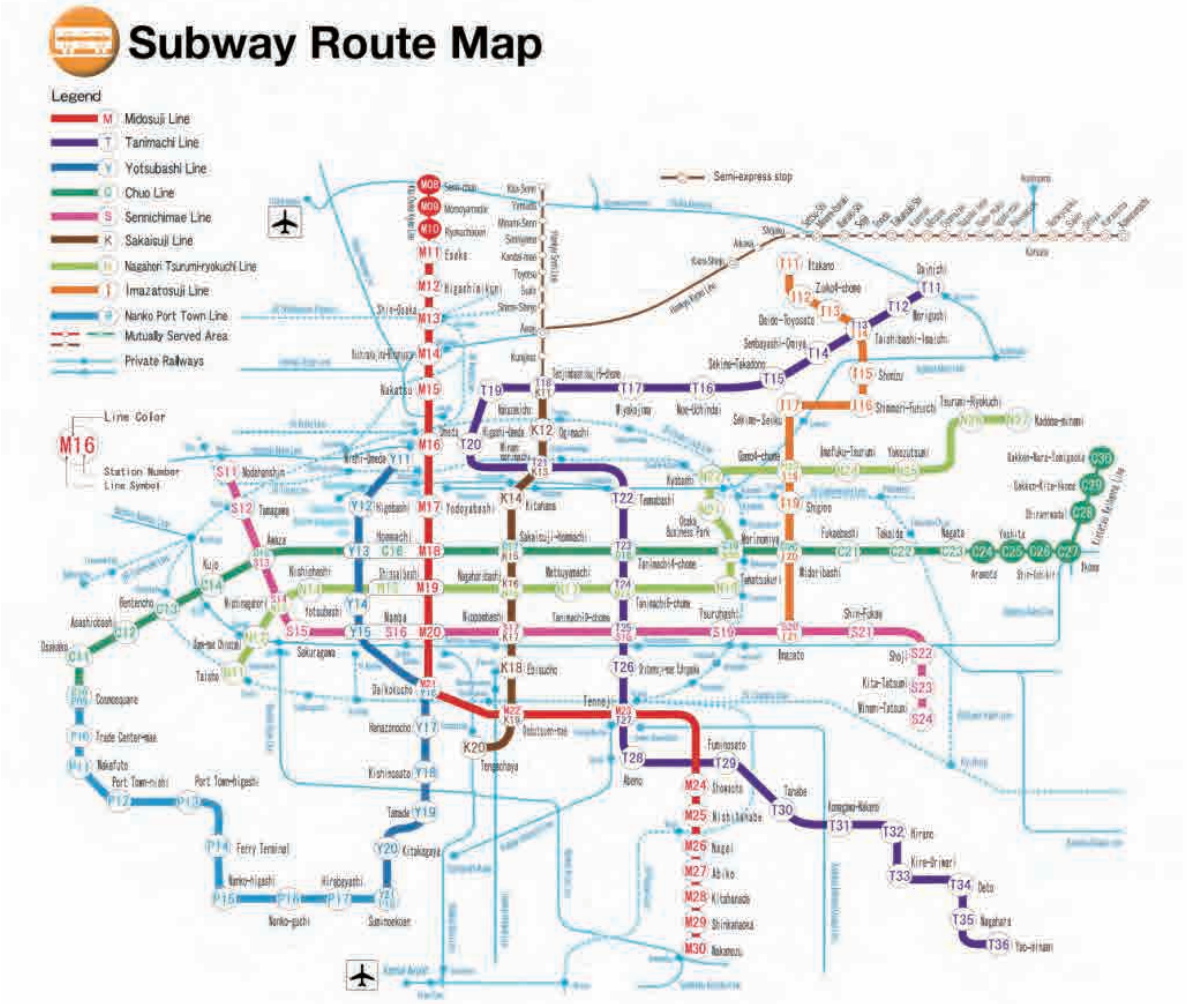
2) Use of beneficiary-pays scheme under urban planning law

This approach requires owners of land alongside the line to bear part of the cost of construction under a beneficiary-pays scheme provided for under urban planning law. One example of such a scheme is that employed in Osaka, described below, where one quarter of the cost of the project concerned was financed by raising funds, weighted according to grade of station, from landowners and leaseholders located near stations.

<Example of Midosuji subway line on the Osaka Municipal Subway>

In Japan before the Second World War, in addition to the capital, Tokyo, a subway was also built and operated in Osaka, which is Japan’s second largest city after Tokyo. While Tokyo’s subway was funded, built and run by private-sector companies, in the case of Osaka, the City of Osaka, which is the body that implements city planning, built the subway as a city planning project and also operated it. Line 1 of the Osaka Municipal Subway (now the Midosuji Line) was

opened from Umeda Station (provisional name) to Shinsaibashi Station in 1933 as Japan's first publicly operated subway line. This line links Osaka City's major shopping districts of Umeda, Namba and Tennoji, and since it opened it has been used by many passengers as a main traffic route in Osaka. Even now, this line is the only one with over 1 million passengers among the nine lines that the Osaka Municipal Transportation Bureau operates.



Source: Osaka Municipal Transportation Bureau website

Figure 4.3.2 Map of Osaka Municipal Subway

When building this line, the City of Osaka asked owners of land along the railway line to pay part of the construction costs, based on the user-pays principle in the City Planning Law. The details regarding the beneficiary charge under the City Planning Law of the time are shown below, and even in the current City Planning Law the same provisions are followed.

- ○ When the competent minister acknowledges it is necessary, it is permitted to make people who will significantly benefit from a city planning project bear all or part of the costs required for the city planning project.
- ○ The upper limit of the cost burden shall be the profit received from a city planning project.
- ○ The details of the cost burden are stipulated in an Imperial Ordinance.

As regards the reasons for using this system, the opinion of the City of Osaka is shown below.

> If a high-speed railway is opened, citizens will receive the benefit of this comfortable mass transit system, business activities will become invigorated, and they will enjoy direct and indirect benefits. Land near stops will become substantially developed, business districts and commercial districts will be formed, and land owners will receive large profits from a rise in land prices.
> Therefore, as in the case of city planning projects such as roads and water and sewer services, in regard to urban railway construction as well, it has been decided that land owners who will receive more profits than other citizens will have to pay part of the construction costs as a beneficiary charge.
> (Source: 50-Year History of Construction of Osaka Municipal Subway)

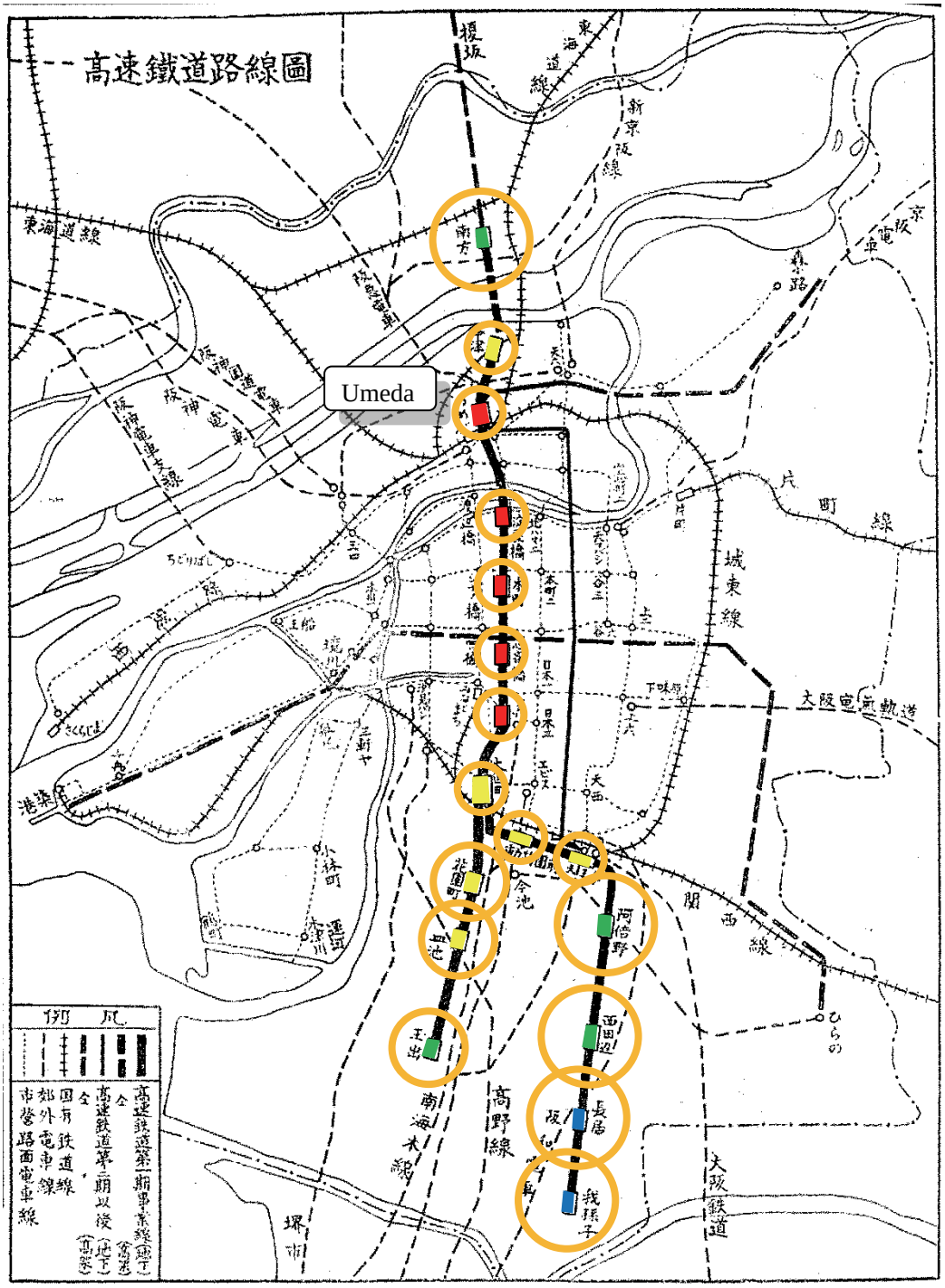
The details of beneficiary charges are prescribed below in the Ordinance of the Ministry of Home Affairs titled “Matters Concerning Beneficiary Burdens for Osaka City Planning Projects Involving High-Speed Rail Development”.

Table 4.3.1 Beneficiary charges for Osaka Municipal Subway No. 1 Line (Midosuji Line)

Total burden	A quarter of project costs
Bearer	Owners, pledgees and farming right holders, etc. of land subject to land tax within the following range from each entrance and exit of stations City-center stations Within 200 ken (about 360 m) Suburban stationsWithin 300 ken (about 550 m) or Within 400 ken (about 730 m)
Burden method	Weightings are applied below according to the station grade and divided by the total burden Grade A station vicinity 10 Grade B station vicinity 6 Grade C station vicinity 5 Grade D station vicinity 3

Source: The Ordinance of the Ministry of Home Affairs titled “Matters Concerning Beneficiary Burdens for Osaka City Planning Projects Involving High-Speed Rail Development”

A rough range of requested burden charges and station grades are shown in the figure below. The orange circles show the rough range of beneficiary charges requested, while Grade A stations are shown in red, Grade B stations in yellow, Grade C stations in green, and Grade D stations in blue.



Source: “Progress of 70 Years of Construction of Osaka Municipal Subway”

Figure 4.3.3 Rough range of requested beneficiary charges and station grades

3) New station development using the benefit principle system based on applications by developers, etc.

The convenience of railway infrastructure varies considerably according to the existence or absence of stations and location factors for people living along the railway line and developers. Therefore, developers and other parties that want to establish stations bear the burden of station construction financing, and adopting these development plans and linked station plans is beneficial for both railway operators and developers.

In the future, if the necessity to establish new stations arises, when developers that already own land along the railway lines and local residents want to establish a station, the condition imposed on developers and local residents is that they will have to bear the majority or all of the development costs for the station, the square in front of the station and access roads. This will result in the realization of urban development that improves access and convenience for developers and local residents.

Owing to the introduction of this measure, developers will be able to increase development profits based on urban development that is integrated with railway infrastructure, and the government will enjoy the advantage of being able to reduce its burden of the infrastructure portion such as station construction. This kind of measure is called the benefit principle system.

① Station development based on this system

In the suburban district of Line 5, there are projects for which applications were approved and considered during the former Ha Tay province period, but in the case of the post-merger Hanoi City government, there are also projects that have been left unapproved. In the future, the projects themselves may also be suspended, and it is uncertain whether there is demand for railway use.

In regard to the establishment of stations on this line, 17 stations are planned along the entire line, but not all of them will be established with government funds and in the case of Phase 2, in particular, study team proposes development based on the introduction of this benefit principle system. Alternatively, it would be possible to develop the area where there is railway demand because it is urbanized even at present, such as in Quoc Oai, and only the center of the area where large-scale development such as the high-tech park at Hoa Lac is progressing with government funds; for other stations, adopting the kind of method that attracts requests for stations to be established is also conceivable.

Along Line 5, with regard to stations where development based on the benefit principle is conceivable, there is Station 8 in the case of Phase 1 and there are all stations for Phase 2. As the areas around these stations are areas where development is planned, it likely that there will be attempts at cooperation with developers. Moreover, this method does not apply only to development projects that are currently planned but also to development projects that will be newly planned going forward. If parties planning development that emerge going forward are prepared to bear the burden of funding for railway infrastructure and related facilities (squares in front of stations and peripheral roads, etc.), the government could grant development rights, and by reflecting this in urban plans, urban development that integrates the administration and developers will be enabled.

② Development costs for new stations

If study team adds up the establishment of two separate platforms facing each other with two sets of tracks running between in the form of stations that are installed in the 20m width of the Thang Long Highway median, the construction of station buildings on bridges and Thang Long Highway overbridges, and electrical equipment costs, this comes to about USD30-35 million. Moreover, if a square in front of the station is developed, USD5-7 million (excluding the cost of land acquisition) will be required.

Table 4.3.2 Candidate stations for station development based on the benefit principle

No	Station Name (provisional)	Km approx.	Form of structure	Explanation
<Phase 1>				
St.8	Tay Mo	10K 500M	Elevated	This is the station that should be established when Line 6 is developed in the future.
<Phase 2>				
St.11	Song Phuong	14K 600M	On ground	Development project in progress.
St.12	Quoc Oai	20K 500M	On ground	Built-up area
St.13	West Quoc Oai	23K 700M	On ground	Built-up area
St.14	Hoa Lac	31K 800M	On ground	Development of high-tech park is progressing.
St.15	Tien Xuan	34K 700M	On ground	Hanoi National University is planned.
St.16	Trai Moi	36K 700M	On ground	Development as resort area is in progress.
St.17	Ba Vi	38K 300M	On ground	Development of Vietnam National Village for ethnic minorities is progressing.

Source: JICA Study Team

③ Applicable entity for financial burden

The benefit principle system is a development method of which there are many examples in Japan as well, and the kind of entities in Table 4.3.3 that would likely enjoy the benefit of profits from the development of new stations could bear the cost.

Table 4.3.3 Applicable entities assumed to bear new station development costs

Applicable Entity	Explanation
Developer	Suburban land beside railway Line 5 has already been sold to a private-sector developer, but many development projects have not been approved. It is likely that profits from a rise in land prices caused by the establishment of new stations will be enjoyed to the maximum. Development is already progressing, but incentives according to the contribution of funds aimed at promoting projects where construction is delayed and projects in which sales are in a slump will work.
Large-scale facilities	There are a certain number of citizens that cannot ride motorbikes or drive cars, and large-scale facilities such as a corporate park, university, hospital or tourist facility that are intended to capture usage demand from these groups would enhance the convenience of users. It is likely that the cost of a plan intended to differentiate facilities would be borne. A railway entity as well would likely benefit from the number of people using the railway on a daily basis, and as this would become a stable source of fare income, facilities located in (transferred to) suburban areas in particular should be considered even if the burden amount is small. Wide-ranging linkage, including feeder transportation from in front of the stations, can be expected.

Source: JICA Study Team

4) Adoption of developer burden charge based on negotiation between parties

This is a system where the land owners in surrounding areas bear part of the construction costs as a developer burden charge, in advance of the development of a railway. In the case of Yokohama City described later, one quarter of the initial project costs was apportioned according to the respective amount of benefit for the land.

<Example of Minato Mirai Line>

The City of Yokohama is located 30-40 km south of the city center of Tokyo. At present, it is the city with the highest population among the cities, towns and villages of Japan, and it is an international port city that has the Port of Yokohama, which is a representative port of Japan.

The Minato Mirai district, which borders the Port of Yokohama, was previously a district with shipyards, freight stations, and wharves, but it underwent urban redevelopment from the 1980s, and it has now become a neo-futuristic town that has offices, commercial facilities, housing, and tourist spots.

The Yokohama Minato Mirai Railway 21 line (usually called the Minato Mirai line) is a line that was constructed fully underground to link the built-up area that includes Yokohama Station, the central station in Yokohama City, and the Yokohama municipal offices with the Minato Mirai district, and it opened in 2004.

Among the six stations on the Minato Mirai line, the stations located in the Minato Mirai district are Shintakashima Station and Minato Mirai Station.

Source: Yokohama Minato Mirai Railway Company website

Figure 4.3.4 Map of Minato Mirai line

When this line was constructed, owners of land in the vicinity of Minato Mirai Station were asked to pay a developer burden charge, based on the rationale that part of the development profits from a rise in land prices caused by the development of the railway would be allocated to the railway construction costs, and these charges were allocated to construction project expenses.

Table 4.3.4 Developer burden charge for Minato Mirai line

Total burden	A quarter of initial project costs (about 50 billion yen)
Bearer	Owners of land in the vicinity of Minato Mirai Station (including Mitsubishi Estate, Urban Renaissance Agency, City of Yokohama, and Mitsubishi Heavy Industries)
Burden method	The burden amount was established based on the amount required to maintain profitability in terms of railway management in proportion to the amount of benefit derived by the respective land.

Source: (Compiled from “Railway Development and Development of Cities beside Railway Lines” (Shunji Takatsu, 2008))

When levying developer burden charges, as no clear legislation has been established regarding returning development profits to railway businesses, negotiations were conducted with applicable local land owners and leaseholders, with the aim of charging 50 billion yen.

According to “Railway Development and Development of Cities beside Railway Lines” (Shunji Takatsu, 2008), when interviews were conducted with the developers of Minato Mirai Station, the response obtained was that “as there is a benefit, a certain degree of burden cannot be helped”.

On the other hand, there was no initial plan for Shintakashima Station, but it was decided to establish the burden based on the “Petition for a Station System”, where developers bear the entire station establishment cost (about 20 billion yen), and the construction work plan was altered. Consequently, the ultimate funding framework was as shown in the table below.

Table 4.3.5 Funding framework for Minato Mirai line

Capital	27 billion yen	• City of Yokohama, Kanagawa Prefecture, railway company, real estate companies, and banks made contributions
Developer burden charge	74 billion yen	• Minato Mirai Station vicinity developer burden charge • Burden charge associated with construction of Shintakashima Station
Railway and transportation system funds	About 129 billion yen	• Payment of compensation for transferred facilities • Central government and Kanagawa Prefecture subsidize interest payments
Borrowings, etc.	About 27 billion yen	• City of Yokohama provides compensation for losses
Total	About 257 billion yen	

Source: City of Yokohama data

5) Internalization by railway operator of land price gains from line-side development to alleviate cost of investment in railway development (for reference)

For reference purposes, study team describes below a method by which a railway operator recoups and repays part of the cost of railway development that cannot be covered solely from railway business revenues by using the profits generated by engaging in other business (such as development of line-side real estate) at the same time as developing a railway.

As urban areas spread and the population grew from the beginning of the 20th century, Japan’s private railway operators themselves increasingly turned to developing real estate alongside lines in the suburbs. Actively engaging in developing quality housing alongside their own lines served to increase the line-side residential populations that provided the regular passengers who used their lines, while at the same time the development of shops and everyday conveniences near major stations acting as nodes for feeder transport provided by affiliated bus and taxi services absorbed consumer demand. The result of this was to increase the value of line-side real estate, the gains from which were enjoyed by the railway operators themselves. These gains were used, along with the increase in fare revenues also generated, to help recoup prior investment in railway development. There also emerged cases of real estate companies with major development plans engaging in railway development through affiliates in order to enhance transportation access in areas undergoing development. (Examples of such projects include Kita-Osaka Tochi’s Kita-Osaka Electric Railway, Garden City’s Meguro-Kamata Electric Railway, and Hakone Tochi’s Tamako Railway.)

After World War II, conurbation growth accelerated further, driven in part by the severe housing shortage, as the Japanese economy moved beyond recovery and into a period of high growth. Private railway operators that had to invest in expanding transportation capacity to alleviate the consequent serious congestion often found that the authorities were slow to approve their proposed fare revisions, as the authorities saw this as one way to help curb prices at a time when the economy was experiencing inflationary pressure. To counter this, operators tended to depend on profits generated by their real estate operations, which accounted for an increasing proportion of their overall businesses, and development projects increased in size. The massively increasing scale of investment required to develop railways to keep pace with large-scale

development made it increasingly unfeasible for railway-affiliated capital to continue to exclusively buy up line-side land outright ahead of railway development, as a consequence of which alternative approaches were adopted. These included the formation of associations with line-side landowners and leaseholders to engage in land readjustment projects under urban city plans (e.g., the Tokyu Den-en-toshi Line) and the securing of land and development of infrastructure for the construction of new lines undertaken in concert with public sector "new town" development projects (e.g., Kita-Osaka Kyuko Railway, Osaka Prefectural Urban Development's Semboku Rapid Railway, and Chiba Newtown Railway). A system of public subsidies was also put in place.

However, the Japanese economy then entered a period of stable growth followed by deflation after the collapse of the bubble economy. Demographic growth also stagnated as the birth rate fell and the population aged. Under these conditions, it became apparent that the stock of real estate hitherto developed through prior investment was turning toxic due to the length of time required from development to payback and the application of market value accounting, making this business model no longer viable in today's Japan.

In the case of the present project, the evidence to date indicates that the railway operator not have the scope to newly acquire large-scale development rights for development of real estate along the line. However, some projects that had been approved or were being considered when the province of Ha Tay was still in existence have been unapproved by the Hanoi City government following Ha Tay's merger with Hanoi. There is also a possibility that future projects may be suspended even after being approved. Absorption of betterment gains in the form of acquisition of development rights by the development division of Hanoi City (i.e., the railway operator) itself when re-granting development rights is thus one strategy that could be considered.

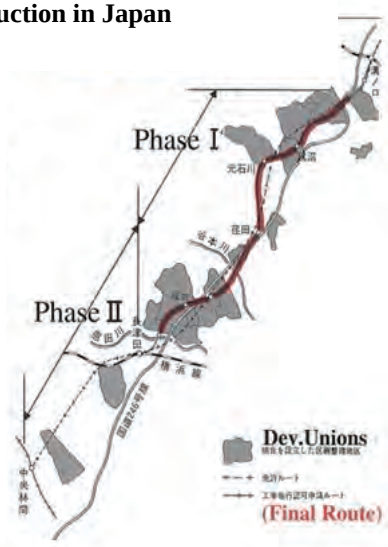
The community development example which was combined with the railroad new line construction in Japan

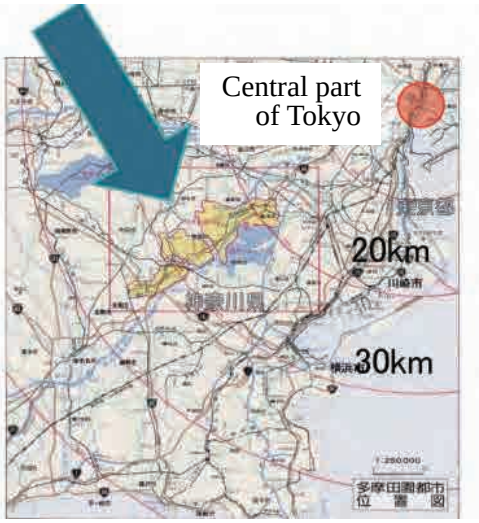
The "Tama Denen Toshi" development by Tokyu Corp.

Based on the land purchased like precedence of a private sector development company (Tokyu), it was carried out the urban development of the railroad wayside with the union system with which a landowner participates.

Gross development area is 5000ha and 540,000 overall populations on 2003 (moving-in start in 1961).

The number of railroad users is about 450,000 people (the south of Kajigaya, in the 2010 fiscal year/the one-day average).





Source: "Thirty-Five Year History of the Development of Tama Garden City," TOKYU CORPORATION, 1988

Figure 4.3.5 Example of regional development integrated with new railway line development in Japan

4.3.2 Sharing of Line 2 rolling stock inspection and repair facilities and inspection personnel

(1) Summary

Facilities operated by the same business are normally consolidated to enhance project effects. Shared use of Line 2 sheds by Line 5 rolling stock was considered as a means of improving work efficiency and limiting construction costs. Line 5 is scheduled to have 90 cars when Phase 2 opens, and only around 24 cars will be overhauled per year on average under current rolling stock inspection and repair plans. However, the maintenance center currently planned for development

will be capable of overhauling at least 200 cars per year, which is the same capacity as that of inspection and repair facilities on other lines. Investing in facilities that other lines have thus appears to represent an excessive level of capital investment.

Specifically, while St 1 on Line 5 and St 5 on Line 2 are planned as connecting stations, it is proposed that a new non-service connecting line be built as shown in Figure 4.3.6. This would allow Line 5 rolling stock to be moved at night to the Line 2 shed, where overhaul work could be performed under contract for an outsourcing fee to cover costs, thereby allowing capital investment and asset holdings to be minimized and keeping down the number of employees required.

Study team understands that the number of cars on Line 2 will at most be 192. The total number of cars including Line 5 will therefore be 282. If repairs and inspections are performed to the same extent as on Line 5, the number of cars undergoing overhaul will average around 72 per year, which will present no problems at all from the point of view of facility capacity.

Additionally, as even rolling stock used on lines with different voltages and other standards can be towed to inspection and repair facilities by locomotives for inspection and repair provided that the lines are connected, sharing of rolling stock inspection and repair facilities with lines such as Lines 6 and 8 in the future would also not be impossible. Conversely, then, another option could be to overhaul other lines' rolling stock at the Line 5 maintenance center for an outsourcing fee that would then be used to keep down Line 5's running costs. Even if overhauling work is outsourced, 10-day and 3-month inspections conducted routinely to maintain service safety and car washing would still be performed at the Line 5 depot.

(2) Study findings

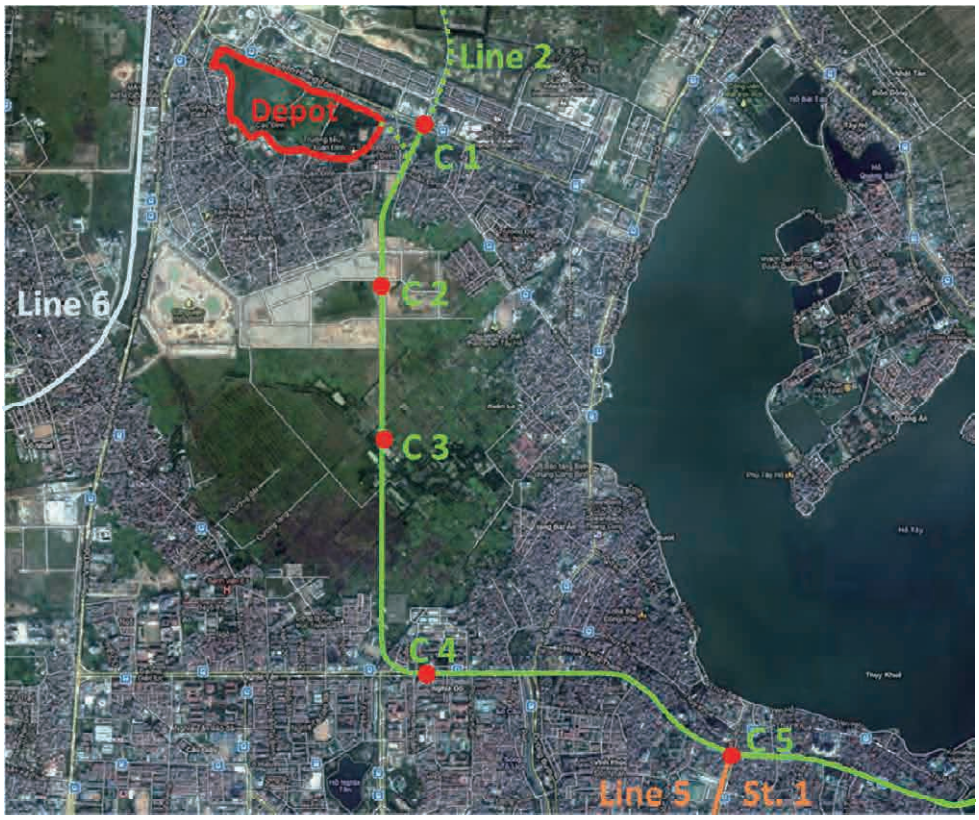
1) Potential for reduction of car shed facilities and inspection personnel

Outsourcing of overhaul work will render unnecessary overhaul track, wheel lathe track, various equipment and facilities used for overhauls, overhaul yards, and other such equipment, reducing equipment installation costs by approximately USD 24 million. Additionally, the number of personnel required to perform overhaul work will be reducible by 5 when Phase 1 is opened and by 10 when Phase 2 is opened.

Note: A separate fee will need to be paid by the Line 5 rail operation contractor to the Line 2 rail operator for outsourced work.

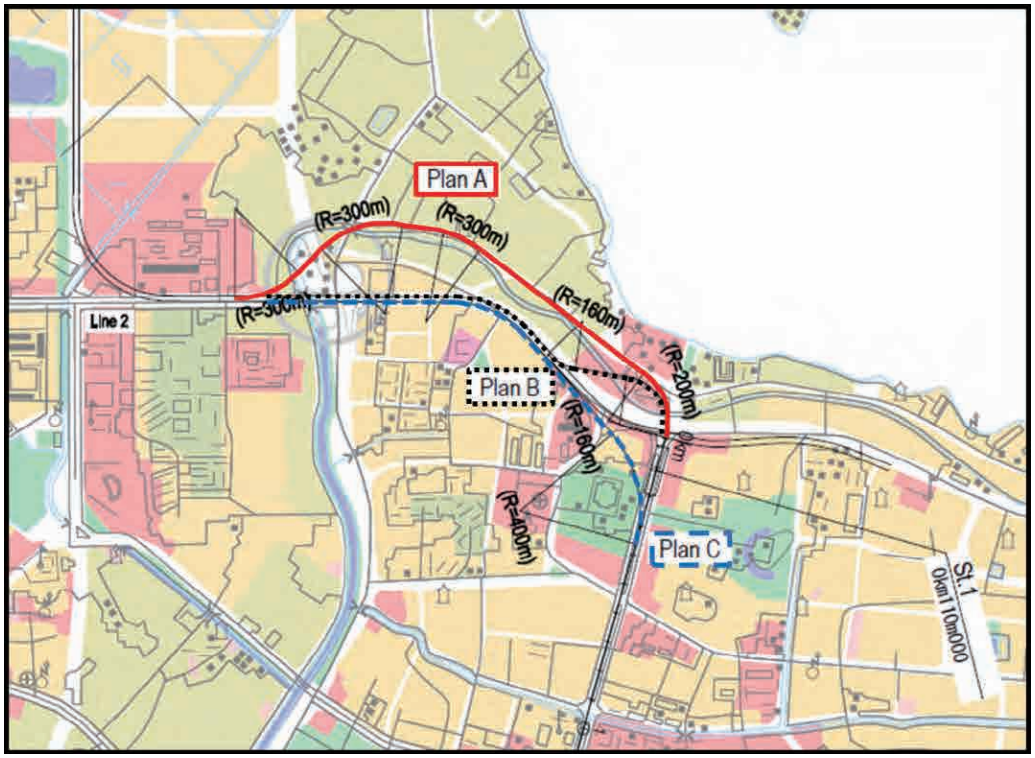
2) Cost of construction of connecting line

The existence of issues such as the problem of compulsory land purchases mean that further study will be required. As Table 4.3.6 shows, however, a connecting line can be built for approximately USD 40 million under Plan B. In such case, securing storage track and car inspection and washing space on the terminal side of St 10 on Line 5 as shown in Figure 4.3.8 would allow reductions in expenditure on construction of shed entry/exit track (2.3 km) and excessive shed construction (by USD 460 million).



Source: JICA Study Team

Figure 4.3.6 Overview of Line 5 and Line 2 routes



Source: JICA Study Team

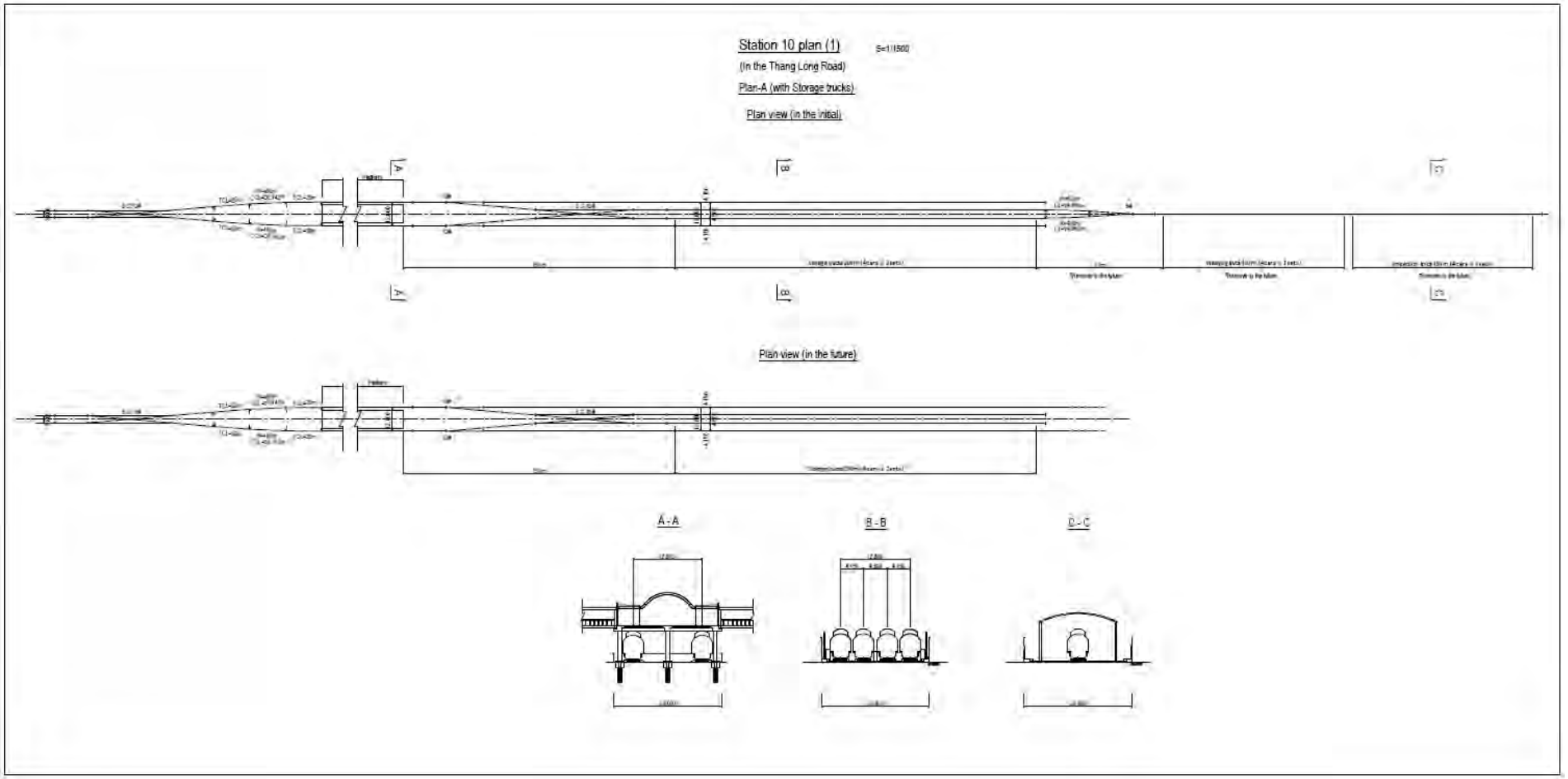
Figure 4.3.7 Suggested methods of connecting Line 5 and Line 2

Table 4.3.6 Suggested methods of connecting Lines 5 and 2

Proposal	Summary	Construction method	Length (m)	Approx. construction cost (USD m)
Plan A	Connection running north from St 1, under Line 2, and along a line beneath a road	Shield	1,830	130
Plan B	Connection running north from St 1, under Line 2, and then connecting immediately with Line 2	Shield	550	40
Plan C	Connection with Line 2 branching from the terminal side of St 1	Excavation	700	90

(Excluding price escalation)

Source: JICA Study Team



Source: JICA Study Team

Figure 4.3.8 Plan of Line 5 storage track for when shared use of Line 2 depot is available

4.4 Construction schedule (see attachment 1)

4.4.1 Basic concept

In Vietnam, there is not the PPP project which reached to the bidding as of the end time of May, 2012. As for the railroad, it is not adopted even as a pilot project candidate. In the first half of the 2012 fiscal year, MOT has entrusted F/S survey of Line.5 to the local consultant. It is assumed that industrialization is examined based on these survey results.

In the Decision No.78/2010/ND-CP, in Vietnam, in the case of ODA, the candidate for a loan of construction fund is specified as each ministry people's committee. Therefore, construction of Line.5 is assumed to maintain the railroad facilities by scheme of separating infrastructure and operation as PPP scheme which is used with ODA together. However, the enforcement authority of infrastructure railroad construction may be transferred to HPC from MOT. Moreover, ODA may be subleased to HPC from Ministry of Finance of Vietnam. The possibility that the MOT will construct by oneself cannot be denied, either.

Procurement of the project fund concerning the railroad facility, such as rolling stock and AFC device, which shall be supplied by private sector, is outsourced to railway operation contractor (private SPC).

4.4.2 Process to implementation of project

This survey is the proposal which utilized the PPP scheme. If the proposal is not selected by the Vietnamese government as a pilot issue, the proposed contents such as ratio of public funds do not suit the PPP pilot law (Decision 71/2010). It is assumed to be approved by national assembly after MOT explains to national assembly. According to ‘Resolution on Projects and Works of National Importance to be Submitted to the National Assembly for Decision on Their investment (No.66/2006/QH11) ’, which is resolution about national assembly to national project investment, if total project cost exceed 20 thousand billion VND (79,100 million YEN), the procedure of national assembly is required under any cases (Refer to table.4.3.1).

Process of approval and permission before inauguration is shown in table.4.4.2. As the preparation in Vietnam to be completed before the LA contract, the project needs to be approved in the local F/S inspection, followed by adoption as a PPP project as a combined yen-loan project of the Ministry of Planning and Investment (MPI) and approved for EIA.

Table 4.4.1 Domestic investment project which needs approval of national assembly

Article 2. Projects or works which satisfy one of the following five criteria shall be considered projects or works of national importance:

1. Having an investment capital of VND 20 thousand billion or more each, for projects or works with state capital representing thirty per cent or more of their capital.
2. Projects or works which greatly affect the environment or have latent potential to seriously affect the environment, including:

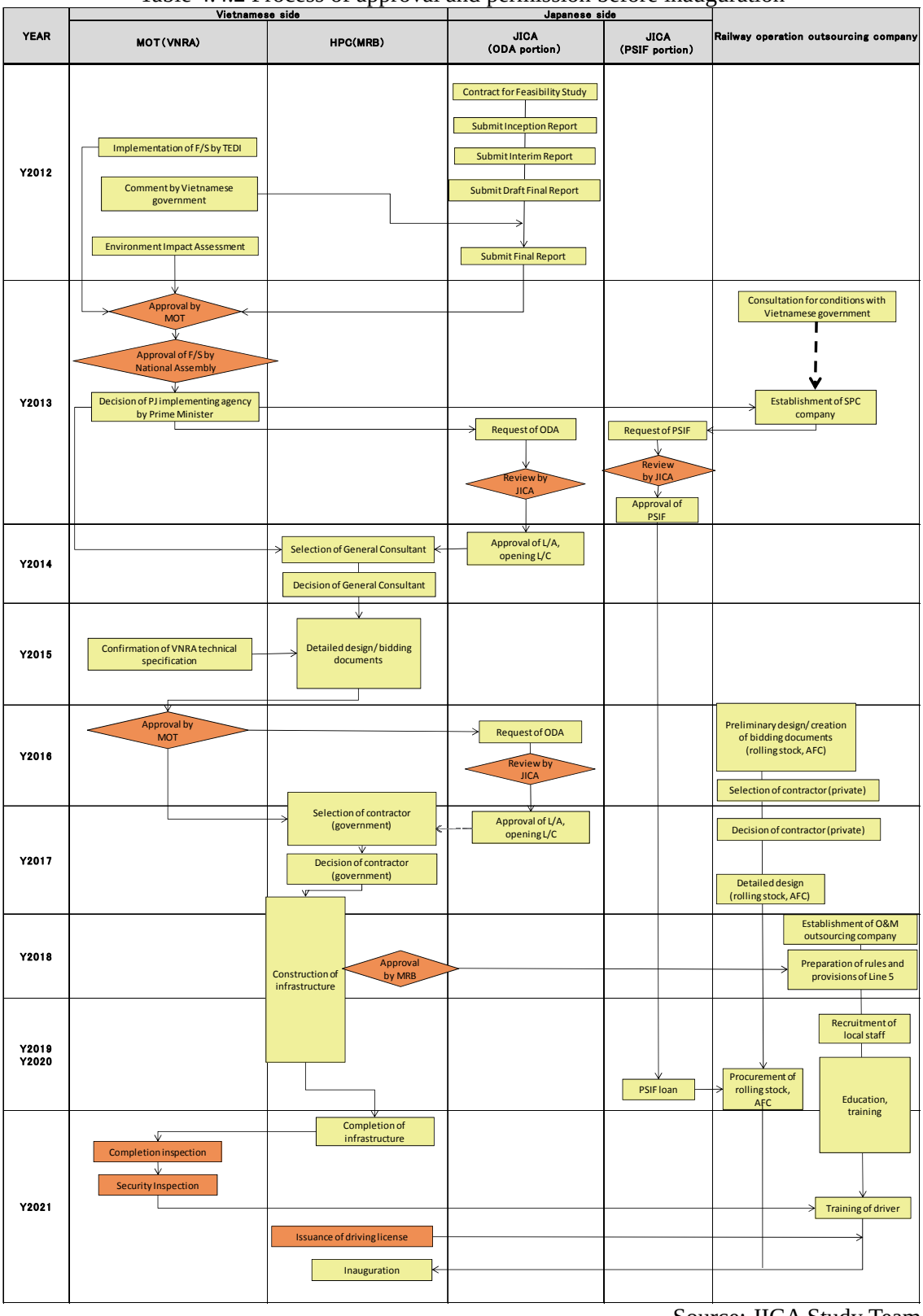
a/ Nuclear power plants;

b/ Land-using investment projects requiring change of the use purpose of headwater protective forest land of two hundred hectares or more; of wave-breaking or sea-encroaching protective forest land of five hundred hectares or more; of special-use forest land of two hundred hectares or more, except forest land areas belonging to national parks or nature conservation zones; or of production forest land of one thousand hectares or more.

3. Projects or works requiring relocation and resettlement of twenty thousand people or more in mountain areas or fifty thousand people or more in other areas.
4. Investment projects or works in geographical areas of special national defense or security significance or areas where exist national relics of special historical-cultural significance.
5. Projects or works subject to particular mechanisms or policies which should be decided by the National Assembly.

Source:No.66/2006/QH11

Table 4.4.2 Process of approval and permission before inauguration



Source: JICA Study Team

4.4.3 Construction schedule after completion of preparation by Vietnam

The construction schedule from the completion of preparation in Vietnam to the start of operations is stated below, and the railway business is expected to open in July 2021, 42 months after the start of construction (In case of underground structure in urban area, construction period is assumed as 60 months).

The timing of the opening after Phase 2 is to be determined based on the increase in demand after starting the operation of Phase 1 and development of nearby lines. However, the expected timing to open operations of Phase 2 is at least 24 months after the start of construction.

Selection of consultants by the client	: 10 months
Investigation and detailed designs	: 20 months
Selection of contractors	: 15 months
Preparation of documents for bidding and agreement of JICA	: 3 months
Bidding period	: 2 months
Bid evaluation	: 2 months
Contract negotiation	: 2 months
Agreement of JICA on the bid result	: 1 month
Agreement of JICA on the selected contractors	: 1 month
Acquisition of yen loan and loan certificate	: 1 month
Phase 1 construction	: 42 months

4.4.4 Completion inspection and security inspection (2 months)

The constructed railroad facilities shall be handed over to the Hanoi city after the following procedures: inspection of compliance with laws and regulations in Vietnam; inspection of performance and functions, such as tracks, signaling systems, and wires; and inspection of communications between trains and ground facilities; security inspections including current collection test by actual train cars and running test by trains running in service lines to verify running comfort and safety.

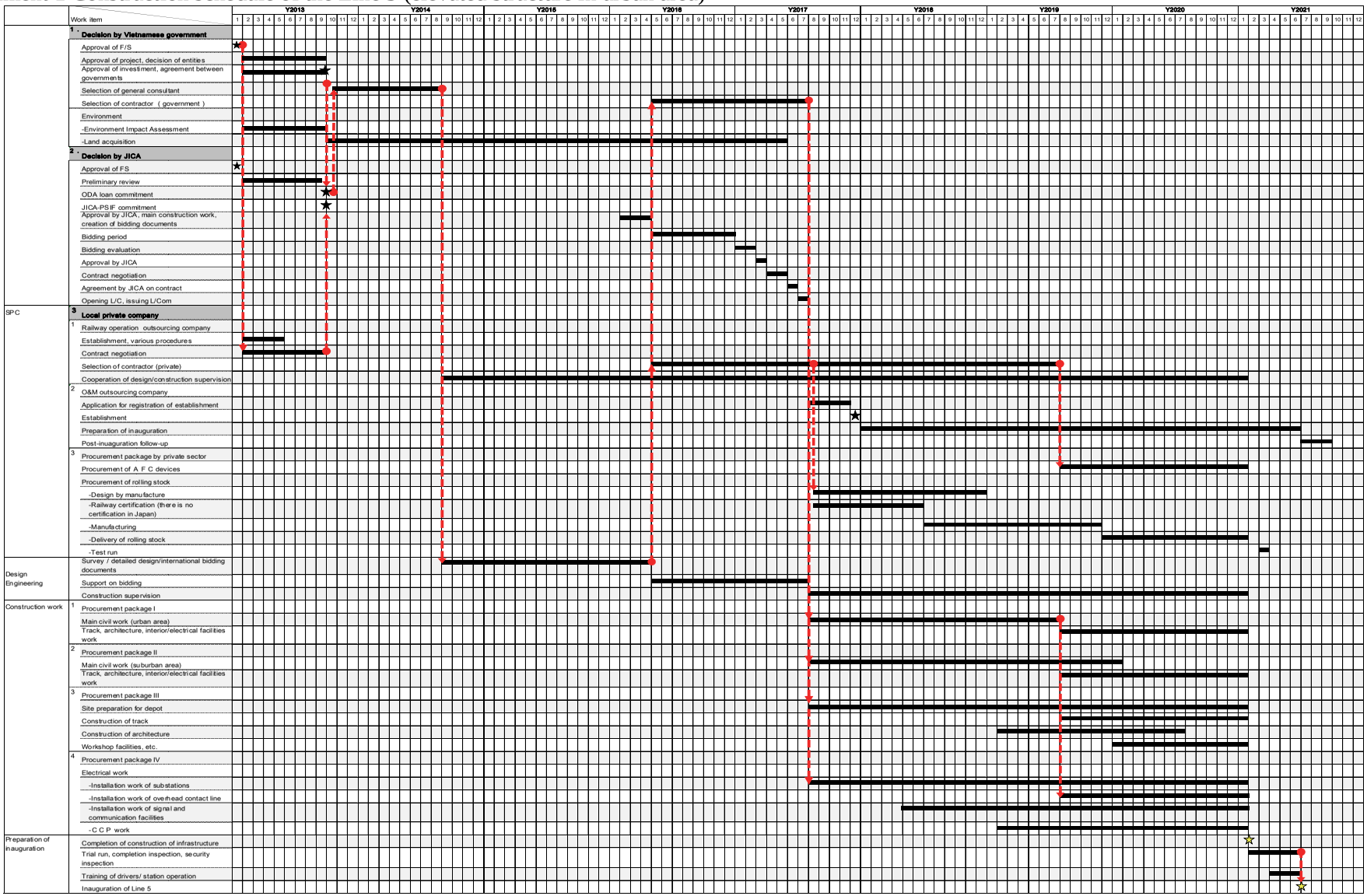
Table 4.4.3 List of inspection upon completion and safety (example)

Contents of inspection		
Completion inspection	Power transformation and distribution system	Substation
	Distribution line	Distribution line
	Electric cables (generators)	Feeder line, contact line, generators
	Civil engineering facilities and operation safety systems	Railroad tracks, stations, (tunnels), fire-fighting facilities Block equipment, interlocking device Centralized traffic control system, automatic train control device
Security inspection		Civil engineering section Electricity section Rolling stock section Operation section

*The words between brackets indicate facilities used in underground structures.

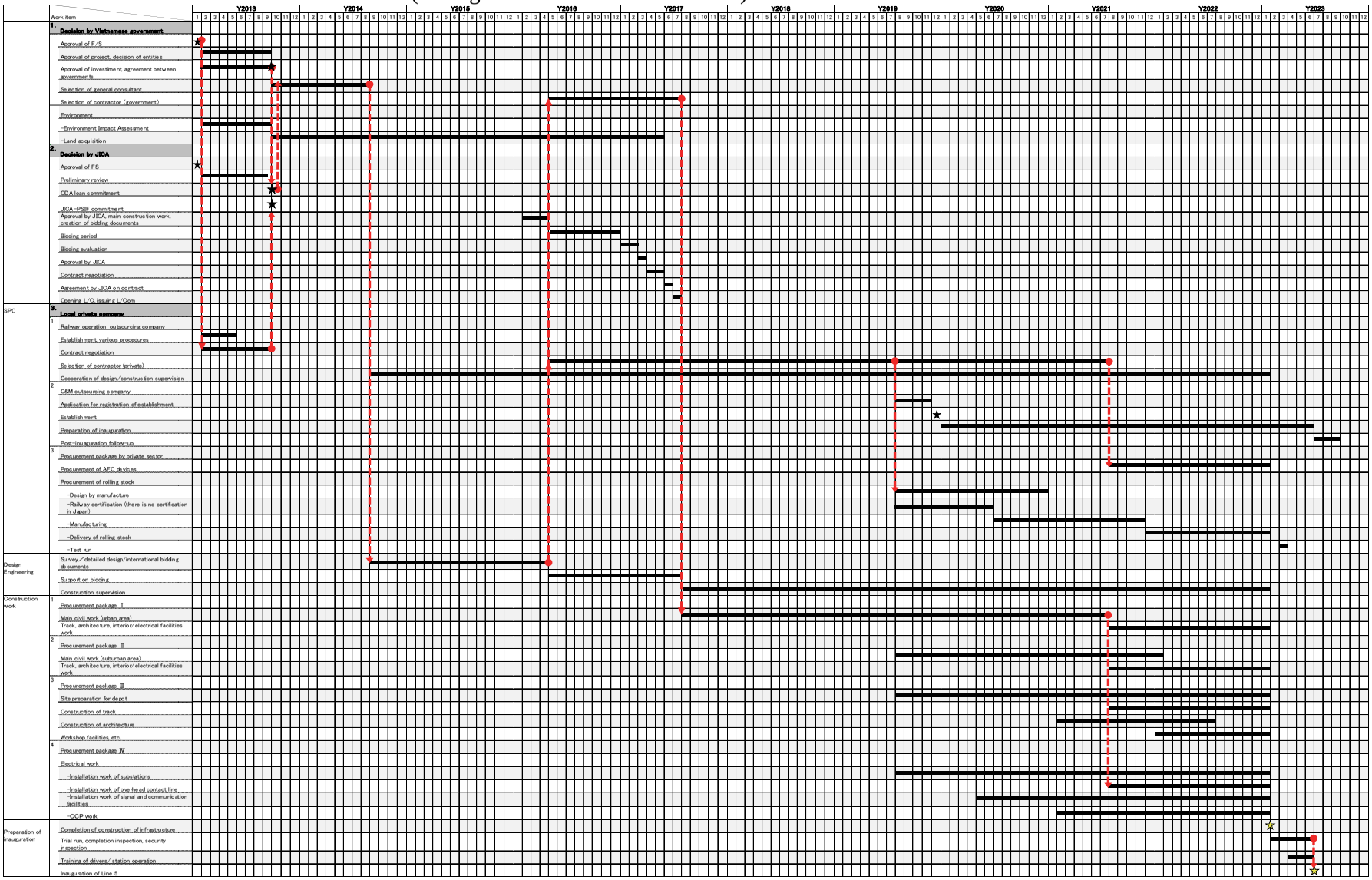
Source: JICA Study Team

Attachment 1 Construction schedule of the Line 5 (elevated structure in urban area)



Source: JICA Study Team

Attachment 2 Construction schedule of the Line 5 (underground structure in urban area)



Source: JICA Study Team

Attachment 3 Construction cost of Phase 1 (elevated structure in urban area): Japanese yen loan

Annual Fund Requirement

Base Year for Cost Estimation: Sep, 2012 — FC & Total: million JPY
Exchange Rates: VND = Yen 0.003956 — LC : million VND
Price Escalation: FC: 1.6% LC: 7.3%
Physical Contingency 5%
Physical Contingency for Consultant 5%

Item	Total			2013			2014			2015			2016			2017			2018			2019			2020			2021		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
A. ELIGIBLE PORTION																														
Ⅰ) Procurement / Construction	76,600	43,540,364	248,855	0	0	0	0	0	0	0	0	0	0	0	0	6,376	4,503,239	24,192	15,636	11,598,693	61,522	22,991	12,612,942	72,890	27,999	13,612,339	81,852	3,598	1,213,151	8,398
Civil	10,100	17,970,160	81,193	0	0	0	0	0	0	0	0	0	0	0	0	1,202	2,139,305	9,666	2,886	5,134,331	23,198	2,886	5,134,331	23,198	2,886	5,134,331	23,198	240	427,861	1,933
Track	6,231	1,033,915	10,321	0	0	0	0	0	0	0	0	0	0	0	0	742	123,085	1,229	1,780	295,404	2,949	1,780	295,404	2,949	1,780	295,404	2,949	148	24,617	246
Depot	8,536	5,966,732	32,142	0	0	0	0	0	0	0	0	0	0	0	0	1,016	710,325	3,826	2,439	1,704,780	9,183	2,439	1,704,780	9,183	2,439	1,704,780	9,183	203	142,065	765
Electricity	37,845	609,008	40,254	0	0	0	0	0	0	0	0	0	0	0	0	2,649	42,631	2,818	6,434	103,531	6,843	12,489	200,973	13,284	15,138	243,603	16,102	1,135	18,270	1,208
Maintenance car	2,487	0	2,487	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,243	0	1,243	1,243	0	1,243
Base cost for JICA financing	65,198	25,579,814	166,397	0	0	0	0	0	0	0	0	0	0	0	0	5,609	3,015,346	17,539	13,538	7,238,047	42,174	19,593	7,335,489	48,614	23,486	7,378,119	52,675	2,971	612,813	5,395
Price escalation	7,755	15,887,199	70,608	0	0	0	0	0	0	0	0	0	0	0	0	463	1,273,454	5,501	1,353	3,808,327	16,419	2,303	4,676,837	20,805	3,180	5,586,013	25,279	456	542,569	2,603
Physical contingency	3,648	2,073,351	11,850	0	0	0	0	0	0	0	0	0	0	0	0	304	214,440	1,152	745	552,319	2,930	1,095	600,616	3,471	1,333	648,207	3,898	171	57,769	400
Ⅱ) Consulting services	5,370	180,536	6,085	0	0	0	95	2,476	104	289	7,970	320	293	8,551	327	639	19,690	717	1,135	36,921	1,281	1,153	39,616	1,310	1,172	42,508	1,340	595	22,805	685
Base cost	4,613	108,160	5,041	0	0	0	87	2,048	95	262	6,144	286	262	6,144	286	562	13,184	614	983	23,040	1,074	983	23,040	1,074	983	23,040	1,074	491	11,520	537
Price escalation	501	63,779	754	0	0	0	3	310	4	13	1,446	19	17	2,000	25	46	5,568	68	98	12,123	146	115	14,689	174	133	17,444	202	75	10,200	116
Physical contingency	256	8,597	290	0	0	0	5	118	5	14	380	15	14	407	16	30	938	34	54	1,758	61	55	1,886	62	56	2,024	64	28	1,086	33
Total (Ⅰ + Ⅱ)	81,971	43,720,900	254,940	0	0	0	95	2,476	104	289	7,970	320	293	8,551	327	7,016	4,522,929	24,909	16,771	11,635,614	62,803	24,144	12,652,558	74,200	29,171	13,654,846	83,192	4,193	1,235,957	9,083
B. NON ELIGIBLE PORTION																														
a Procurement / Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost for JICA financing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b Land Acquisition	0	67,575	267	0	3,964	16	0	17,012	67	0	18,254	72	0	19,587	77	0	8,757	35	0	0	0	0	0	0	0	0	0	0	0	0
Base cost	0	51,600	204	0	3,518	14	0	14,073	56	0	14,073	56	0	14,073	56	0	5,864	23	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	12,757	50	0	257	1	0	2,130	8	0	3,312	13	0	4,581	18	0	2,476	10	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	3,218	13	0	189	1	0	810	3	0	869	3	0	933	4	0	417	2	0	0	0	0	0	0	0	0	0	0	0	0
c Administration cost	0	6,450,796	25,521	0	396	2	0	4,342	17	0	9,917	39	0	10,225	40	0	630,500	2,494	0	1,587,465	6,280	0	1,875,536	7,420	0	2,102,825	8,319	0	229,591	908
d VAT	0	6,450,796	25,521	0	396	2	0	4,342	17	0	9,917	39	0	10,225	40	0	630,500	2,494	0	1,587,465	6,280	0	1,875,536	7,420	0	2,102,825	8,319	0	229,591	908
e Import Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (a+b+c+d+e)	0	12,969,167	51,309	0	4,757	19	0	25,696	102	0	38,088	151	0	40,037	158	0	1,269,756	5,023	0	3,174,930	12,561	0	3,751,072	14,840	0	4,205,649	16,638	0	459,182	1,817
TOTAL (A+B)	81,971	56,690,067	306,249	0	4,757	19	95	28,172	206	289	46,057	471	293	48,588	485	7,016	5,792,685	29,933	16,771	14,810,544	75,364	24,144	16,403,630	89,040	29,171	17,860,496	99,831	4,193	1,695,138	10,900
C. Interest during Construction	1,521	0	1,521	0	0	0	0	0	0	0	0	0	0	0	0	49	0	49	172	0	172	318	0	318	483	0	483	500	0	500
Interest during Construction(Const.)	1,519	0	1,519	0	0	0	0	0	0	0	0	0	0	0	0	48	0	48	172	0	172	318	0	318	482	0	482	500	0	500
Interest during Construction (Consul.)	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1
D. Commitment Charge	2,308	0	2,308	256	0	256	256	0	256	256	0	256	256	0	256	256	0	256	256	0	256	256	0	256	256	0	256	256	0	256
GRAND TOTAL (A+B+C+D)	85,800	56,690,067	310,078	256	4,757	275	351	28,172	463	545	46,057	727	550	48,588	742	7,321	5,792,685	30,238	17,199	14,810,544	75,792	24,718	16,403,630	89,615	29,910	17,860,496	100,570	4,950	1,695,138	11,657
E. JICA finance portion incl. IDC (A + C + D)	85,800	43,720,900	258,769	256	0	256	351	2,476	361	545	7,970	577	550	8,551	584	7,321	4,522,929	25,214	17,199	11,635,614	63,232	24,718	12,652,558	74,775	29,910	13,654,846	83,931	4,950	1,235,957	9,840

Administration Cost = 10%
VAT= 10% of the expenditure in local currency of the eligible portion
Import Tax= 0%

Source: JICA Study Team

Attachment 4 Construction cost of Phase 1 (elevated structure in urban area): Rolling stocks and AFC devices

Annual Fund Requirement

Base Year for Cost Estimation: Sep, 2012 — FC & Total: million JPY
Exchange Rates: VND = Yen 0.00395621 — LC : million VND
Price Escalation: FC: 1.6% LC: 7.3%
Physical Contingency: 5%
Physical Contingency for Consultant: 5%

Item	Total			2013			2014			2015			2016			2017			2018			2019			2020			2021		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
A. ELIGIBLE PORTION																														
Ⅰ) Procurement / Construction	14,829	0	14,829	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,356	0	7,356	7,473	0	7,473
Rolling stock	9,342	0	9,342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,671	0	4,671	4,671	0	4,671
AFC	2,998	0	2,998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,499	0	1,499	1,499	0	1,499
Base cost for JICA financing	12,340	0	12,340	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,170	0	6,170	6,170	0	6,170
Price escalation	1,783	0	1,783	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	835	0	835	948	0	948
Physical contingency	706	0	706	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	350	0	350	356	0	356
Ⅱ) Consulting services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Ⅰ + Ⅱ)	14,829	0	14,829	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,356	0	7,356	7,473	0	7,473
B. NON ELIGIBLE PORTION																														
a Procurement / Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost for JICA financing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b Land Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c Administration cost	0	374,828	1,483	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	185,926	736	0	188,901	747
d VAT	0	374,828	1,483	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	185,926	736	0	188,901	747
e Import Tax	0	749,655	2,966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	371,853	1,471	0	377,802	1,495
Total (a+b+c+d+e)	0	1,499,310	5,932	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	743,705	2,942	0	755,605	2,989
TOTAL (A+B)	14,829	1,499,310	20,761	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,356	743,705	10,298	7,473	755,605	10,463
C. Interest during Construction	559	0	559	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	184	0	184	375	0	375
Interest during Construction(Const.)	559	0	559	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	184	0	184	375	0	375
Interest during Construction (Consul.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D. Commitment Charge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GRAND TOTAL (A+B+C+D)	15,388	1,499,310	21,320	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,540	743,705	10,482	7,849	755,605	10,838
E. JICA finance portion incl. IDC (A+ C + D)	15,388	0	15,388	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,540	0	7,540	7,849	0	7,849

Administration Cost = 10%
VAT= 10% of the expenditure in local currency of the eligible portion
Import Tax= 20%

*Besides the above table, 1 billion yen of JICA PSIF portion are added up as a part of cost for preparation of inauguration.

Source: JICA Study Team

Attachment 5 Construction cost of Phase 1 (underground structure in urban area): Japanese yen loan

Annual Fund Requirement

Base Year for Cost Estimation: Sep, 2012 — FC & Total: million JPY
Exchange Rates: VND = Yen 0.003956213 — LC : million VND
Price Escalation: FC: 1.6% LC: 7.3%
Physical Contingency 5%
Physical Contingency for Consultant 5%

Item	Total			2013			2014			2015			2016			2017			2018			2019			2020			2021			2022			2023		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
A. ELIGIBLE PORTION																																				
I) Procurement / Construction	110,382	61,863,610	355,128	0	0	0	0	0	0	0	0	0	0	0	0	2,532	1,953,372	10,260	6,173	5,030,324	26,074	12,278	8,497,917	45,898	21,114	13,778,018	75,623	29,299	14,986,614	88,589	34,785	16,175,839	98,780	4,201	1,441,525	9,904
Civil downtown	29,399	17,265,176	97,704	0	0	0	0	0	0	0	0	0	0	0	0	2,227	1,307,968	7,402	5,345	3,139,123	17,764	5,345	3,139,123	17,764	5,345	3,139,123	17,764	5,345	3,139,123	17,764	5,345	3,139,123	17,764	445	261,594	1,480
Civil suburb	4,391	7,774,712	35,149	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	523	925,561	4,184	1,255	2,221,346	10,043	1,255	2,221,346	10,043	1,255	2,221,346	10,043	105	185,112	837
Track	6,262	1,028,387	10,330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	745	122,427	1,230	1,789	293,825	2,951	1,789	293,825	2,951	1,789	293,825	2,951	149	24,485	246
Depot	8,536	5,966,732	32,142	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,016	710,325	3,826	2,439	1,704,780	9,183	2,439	1,704,780	9,183	2,439	1,704,780	9,183	203	142,065	765
Electricity	40,489	640,270	43,021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,834	44,819	3,011	6,883	108,846	7,314	13,361	211,289	14,197	16,195	256,108	17,208	1,215	19,208	1,291
Maintenance car	2,487	0	2,487	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,243	0	1,243	1,243	0	1,243
Base cost for JICA financing	91,962	32,675,276	220,837	0	0	0	0	0	0	0	0	0	0	0	0	2,227	1,307,968	7,402	5,345	3,139,123	17,764	10,464	4,942,255	30,016	17,711	7,467,930	47,255	24,189	7,570,364	54,139	28,296	7,615,182	58,393	3,360	632,464	5,862
Price escalation	13,564	26,242,448	117,385	0	0	0	0	0	0	0	0	0	0	0	0	184	552,387	2,369	534	1,651,962	7,068	1,230	3,151,000	13,696	2,398	5,654,002	24,766	3,715	6,702,692	30,232	4,863	7,790,379	35,683	641	740,417	3,570
Physical contingency	5,256	2,945,886	16,911	0	0	0	0	0	0	0	0	0	0	0	0	121	93,018	489	294	239,539	1,242	585	404,663	2,186	1,005	656,096	3,601	1,395	713,648	4,219	1,656	770,278	4,704	200	68,644	472
II) Consulting services	7,388	268,940	8,452	0	0	0	118	3,095	130	360	9,962	399	365	10,689	408	433	13,381	486	528	17,230	596	856	29,492	972	1,324	48,176	1,514	1,345	51,692	1,549	1,366	55,466	1,586	694	29,757	812
Base cost	6,215	146,176	6,793	0	0	0	109	2,560	119	327	7,680	357	327	7,680	357	381	8,960	416	457	10,752	500	729	17,152	797	1,110	26,112	1,213	1,110	26,112	1,213	1,110	26,112	1,213	555	13,056	607
Price escalation	821	109,958	1,256	0	0	0	4	387	5	16	1,808	23	21	2,500	31	31	3,784	46	46	5,657	68	86	10,935	129	150	19,770	229	170	23,119	262	191	26,713	297	106	15,284	166
Physical contingency	352	12,807	402	0	0	0	6	147	6	17	474	19	17	509	19	21	637	23	25	820	28	41	1,404	46	63	2,294	72	64	2,462	74	65	2,641	76	33	1,417	39
Total (I + II)	117,770	62,132,551	363,580	0	0	0	118	3,095	130	360	9,962	399	365	10,689	408	2,965	1,966,753	10,746	6,701	5,047,553	26,670	13,134	8,527,409	46,870	22,438	13,826,194	77,137	30,643	15,038,307	90,138	36,151	16,231,305	100,386	4,895	1,471,283	10,716
B. NON ELIGIBLE PORTION																																				
a Procurement / Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost for JICA financing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b Land Acquisition	0	67,575	267	0	3,968	16	0	17,012	67	0	18,254	72	0	19,587	77	0	8,767	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost	0	51,600	204	0	3,518	14	0	14,073	56	0	14,073	56	0	14,073	56	0	5,864	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	12,757	50	0	257	1	0	2,130	8	0	3,312	13	0	4,581	18	0	2,476	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	3,218	13	0	189	1	0	810	3	0	869	3	0	933	4	0	417	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c Administration cost	0	9,196,860	36,385	0	396	2	0	4,993	20	0	11,910	47	0	12,262	49	0	272,490	1,078	0	674,142	2,667	0	1,184,721	4,687	0	1,949,770	7,714	0	2,278,390	9,014	0	2,536,917	10,037	0	270,868	1,072
d VAT	0	9,196,860	36,385	0	396	2	0	4,993	20	0	11,910	47	0	12,262	49	0	272,490	1,078	0	674,142	2,667	0	1,184,721	4,687	0	1,949,770	7,714	0	2,278,390	9,014	0	2,536,917	10,037	0	270,868	1,072
e Import Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (a+b+c+d+e)	0	18,461,294	73,037	0	4,757	19	0	26,998	107	0	42,075	166	0	44,111	175	0	553,737	2,191	0	1,348,283	5,334	0	2,369,442	9,374	0	3,899,540	15,427	0	4,556,781	18,028	0	5,073,835	20,073	0	541,736	2,143
TOTAL (A+B)	117,770	80,593,845	436,617	0	4,757	19	118	30,092	237	360	52,037	565	365	54,800	582	2,965	2,520,490	12,936	6,701	6,395,837	32,005	13,134	10,896,851	56,244	22,438	17,725,734	92,564	30,643	19,595,088	108,166	36,151	21,305,140	120,439	4,895	2,013,019	12,859
C. Interest during Construction	2,478	0	2,478	0	0	0	0	0	0	0	0	0	0	0	0	21	0	21	73	0	73	165	0	165	317	0	317	495	0	495	693	0	693	715	0	715
Interest during Construction(Const.)	2,474	0	2,474	0	0	0	0	0	0	0	0	0	0	0	0	21	0	21	73	0	73	165	0	165	316	0	316	494	0	494	693	0	693	714	0	714
Interest during Construction (Consul.)	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	1
D. Commitment Charge	4,027	0	4,027	366	0	366	366	0	366	366	0	366	366	0	366	366	0	366	366	0	366	366	0	366	366	0	366	366	0	366	366	0	366	366	0	366
GRAND TOTAL (A+B+C+D)	124,275	80,593,845	443,121	366	4,757	385	484	30,092	603	726	52,037	932	731	54,800	948	3,351	2,520,490	13,323	7,140	6,395,837	32,444	13,665	10,896,851	56,775	23,120	17,725,734	93,247	31,504	19,595,088	109,026	37,211	21,305,140	121,498	5,976	2,013,019	13,940
E. JICA finance portion incl. IDC (A + C + D)	124,275	62,132,551	370,085	366	0	366	484	3,095	496	726	9,962	765	731	10,689	774	3,351	1,966,753	11,132	7,140	5,047,553	27,109	13,665	8,527,409	47,401	23,120	13,826,194	77,820	31,504	15,038,307	90,999	37,211	16,231,305	101,425	5,976	1,471,283	11,797

Administration Cost = 10%
VAT= 10% of the expenditure in local currency of the eligible portion
Import Tax= 0%

Source: JICA Study Team

Attachment 6 Construction cost of Phase 1 (underground structure in urban area): Rolling stocks and AFC devices

Annual Fund Requirement

Base Year for Cost Estimation: Sep, 2012 — FC & Total: million JPY
Exchange Rates: VND = Yen 0.003956 — LC : million VND
Price Escalation: FC: 1.6% LC: 7.3%
Physical Contingency: 5%
Physical Contingency for Consultant: 5%

Item	Total			2013			2014			2015			2016			2017			2018			2019			2020			2021			2022		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
A. ELIGIBLE PORTION																																	
Ⅰ) Procurement / Construction	15,066	0	15,066	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,473	0	7,473	7,593	0	7,593
Rolling stock	9,342	0	9,342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,671	0	4,671	4,671	0	4,671
AFC	2,998	0	2,998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,499	0	1,499	1,499	0	1,499
Base cost for JICA financing	12,340	0	12,340	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,170	0	6,170	6,170	0	6,170
Price escalation	2,009	0	2,009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	948	0	948	1,061	0	1,061
Physical contingency	717	0	717	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	356	0	356	362	0	362
Ⅱ) Consulting services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Ⅰ + Ⅱ)	15,066	0	15,066	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,473	0	7,473	7,593	0	7,593
B. NON ELIGIBLE PORTION																																	
a Procurement / Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost for JICA financing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b Land Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c Administration cost	0	380,825	1,507	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	188,901	747	0	191,924	759
d VAT	0	380,825	1,507	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	188,901	747	0	191,924	759
e Import Tax	0	761,650	3,013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	377,802	1,495	0	383,847	1,519
Total (a+b+c+d+e)	0	1,523,299	6,026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	755,605	2,989	0	767,694	3,037
TOTAL (A+B)	15,066	1,523,299	21,093	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,473	755,605	10,463	7,593	767,694	10,630
C. Interest during Construction	568	0	568	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	187	0	187	381	0	381
Interest during Construction(Const.)	568	0	568	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	187	0	187	381	0	381
Interest during Construction (Consul.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D. Commitment Charge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GRAND TOTAL (A+B+C+D)	15,634	1,523,299	21,661	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,660	755,605	10,649	7,974	767,694	11,011
E. JICA finance portion incl. IDC (A+ C + D)	15,634	0	15,634	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,660	0	7,660	7,974	0	7,974

Administration Cost = 10%
VAT= 10% of the expenditure in local currency of the eligible portion
Import Tax= 20%

*Besides the above table, 1 billion yen of JICA PSIF portion are added up as a part of cost for preparation of inauguration.

Source: JICA Study Team

Attachment 7 Construction cost of Phase 2: Japanese yen loan

Annual Fund Requirement

Base Year for Cost Estimation: Sep, 2012 — FC & Total: million JPY
Exchange Rates: VND = Yen 0.003956213 — LC : million VND
Price Escalation: FC: 1.6% LC: 7.3%
Physical Contingency 5%
Physical Contingency for Consultant 5%

Item	Total			2025			2026			2027			2028			2029		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
A. ELIGIBLE PORTION																		
Ⅰ) Procurement / Construction	63,024	38,455,669	215,163	0	0	0	0	0	0	0	0	0	21,997	18,174,264	93,898	41,027	20,281,405	121,265
Civil	4,548	9,122,198	40,638	0	0	0	0	0	0	0	0	0	2,274	4,561,099	20,319	2,274	4,561,099	20,319
Track	8,408	1,753,751	15,346	0	0	0	0	0	0	0	0	0	4,204	876,875	7,673	4,204	876,875	7,673
Electricity	32,576	560,898	34,795	0	0	0	0	0	0	0	0	0	9,773	168,269	10,438	22,803	392,629	24,356
Maintenance car	552	0	552	0	0	0	0	0	0	0	0	0	0	0	0	552	0	552
Base cost for JICA financing	46,083	11,436,847	91,330	0	0	0	0	0	0	0	0	0	16,251	5,606,244	38,430	29,833	5,830,603	52,900
Price escalation	13,940	25,187,600	113,587	0	0	0	0	0	0	0	0	0	4,699	11,702,579	50,997	9,241	13,485,021	62,591
Physical contingency	3,001	1,831,222	10,246	0	0	0	0	0	0	0	0	0	1,047	865,441	4,471	1,954	965,781	5,775
Ⅱ) Consulting services	3,480	191,335	4,237	342	16,123	406	347	17,300	416	353	18,562	426	1,210	67,222	1,476	1,229	72,129	1,514
Base cost	2,582	59,904	2,819	265	6,144	289	265	6,144	289	265	6,144	289	894	20,736	976	894	20,736	976
Price escalation	733	122,320	1,217	61	9,211	97	66	10,332	107	71	11,535	117	258	43,285	430	277	47,958	467
Physical contingency	166	9,111	202	16	768	19	17	824	20	17	884	20	58	3,201	70	59	3,435	72
Total (Ⅰ + Ⅱ)	66,505	38,647,005	219,400	342	16,123	406	347	17,300	416	353	18,562	426	23,207	18,241,486	95,374	42,256	20,353,534	122,779
B. NON ELIGIBLE PORTION																		
a Procurement / Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost for JICA financing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b Land Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c Administration cost	0	5,545,718	21,940	0	10,251	41	0	10,507	42	0	10,773	43	0	2,410,733	9,537	0	3,103,455	12,278
d VAT	0	5,545,718	21,940	0	10,251	41	0	10,507	42	0	10,773	43	0	2,410,733	9,537	0	3,103,455	12,278
e Import Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (a+b+c+d+e)	0	11,091,436	43,880	0	20,501	81	0	21,013	83	0	21,547	85	0	4,821,465	19,075	0	6,206,910	24,556
TOTAL (A+B)	66,505	49,738,441	263,280	342	36,624	487	347	38,313	499	353	40,109	511	23,207	23,062,951	114,448	42,256	26,560,444	147,335
C. Interest during Construction	619	0	619	0	0	0	0	0	0	0	0	0	188	0	188	431	0	431
Interest during Construction(Const.)	618	0	618	0	0	0	0	0	0	0	0	0	188	0	188	431	0	431
Interest during Construction (Consul.)	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D. Commitment Charge	1,100	0	1,100	220	0	220	220	0	220	220	0	220	220	0	220	220	0	220
GRAND TOTAL (A+B+C+D)	68,224	49,738,441	265,000	562	36,624	707	567	38,313	719	573	40,109	732	23,615	23,062,951	114,857	42,908	26,560,444	147,986
E. JICA finance portion incl. IDC (A + C + D)	68,224	38,647,005	221,120	562	16,123	626	567	17,300	636	573	18,562	646	23,615	18,241,486	95,782	42,908	20,353,534	123,430

Administration Cost = 10%
VAT= 10% of the expenditure in local currency of the eligible portion
Import Tax= 0%

Source: JICA Study Team

Attachment 8 Construction cost of Phase 2: Rolling stocks and AFC devices

Annual Fund Requirement

Base Year for Cost Estimation: Sep, 2012 — FC & Total: million JPY
Exchange Rates VND = Yen 0.003956 — LC : million VND
Price Escalation: FC: 1.6% LC: 7.3%
Physical Contingency 5%
Physical Contingency for Consultant 5%

Item	Total			2025			2026			2027			2028			2029		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
A. ELIGIBLE PORTION																		
Ⅰ) Procurement / Construction	11,419	0	11,419	0	0	0	0	0	0	0	0	0	5,664	0	5,664	5,755	0	5,755
Rolling stock	7,752	0	7,752	0	0	0	0	0	0	0	0	0	3,876	0	3,876	3,876	0	3,876
AFC	617	0	617	0	0	0	0	0	0	0	0	0	309	0	309	309	0	309
Base cost for JICA financing	8,369	0	8,369	0	0	0	0	0	0	0	0	0	4,185	0	4,185	4,185	0	4,185
Price escalation	2,506	0	2,506	0	0	0	0	0	0	0	0	0	1,210	0	1,210	1,296	0	1,296
Physical contingency	544	0	544	0	0	0	0	0	0	0	0	0	270	0	270	274	0	274
Ⅱ) Consulting services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (Ⅰ + Ⅱ)	11,419	0	11,419	0	0	0	0	0	0	0	0	0	5,664	0	5,664	5,755	0	5,755
B. NON ELIGIBLE PORTION																		
a Procurement / Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost for JICA financing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b Land Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c Administration cost	0	288,635	1,142	0	0	0	0	0	0	0	0	0	0	143,172	566	0	145,463	575
d VAT	0	288,635	1,142	0	0	0	0	0	0	0	0	0	0	143,172	566	0	145,463	575
e Import Tax	0	577,269	2,284	0	0	0	0	0	0	0	0	0	0	286,344	1,133	0	290,925	1,151
Total (a+b+c+d+e)	0	1,154,538	4,568	0	0	0	0	0	0	0	0	0	0	572,688	2,266	0	581,851	2,302
TOTAL (A+B)	11,419	1,154,538	15,987	0	0	0	0	0	0	0	0	0	5,664	572,688	7,930	5,755	581,851	8,057
C. Interest during Construction	431	0	431	0	0	0	0	0	0	0	0	0	142	0	142	289	0	289
Interest during Construction(Const.)	431	0	431	0	0	0	0	0	0	0	0	0	142	0	142	289	0	289
Interest during Construction (Consul.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D. Commitment Charge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GRAND TOTAL (A+B+C+D)	11,850	1,154,538	16,417	0	0	0	0	0	0	0	0	0	5,806	572,688	8,071	6,044	581,851	8,346
E. JICA finance portion incl. IDC (A + C + D)	11,850	0	11,850	0	0	0	0	0	0	0	0	0	5,806	0	5,806	6,044	0	6,044

Administration Cost = 10%
VAT= 10% of the expenditure in local currency of the eligible portion
Import Tax= 20%

Source: JICA Study Team

Chapter 5 Framework for Project Implementation, Operation and Maintenance

5.1 Project implementation scheme

PPP method is very advantageous for reducing the financial burden of the government and early and smooth transfer of advanced technologies and expertise of the private sector by asking the private sector to participate in projects and making them implement projects including fundraising. Countries around the world are promoting the use of PPP for these reasons. However, the proper risk allocation between the government and the private sector as well as securing profitability of the private sector and reduction of the financial burden of the government based on the proper allocation need to be carefully examined when exploring the possibility and methods of the participation of the private sector in infrastructure projects in development countries

Matters that are examined concerning the proposed project scheme in this study are indicated in the following.

5.1.1 Basic rationale of PPP project scheme

(1) PPP project scheme

In Vietnam, to ensure the continuation of sustained economic development, it will be necessary to develop wide-ranging infrastructure. In particular, the development of railways, which are a form of social infrastructure, is a very important issue as a measure to resolve urban environmental problems. However, a huge amount of funds is required for infrastructure development, and as we have seen in the past, the use of private-sector funds has come under the spotlight, as it will be difficult to cover the cost sufficiently merely with a fiscal burden that utilizes Vietnamese government funds and ODA funding.

The PPP project scheme is called a public private partnership, and it is a scheme involving cooperation between the public and private sectors that utilizes private-sector funds. For Vietnam, it is expected to generate new employment while reducing the government's fiscal burden and it will also enable the provision of high-quality public services that utilize private-sector know-how. Furthermore, for the private sector, this project is expected to provide new business opportunities and invigorate the economy. Moreover, in this regard, the characteristic of a PPP is that the public and private sectors cooperate in bearing risks and costs appropriately (for example, the public sector develops infrastructure and creates regulations and rules) and complementation is provided in the market. At the same time, in terms of both software and hardware, it is desirable to establish a joint-venture method in which the public and private sectors team up together and make use of all kinds of resources.

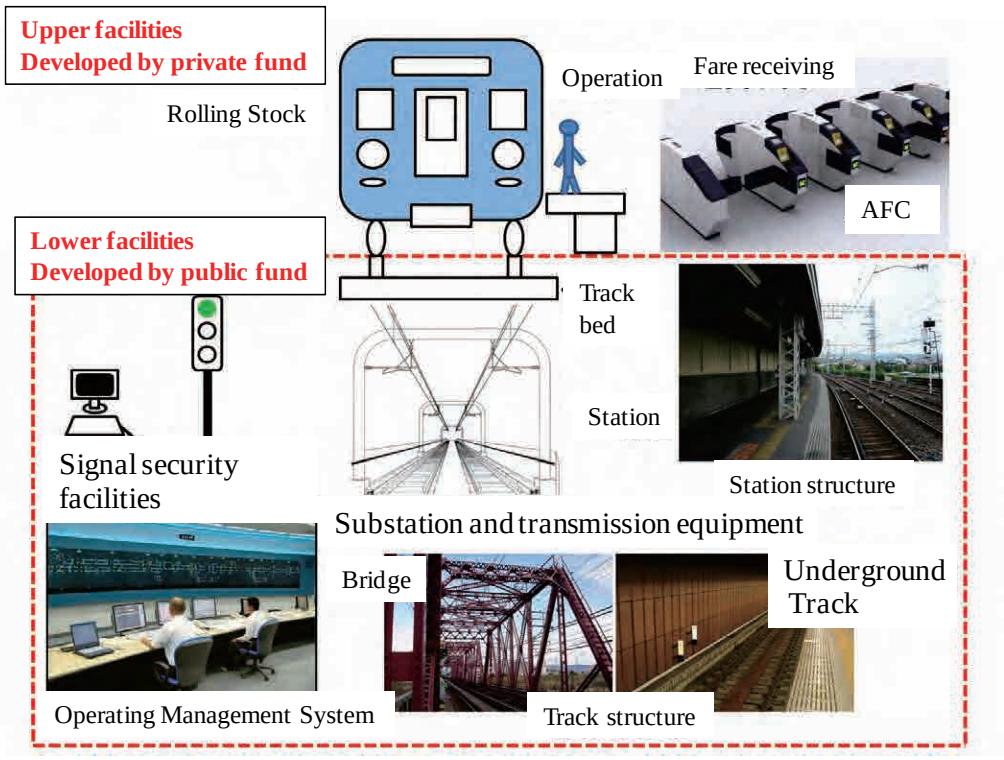
Based on this background, Vietnam introduced the PPP Pilot Law (Prime Minister's Decision No. 71) in November 2010 and has been promoting PPP pilot projects.

In this report, while studying and referring to the PPP Pilot Law, we have considered a highly feasible project scheme in terms of what kind of content and scale will facilitate incentives for private-sector investment and whether it will be possible to utilize private-sector know-how.

(2) General two-tiered system (see Figure. 5.1.1 , Table5.1.1)

Transport services, including railways, require transport infrastructure such as civil engineering structures and rolling stock, which is transport equipment. In the case of a two-tiered system for railway projects, there is a division between the lower segment, which consists of the development and ownership of infrastructure such as railway track structures (including tunnels and bridges), station buildings, power substations, power transmission and distribution lines, and track and signal systems, and the upper segment, which consists of the ownership and operation of rolling stock and equipment maintenance. This is a system where the organization for the ownership of infrastructure, the lower segment, is separated from the organization for the upper segment, which uses the rolling stock and performs operation and management. Accounting in the lower and upper segments is also independently carried out. In regard to railways, in particular, as the cost of developing infrastructure facilities is huge and there is a risk of not recouping those costs, there are many cases where the two-tiered system has been introduced and the public sector develops and owns the lower segment (infrastructure).

Study team has considered the PPP project scheme in this study based on the viewpoint of this two-tiered system.



Source: JICA Study Team

Figure 5.1.1 General public private role sharing method (two-tiered system)

Table 5.1.1 Foreign country example of Public-and-Private assignment by PPP system

		Britain Inter-city High-speed rail		Seoul The subway No. 9 line		Bangkok Blue line		Delhi Airport line		Singapore MRT north-south line		Sao Paulo The subway No. 4 line	
		Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private
Construction Phase	Engineering works (Track structure, Track bed, Station structure)	○		Except an orbit	Orbit	○		○		○		○	
	Electric power	○			○	○	○		○	○		○	
	Signal communication	○			○		○		○	○		Commu nication	Signal
	Rolling stock		○		○		○		○	○			○
	AFC devices	○			○				○	○			
O&M Phase	Operation management and Fare receiving		○		○		○		○		○		○
	Rolling stock maintenance		○		○		○		○		○		○
	Railroad infrastructure maintenance			○			○		○	○	Signal	○	

Source: JICA Study Team

5.1.2 PPP project scheme proposed in this study

(1) Basic rationale in considering project scheme

In this study, study team has adopted the basic rationale of supporting 1) exporting Japanese railway management know-how to Vietnam; 2) rapid and appropriate technology transfer; and 3) the development of local autonomous management at an early stage. Based on this rationale, study team will consider a PPP project scheme that will reduce the Vietnamese government's burden of external debt and enable efficient business operation that makes use of private-sector funds and expertise.

1) Sources of demand risks

- Considering the demand risks, which are the most important factor when considering risk allocation between the government and the private sector, the key in this project is how the project will respond to demand from suburbs, such as Hoa Lac in which major development is to be implemented, in addition to urban areas where demand is already apparent.
- Also, urban railway is not established as a common means of transportation in Vietnam at this point, and it is not reasonable to assume that the modal shift from automobiles and motorcycles to urban railway is sure to occur. The shift of users to public transportation will become possible if the Vietnamese government will effectively control traffic and promote the use of public transportation.
- Based on the above observations, the demand risks of this project are not to be controlled by private railway companies; rather, it is more appropriate for the Vietnamese government, which has the means, capability, and authority to alter demand, to become responsible for the proper amount of risks. (It is general that the private sector is not responsible for risks in PPP projects involving water supply and power supply.)

2) Method to separate basic (lower) and additional (upper) infrastructures between the government and the private sector

Vietnam does not have the experience of operating urban railways. Therefore, an important point in the allocation of roles between the government and the private sector is to carefully plan the allocation so that responsibilities in case of an accident in the operation phase will be clear. This means that if the cause of a railway accident is in the railroad facilities rather than human error, both the government and the private sector will be responsible for unexpected risks when the faults of specific facilities cannot be identified. If faults cannot be identified, the private sector will seek high returns for high risks as in the case of demand risks. Thus, such a system will likely degrade profitability.

With above basic rationale in mind, study team has organized our consideration of the project scheme in accordance with the following points related to what kind of structure and scale the facilities procured by the private sector should have and how the facilities should be used.

i) Scope of facilities procured by the private sector

In the case of this project scheme, study team has decided that the facilities procured by the private sector should be the rolling stock and the AFC (automatic fare collection) system, for the following reasons.

- Study team considers it appropriate for above-ground construction and maintenance to be developed in an integrated manner as the infrastructure portion. The above-ground part here comprises civil engineering structures and the station buildings, railway beds, railway line structures, substation and power transmission equipment, and signaling equipment constructed in an integrated manner with them, as well as the traffic control system.
- The signal system within this infrastructure should be developed in an integrated manner from the perspective of safety management, and this includes the automatic train supervision (ATS) system, the automatic train operation (ATO) system, interlocking devices, the automatic train protection (ATP) system, the Communications-Based Train Control (CBTC) system, signal cables, and automatic platform gates. Usually, this part is inseparable from the track and crossings and points that are developed based on the responsibility of the government.
- Within the study to prepare for the establishment of the Hanoi Urban Rail Management Organization, the integration of the operation control center in the future has been proposed, and in that event, it will be possible to realize the adoption of integrated design specifications at the time of upgrades, which will also contribute to a total cost reduction, as Hanoi City will

own the assets, as in the case of other lines.

- In the meantime, everyday passengers ride directly on rolling stock and it represents operating equipment on which passengers stay for a comparatively long period of time, so we have emphasized meeting the needs of passengers and opted for facilities procured by the private sector. At the time of the occurrence of equipment malfunctions and accidents, it will be possible to separate it physically from the above-ground operation control system.
- Similarly, as the AFC system is also operating equipment and not directly linked to operational safety, study team has decided on facilities procured by the private sector.

ii) Introduction of BLT system as method for using facilities procured by the private sector

In this study, study team has decided to introduce the BLT (Build, Lease, and Transfer) system as the form for introducing the facilities procured on the private-sector side for the two-tiered system. Here, the BLT system means that a private-sector business operator will procure funds, design the facilities and equipment required for public services and build them; lease the facilities and equipment to the public sector; and recoup the investment funds with the leasing fees paid by the public sector and gain a return. When the project term ends, the facilities and equipment will be transferred to the public sector. In the case of transport projects, including railways, this method is often used due in part to the fact that demand fluctuation risk, which private-sector business operators cannot accept, is large.

Accordingly, in this project scheme, the railway operation contractor (private SPC) will lease the rolling stock and AFC system, which are the facilities procured by the private sector, to the railway operator (Vietnamese government), and the rail operation contractor (private SPC) will receive leasing fees.

iii) Period for O&M conducted by the railway operation contractor (private SPC) to be set at five years from start of project

The objective is to export Japan's expertise regarding railway management to Vietnam and to enable autonomous management by Vietnam at an early stage. After referring to the scheduled period of E&M equipment maintenance after the start of operation, which was an EPC tender requirement for Ho Chi Minh's Line 1, study team has concluded that five years is reasonable as the period for mastery.

At five years from the inauguration of Line 5, the rail operation contractor (private SPC) will transfer the status of contractor between the operation contractor and Vietnamese government to the O&M management subsidiary, and at the same time transfer management department of the contractor and the management rights and all shares of the O&M management subsidiary with the amount of net assets at the time of transfer (if the amount is less than the amount invested, acquisition cost, they will be transferred with the amount of investment.) In addition, the railway operator (Vietnamese government) will implement O&M management by utilizing transferred organization of the O&M operation subsidiary.

(2) Overview of PPP scheme proposed in this study

The private sector relating to the PPP project scheme proposed in this study is the railway operation contractor (private SPC) indicated in Figure 5.1.2. It will be commissioned by the railway operator (Vietnamese government) to undertake the leasing and O&M (operation and maintenance) operations for the facilities procured by the private sector for Line 5, and will realize safe and stable operation. In addition, the rail operation contractor will recommission operations to an O&M management subsidiary that it will establish with a 100% capital contribution, and ensure that O&M operations are transferred smoothly to the Hanoi Urban Rail Corporation (tentative name) five years after the start of operation. Moreover, study team has taken into account a risk hedging policy in regard to the procurement of funds by the private sector.

In the following, study team presents the main features of the PPP project scheme proposed in this study.

1) Role of each entity

i) Railway operator (Vietnamese government)

Vietnamese government will become the railway operator, and it will develop the railway infrastructure facilities (excluding the rolling stock and AFC system) and also manage the railway project as the real obtainer of the railway project income and expenditure.

In addition, Hanoi City will prepare for the establishment of the Hanoi Urban Rail Corporation (tentative name) (*1), to which management will be transferred five year after the start of operation.

ii) Rail operation contractor (private SPC)

The rail operation contractor will be commissioned by the railway operator (Vietnamese government) to procure the rolling stock and AFC system, as part of the railway infrastructure facilities, and lease them to the railway operator, as well as to undertake O&M operations based on the cost-on system (*2).

The reason for adopting a cost-on system is as follows. That is, since there is still no management track record of a city railroad in the country and it becomes a completely new enterprise, study team cannot but say that the details of each expense in O&M business are opaque. In such a situation, when the railway operation trust entrepreneur who accepts private sector investment receives O&M expense at a fixed amount, it is necessary to carry out the premise of the following.

It is woven in a risk of expense increasing and it is set up the conservative amount of money placed in trust.

It is assumed that this becomes a high frame as compared with the case where study team is based on a cost-on system, and the burden of Railway operator (Vietnamese government) becomes large. On the other hand, there is a problem at the time of adopting a cost-on system as a generality in becoming difficult to commit the incentive of cost reduction in a Rail operation contractor (private SPC). So, in main enumeration, in order to prevent this, it is used raising a railway operation contractor's cost reduction consciousness by devising the determination method of a rate of pay.

iii) O&M management subsidiary (private sector)

The O&M management subsidiary will be established by the rail operation contractor (private SPC) with a 100% capital contribution. It will be recommissioned by the rail operation contractor to carry out the practical management of O&M while receiving support from Japanese railway operators and manufacturers that have abundant experience and expertise regarding urban railway management.

This is the corporation that is scheduled to transfer the management rights and the contractual position related to O&M practical management from the rail operation contractor (private SPC) to Hanoi City by means of a stock transfer five years after the start of business operation.

2) Fund procurement by rail operation contractor (private SPC) and assumed capital contributors

i) Fund procurement

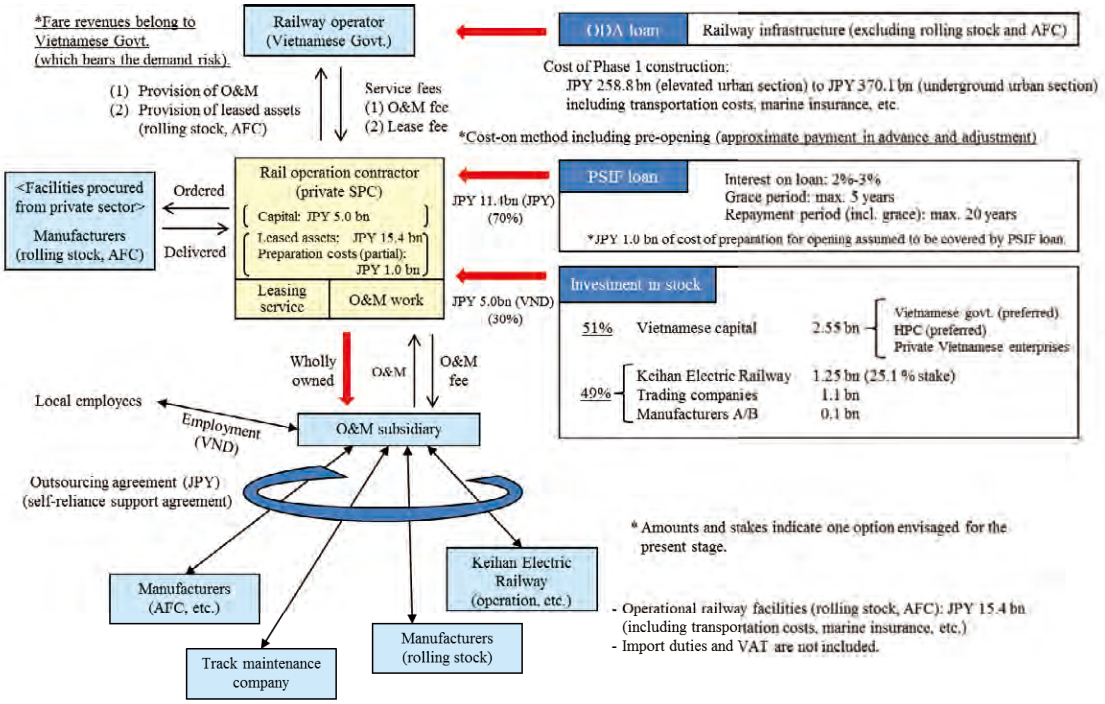
The funds that the rail operation contractor (private SPC) will require are for the procurement of the rolling stock and the AFC system, which are the facilities procured by the private sector, and part of the start-up preparation expenses. Of these funds, it is assumed that 70% will be procured by means of a JICA overseas private sector investment finance (PSIF) and 30% through an equity contribution. In addition, study team assumes that the equity contribution will comprise 51% from Vietnam and 49% from Japan, after taking into account foreign capital regulations as well.

ii) Assumed capital contributors

The parties that study team presumes will contribute capital to the rail operation contractor (private SPC) are, on the Vietnam side, the Vietnamese government (including local governments), government-related corporations and other private-sector corporations, and on the Japan side, Japanese railway companies, trading companies and manufacturers with expertise regarding railway business management.

3) Relationships between various entities

The relationships between the various entities are shown below in Figure 5.1.2.

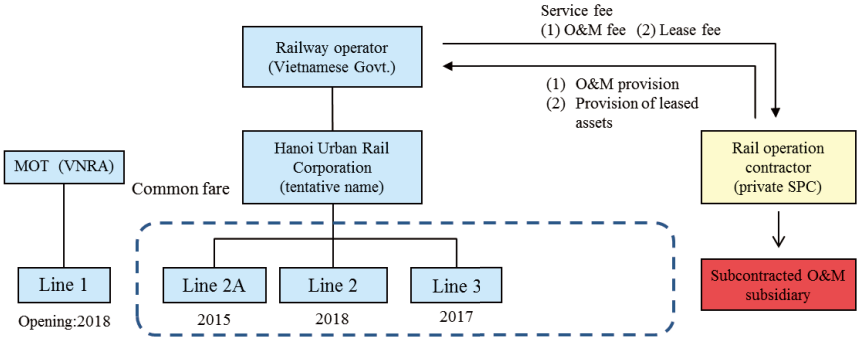


Source: JICA Study Team

Figure 5.1.2 PPP project scheme proposed in this study

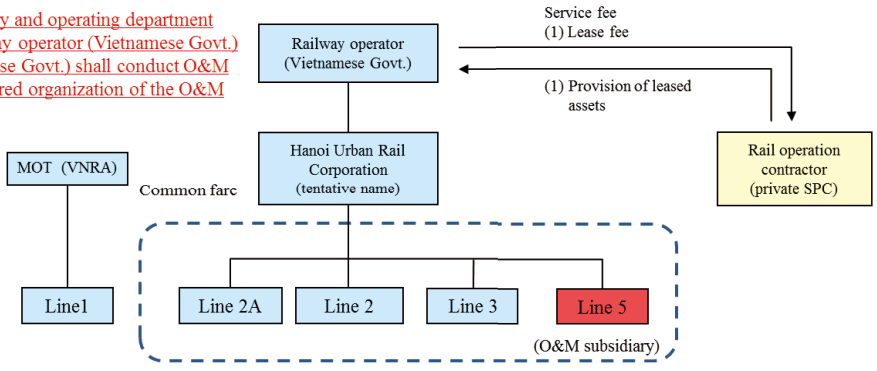
In addition, in this scheme, it is planned to transfer the O&M operations to the Hanoi Urban Rail Corporation (tentative name) five years after the start of operation and the strategy for this is shown below in Figure 5.1.3.

➢ **At opening**



➢ **Five years after opening**

- All shares of O&M subsidiary and operating department shall be transferred to Railway operator (Vietnamese Govt.)
- Railway operator (Vietnamese Govt.) shall conduct O&M business by utilizing transferred organization of the O&M subsidiary.



Source: JICA Study Team

Figure 5.1.3 PPP project scheme proposed in this study
(Organization at start of operation and five years after start of operation)

*1) Hanoi Urban Rail Corporation (tentative name)

With regard to the development of railways in Hanoi City, the project implementing bodies and donors vary for each railway line, but as Hanoi City will basically be responsible for their management, efficient management is desired. Therefore, investigations are being conducted with the aim of establishing the Hanoi Urban Rail Corporation (tentative name), the organization that will jointly administer several railway lines. At present, study team presumes that three lines—Line 2, Line 2A, and Line 3—will be managed in an integrated way, and preparations are proceeding for the establishment of the corporation in 2015.

*2) Cost-on system

The cost-on system involves adding up an amount of remuneration that is calculated based on all costs that the rail operation contractor (private SPC) requires to implement O&M and multiplying those costs by a certain percentage. In addition, the railway operator (Vietnamese government) will pay the rail operation contractor (private SPC) the amount calculated on this basis as an O&M fee. The following items are included in the costs mentioned above.

- Personnel expenses
- Management costs
- Electricity charges
- Cost of spare parts
- Business consignment expenses and maintenance contract expenses
- General overheads and railway operation liability insurance, etc.

Therefore, this O&M fee will generally vary depending on the period concerned, as the amount of items such as electricity charges and foreign exchange for the applicable period will be reflected as costs.

Furthermore, in this scheme, the railway operator, Vietnamese government will bear the demand risk when receiving railway fares, the degree of demand (fare income) will of course not have any kind of impact on the obligation to pay O&M fees (or leasing fees).

5.1.3 Regarding other schemes

<Points of view of Vietnamese government (MOT) and Hanoi City (HPC [MRB])>

Explanations and opinion exchanges regarding the project scheme that the study team conducted with the Vietnamese government (MOT) and Hanoi City (HPC [MRB]) have been organized in the following.

1) Points of view of Vietnam Ministry of Transport (MOT)

i) Selection of mitigation of government debt burden and increased financial burden for entire project period based on introduction of PPP

For example, it would be desirable for the government’s financial burden to be reduced, even if it is a small amount. On the other hand, if the financial burden of the private sector is too small, procedures will be complex, and rather than a PPP that will ultimately impose a rather high financial burden on the government, there is also the possibility of selecting a yen loan for the entire amount.

ii) Skeptical about fulfillment of the function of the Hanoi Urban Rail Corporation (tentative name)

Study team does not think that the Hanoi Urban Rail Corporation (tentative name) will immediately have sufficient capability.

2) Points of view of Hanoi Metropolitan Railway Management Board (MRB)

i) Clarification of merits when participating in private-sector projects (PPPs in general)

If private-sector companies take part in projects, regardless of whether they are Japanese or Vietnamese, it is necessary to properly explain the applicable merits (all the more if the private-sector financial burden is small). (It appears that there is a genuine strong intention to endorse a yen loan for the entire amount.)

ii) Dominance of the Hanoi Urban Rail Corporation (tentative name) (critical regarding O&M organization exclusively for Line 5)

It is logical for the Hanoi Urban Rail Corporation (tentative name) to carry out O&M for Line 5 in an integrated way. Regarding the capability of the Hanoi Urban Rail Corporation (tentative

name) as well, prior to Line 5's operation, HPC will have already brought several urban railway lines into operation. As a result, under a common authority, it is not necessary to create a separate staffing as well as the system for one single line. Therefore, there would be no problem if the organization is developed based on the assumption that Line 5 is included. It is unclear what the merit of transferring the O&M business from the private sector only for Line 5 in 2026, five years after the start of operation, would be. (The Hanoi Urban Rail Corporation (tentative name) is scheduled to be established in 2015.)

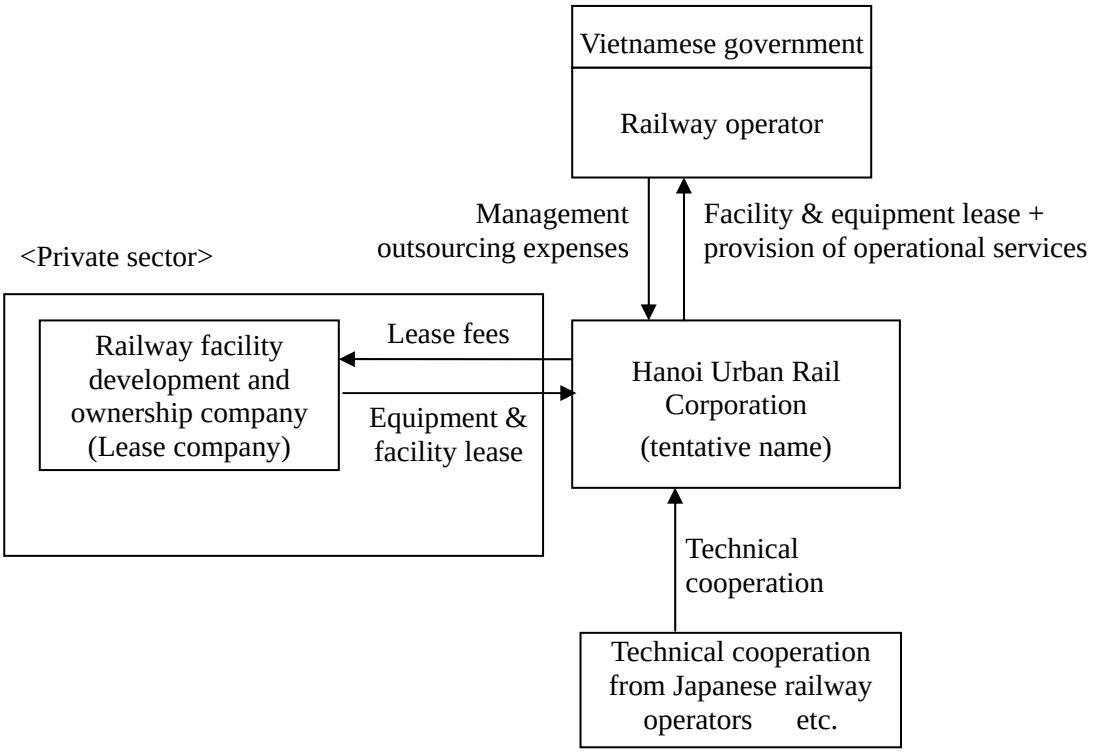
(1) PPP project scheme in which role of private sector is to lease the facilities procured by the private sector

To reflect the opinion that "It is logical for the Hanoi Urban Rail Corporation (tentative name) to carry out O&M for Line 5 in an integrated way", as a separate scheme it is conceivable that the Hanoi Urban Rail Corporation (tentative name) will initially restrict the role of the private sector in the PPP project scheme to the leasing of the facilities procured by the private sector in carrying out O&M.

- Overview of scheme

The railway operator (Vietnamese government) will consign the development, ownership and operation of Line 5 facilities to the Hanoi Urban Rail Corporation (tentative name), which is slated to manage the railway operations of Line 2, Line 2A, and Line 3 in an integrated way, and realize safe and stable operation.

The Hanoi Urban Rail Corporation (tentative name) will procure the rolling stock and AFC system for Line 5 by concluding a finance lease contract with a leasing company. To realize this scheme, it will be necessary for the Hanoi Urban Rail Corporation (tentative name) to carry out reliable administration, and study team assumes that Japanese railway operators will provide technical cooperation to that end.



Source: JICA Study Team

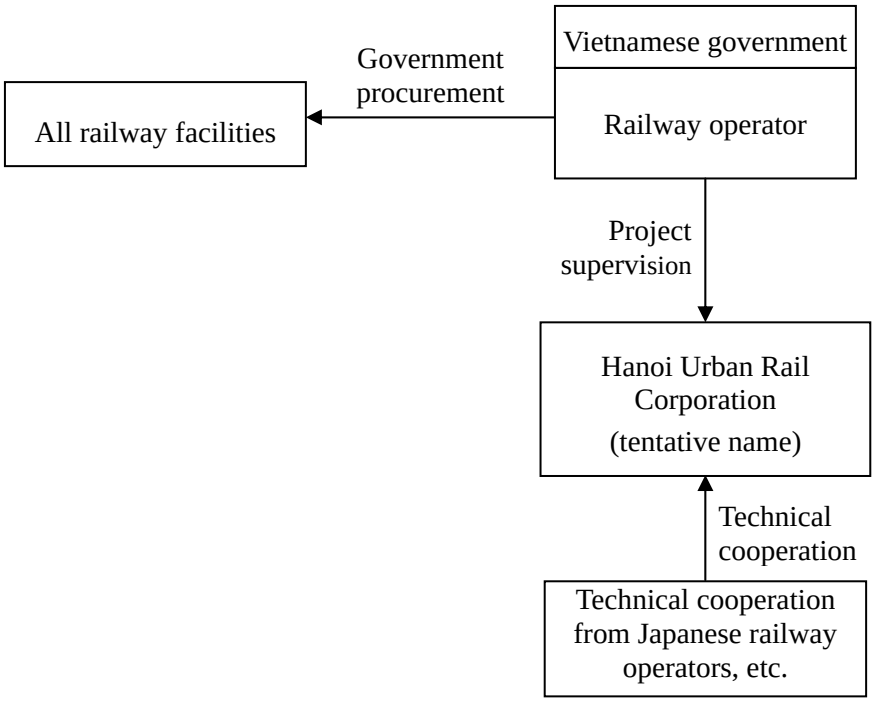
Figure 5.1.4 PPP project scheme in which role of private sector is to lease the facilities procured by the private sector

(2) Scheme where all project costs are serviced by means of government funds

As in the case of (1), in addition to having the Hanoi Urban Rail Corporation (tentative name) carry out O&M, another scheme that reflects the opinion that “procedures will be complex, and rather than a PPP that will ultimately impose a rather high financial burden on the government, there is also the possibility of selecting a yen loan for the entire amount” is conceivable. In this scheme, government liabilities would increase at the time of introduction, but all project costs would be serviced by means of government funds, as in the case of other railway lines.

- Overview of scheme

All of the railway facilities will be developed based on Vietnamese government funds, and the Hanoi Urban Rail Corporation (tentative name) will carry out O&M for Line 5.
It will be possible to reduce the government’s expenditure in total more than through private-sector procurement by incorporating the rolling stock and the AFC system in a low-interest JICA-STEP loan and it will be possible to procure highly reliable Japanese products.



Source: JICA Study Team

Figure 5.1.5 Scheme where all project costs are serviced by means of government funds

(3) Regarding technical cooperation on the Japanese side

Even in the case of development based on the abovementioned “PPP project scheme in which the role of the private sector is to lease the facilities procured by the private sector” and the “Scheme where all project costs are serviced by means of government funds”, it will be possible to establish a system where private-sector companies, including Japanese railway companies that have know-how regarding railway business management, provide technical cooperation, in order to enable the smooth start-up of Line 5 as well as safe and stable operation. As a result, it will be possible to realize the objectives of supporting 1) friendship between Vietnam and Japan; 2) exporting Japanese railway management know-how to Vietnam; 3) rapid and appropriate technology transfer; and 4) the development of local autonomous management at an early stage.

At present, as there are no people with experience regarding electric railways in Vietnam, the following kind of education and training will be provided to field workers that are hired during the period until the completion of facilities for Hanoi Line 5.

1) Basic railway education and prior training in Japan
2) Development of various manuals for Line 5 and training
3) Support for practice train driving before the start of operation

4) Training in recovery from malfunctions and accidents
5) Support after the start of operation

5.1.4 Comparison with proposal scheme and option

It is arranged the merit of Vietnam, and the demerit to Table 5.1.2 about the three above-mentioned options.

Table 5.1.2 Contrast table of proposal scheme and option

	1) The PPP business scheme proposed in this study	2) The finance Lease scheme as the role of private sector	3) The scheme which fixes all the working expenses with government finance
The reduction effect of an external debt	The external debts of 15.4 billion yen equivalent to the private sector supply institution in initial investment are reducible from 3)	The external debts of 15.4 billion yen equivalent to the private sector supply institution in initial investment are reducible from 3)	-
The amount of government gross expenditure	A rental revenue and O&M outsourcing expense occur and the amount of gross expenditure increases 27 billion yen from 3).	Lease payment occurs and the amount of gross expenditure increases 23.5 billion yen from 3).	Since the interest of a yen loan is low, as compared with a PPP business scheme, the amount of gross expenditure becomes the cheapest.
The state of O&M management	Aside from the Hanoi Urban railway corporation (tentative name), It will be managed about five years at the beginning.	It becomes the unified management by the Hanoi Urban railway corporation (tentative name) from the beginning.	It becomes the unified management by the Hanoi Urban railway corporation (tentative name) from the beginning.
Technical assistance of Japan	· Design and surveillance, supply selection. · Employment, and education and training. · O&M contract for five years	· Design and surveillance, supply selection. · Employment, and education and training.	· Design and surveillance, supply selection. · Employment, and education and training.

Source: JICA Study Team

5.2 Construction project implementation system

(1) Establishment of Project Management Unit

To facilitate smooth execution of the Line 5 Construction Project, study team proposes the construction project system shown in Figure 5.2.1. In a railway construction work project, negotiations, schedule adjustments, plan reviews, and various procedures, such as those below, occur one on top of the other in the course of design and construction. Therefore, it is desired that a Project Management Unit (PMU) consisting of suitable persons selected from across all sectors of the Hanoi city should be established under the Hanoi Metropolitan Rail Transport Project Board (MRB) to facilitate working-level adjustments in the Hanoi People's Committee. The following are the primary adjustments and the coordinating and supervising bodies expected necessary for the execution of construction:

- Adjustments in the constructional engineering aspects between Line 5 and Lines 2 and 3, which cross the Line 5 (counterpart: MRB)
- Adjustments in the constructional engineering aspects between the Line 5 and ring roads, which cross the Line 5, adjustment with bus transit (counterpart: DOT)
- Confirmation of the intention of Hanoi City (counterpart: HPC)
- Confirmation of the intention of the body that will come in charge of operation and supervision of the urban railway after its inauguration (counterpart: MRB)
- Site boundary determination work and approval (counterpart: HAUPA)
- Negotiating body for resident relocation and lead implementing body (counterpart: DOLM)
- Identification of technical standards related to railway development (counterpart: VNRA)
- Review of environmental evaluation (counterpart: DONRE)
- Identification of applicable building standards (counterpart: DOC)
- Adjustment in securing of estimate (counterpart: DOF)

(2) Roles and functions of related bodies

1) General Consultant (GC) for the construction of the Line 5

Shall undertake the following services outsourced from the railway operator (Vietnamese government):

(i) Overall management of the project
- Railway construction-related negotiations, arrangements, and coordination with MRB
- Negotiations with related bodies

(ii) Design (basic and detailed designs)
- Surveys and investigations
- Civil engineering structure design, station building and facility design, and electrical design

(iii) Work order placement
- Preparation of work order drawings

(iv) Execution management
- Negotiation with the general contractor
- Infrastructure quality control and process control

(v) Other
- Completion inspection
- Inaugural ceremony-related issues

2) Railway operation contractor (locally established private company)

Shall undertake operation and maintenance and lease procurement of railway facilities (rolling stocks and AFC devices) under the contract with the railway operator (Vietnamese government). Additionally, during the design and construction stages before the inauguration, the Operation contractor shall cooperate in functions contracted out from the Vietnamese government to the GC, such as establishment of specifications, preparation of detailed designs, preparation of tender documents, and execution management, in order to ensure the safety of the railway including the infrastructure part and conduct construction management.

As for the form of organization of the Operation contractor, an appropriate project scheme shall be considered later herein with respect to the actual segregation of duties, type of contract, amount of capital, operating capital, and breakdown of financing.

(i) Cooperation with GC in design, execution, and management of railway construction

- For the infrastructure facilities which are directly related to safety, the railway operation contractor (private SPC) shall confirm equipment specifications and order requirements when general consultants create bidding documents.
- Since overall schedule is relevant for the procurement of rolling stocks and AFC devices, staff recruitment, and training plan, the railway operation contractor (private SPC) needs to cooperate with general consultants.

(ii) Railway operation-related negotiations, arrangements, coordination, and contract conclusion with MRB

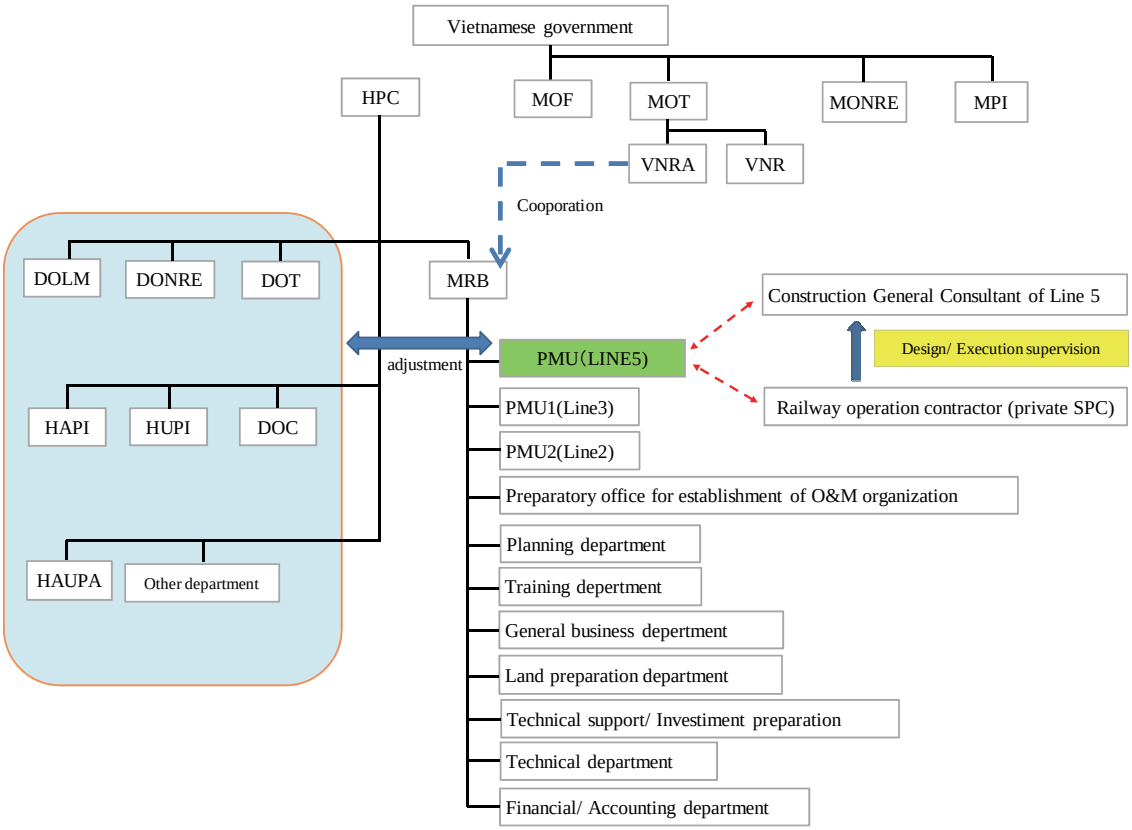
(iii) Procuring and owning rolling stocks and AFC devices and leasing these out to the railway operation contractor (private SPC)

- Regarding the procurement of rolling stocks and AFC devices after inauguration of Phase 1 or in Phase 2, railway operator (Vietnamese government) will be in charge of the procurement.

(iv) Preparation of O&M services

3) MOT and VNRA

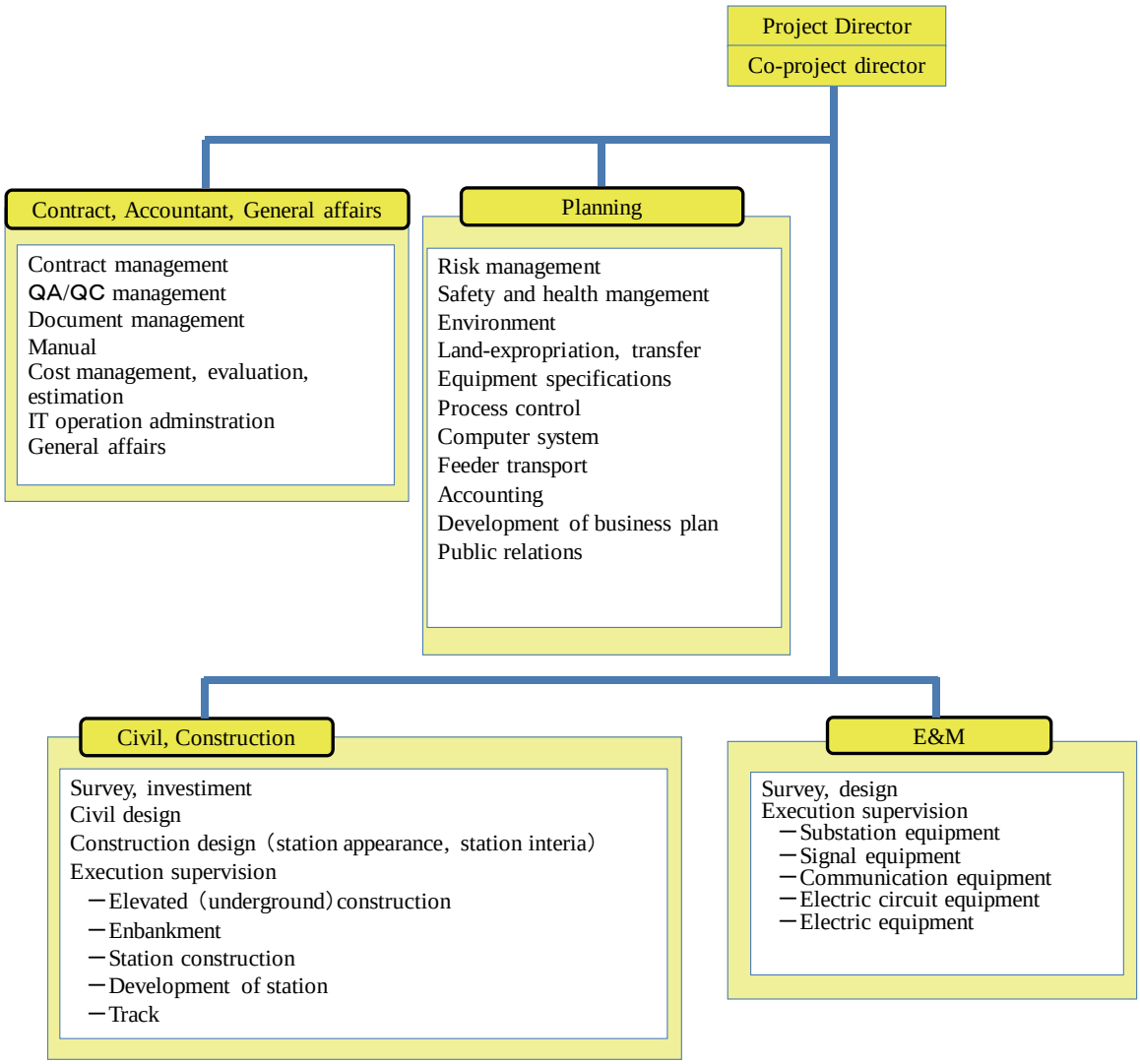
Shall be involved as advisors that have both intimate knowledge of urban railway-related technical standards and other relevant legal regulations in Vietnam and expertise learned through experience with VNR operation and rail accidents.



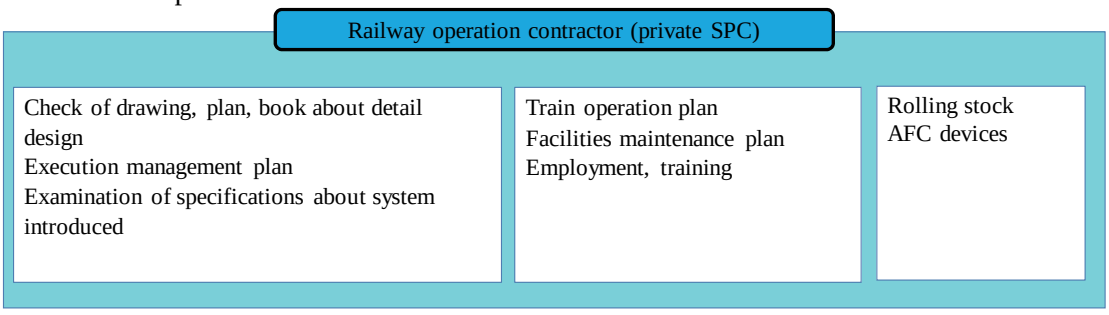
Source: JICA Study Team

Figure 5.2.1 Government implementing bodies for Line 5 construction project and related organizations

■ Organization and Functions of GC for Line 5 Construction



■ Functions of private sector



Source: JICA Study Team

Figure 5.2.2 Conceptual chart of Line 5 construction project system (draft)

5.3 Operation and maintenance framework

5.3.1 Basic concepts

(1) Ensuring the operation of phase 1 section

The railway operation contractor (private SPC) shall prioritize the establishment of the operation framework for the inaugurated section of phase 1. Then, under the guidance of the railway operator (Vietnamese government) supervising the entire urban railway network in Hanoi City, the outsourcing company shall provide Vietnamese employees with knowledge and skills necessary for train traffic control and railway operation and maintenance.

(2) Ensuring independent operation by local personnel at an early stage

More specifically, railway engineers dispatched from Japan shall provide support in training and instruction mainly by on the job training (OJT). Additionally, such a framework shall be developed that Vietnamese employees will become capable of independent operation and maintenance so that headquarter and O&M functions can be handed over to the Vietnamese company (or the Vietnamese government).

(3) Commencement of independent operation (six years after the inauguration)

After the sixth year from the inauguration when local personnel are capable of independent operation under the established framework, Line 5 shall be transferred to the Hanoi City Urban Railway Operating Company (tentative name) in order to integrate operations with other lines. In addition, the basic contract shall continue until the time of completion of the lease contract on railway facilities (for 15 years.)

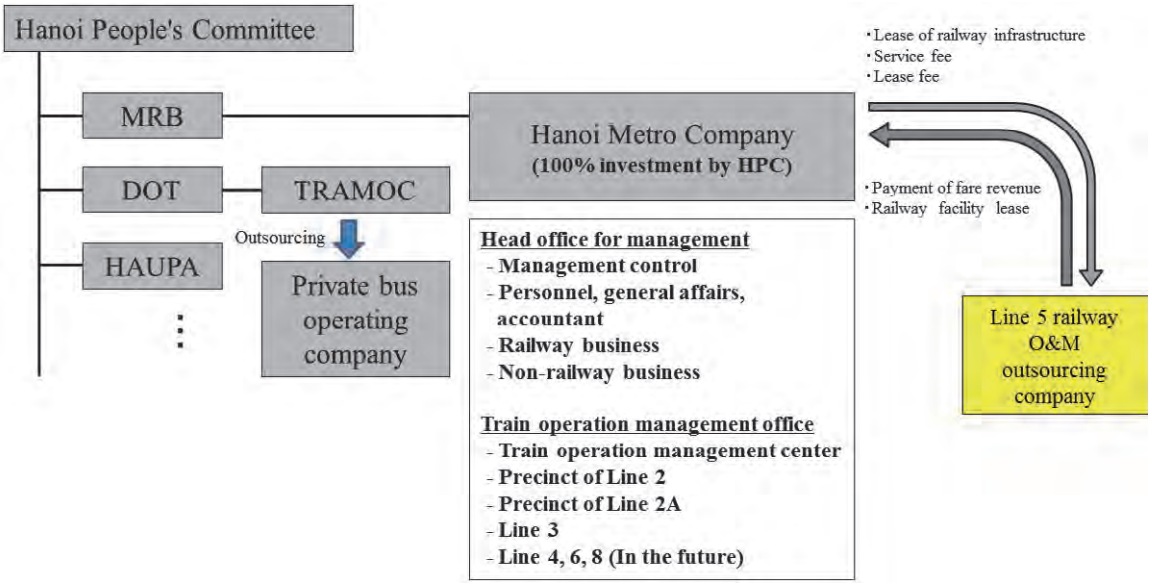
(Reference) Schedule of inauguration of Hanoi City Urban Railway Lines

Summer 2015:	Line 2A
2017:	Line 3
2018:	Line 2
Summer 2021:	Line 5

5.3.2 Implementation of operation and maintenance

Though final approval by the Hanoi City People’s Committee has not been obtained yet, research is underway on the establishment of the urban railway operating organization (provisional name: the Hanoi City Urban Railway Operating Company). According to an informed source, an agreement on the basic direction has been struck with the MRB, the supervisory body.

Operation and maintenance activities for the Line 5 shall be performed in accordance with the operation policy, service level, technical and safety standards, and unified fare system determined by the Hanoi City Urban Railway Operating Company to deliver to users the benefits of cost-effectiveness, safety, and passenger-friendly services. A PPP approach is proposed to promote the railway development of Line 5.



Source: SAPI report

Figure 5.3.1: Business scheme for operation outsourcing

5.3.3 Content and framework of contracted operation and maintenance business

(1) Scope of contracted operation and maintenance services (refer to Table 5.3.1)

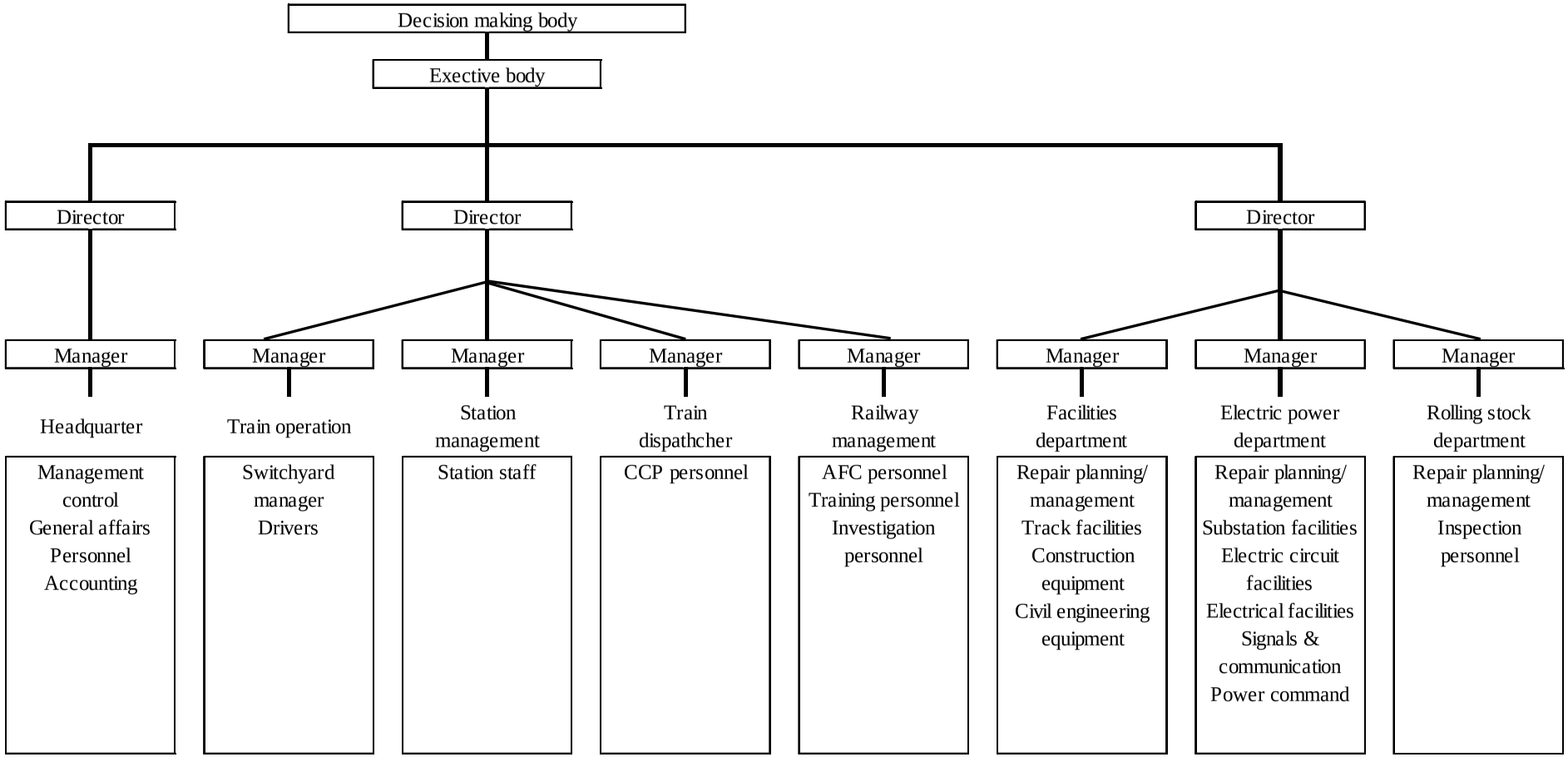
For the descriptions of the basic contracted services, refer to Table 5.3.1. The operations and traffic control services are provided to ensure that trains will run according to the timetable approved by the railway operator (Vietnamese government). The fare collection agency manages each station and collects fares on behalf of the railway operator (Vietnamese government). The daily routine inspections and facility maintenance services are provided as such for infrastructural facilities. If any daily inspection reveals that any repair, improvement, or replacement of equipment is necessary, a separate contract may be concluded for the additional service. The terms and conditions for natural disaster recovery work shall be separately negotiable.

Table 5.3.1 Descriptions of basic contracted services

Service category	Outsourcing
Operations and traffic control	Outsourced from the railway operator (Vietnamese government) to the railway operation contractor (private SPC) (To be included in operation and maintenance fee)
Fare collection agency	
Railway facility operation and maintenance	
Daily routine inspections	
Replacement of consumables as required by inspection results	
Repair and maintenance work	Outsourced to the railway operation contractor (private SPC) at the discretion of the Owner and the railway operator (Vietnamese government) (To be excluded from operation and maintenance fee)
Equipment replacement/improvement work	

Source: JICA Study Team

* The terms and conditions for recovery work from force majeure caused by natural disasters shall be separately negotiable.
* Applicable to all of infrastructural facilities (infrastructure), electrical facilities (infrastructure), AFC and associated equipment (operation), and rolling stocks (operation).
* Facility maintenance work is performed for the recovery of normal operations and functions by replacing damaged or deteriorated parts identified during “daily inspections” and “periodic inspections.”



Source: JICA Study Team

Figure 5.3.2 Concept of O&M organization (draft)

Table 5.3.2 Descriptions of Operation and Maintenance Services (draft)

Administrative activities			Outline	Required skills
A	Headquarter			
		Personnel	Recruitment, labor control, safety and hygiene control	Work experience in personnel affairs and safety and hygiene management Work experience in general affairs
			Specification of working conditions	Work experience in personnel affairs and safety and hygiene management Work experience in general affairs
		Accounting	Settlement of accounts, receipt and disbursement of cash, cash management, slip authentication	Work experience in financing and accounting
			Asset management	Work experience in financing and accounting
			Compilation of Divisions' capital investment plans and income and expenditure plans	Work experience in financing and accounting
			Transportation performance reporting and transportation income budgeting	Work experience in financing and accounting
		General affairs	Oversight of the income and outgo of clothing, lent items, and consumables; and storage of the same	Work experience in general affairs
			Affairs concerning bylaws, rules, and in-house regulations	Experience in preparation of regulations
			Investigation and research of laws and regulations	Work experience in general affairs
			Company seal management	Work experience in general affairs
			Office management	Work experience in general affairs
			Litigations, contracts, and other legal affairs	Work experience in general affairs
			Issues under control of other divisions	
B	Transportation Division			
	Transportation	Railway management	Crew and station staff shift scheduling	Competence to prepare crew and station staff shift schedules
			Training-related tasks	Work experience in human resources development
			AFC-related tasks	Experience in station work system operation
			Investigation-related tasks (ex-post actions for operation accidents and liaising for the division)	Work experience in ex-post actions and negotiations
		Train Operations	Train driving and security	Actual train driving experience
			Handling of passengers	
			Training of train drivers (OJT) * Training and certification at the Training Center shall be outsourced.	Actual train driving experience Work experience in human resources development (OJT)
			Emergency procedures for train accidents	Actual train driving experience
			Ensuring train maneuvers in yards	Actual train driving experience
			Daily cleaning of the insides of vehicles	
		Stations	IC ticket vending, fare adjustments, and transactions	Work experience in face-to-face ticket vending, fare adjustments, and transactions Work experience in face-to-face vending
			Training of train personnel (OJT)	Railway station work experience Work experience in human resources development (OJT)
			Management of station premises	Railway station work experience
		Train dispatching	Train dispatching	Actual train driving experience
			Training of train dispatchers (OJT)	Work experience in train dispatching Work experience in human resources development (OJT)
C	Maintenance Division			
	Facilities	Track maintenance	Planning and implementation of maintenance plans for contact wire, contact wire structures, and track facilities	Work experience in engineering work planning
			Local management of railway lands	Work experience in land management
		Civil engineering and construction	Planning and implementation of railway building maintenance plan	Work experience in engineering work planning
			Control and operation of maintenance machines and vehicles	
	Power utilities	Power	Planning and implementation of maintenance plans for substation facilities and high-voltage distribution and feeding cables	Work experience in electric power planning
			Planning and implementation of maintenance plans for lighting, air-conditioning, firefighting, and other electrical facilities	Work experience in electrical facilities maintenance
			Control and maintenance of electric command system	Work experience in electric power facilities maintenance
			Control and maintenance of electric power facilities	Work experience in electric power facilities maintenance
			Electric power dispatching	Work experience in electric power dispatching
		Signaling and communication	Planning and implementation of maintenance plans for signal and safety equipment and communication facilities	Work experience in signal and security equipment planning
			Control and maintenance of train traffic control system	
	Rolling stocks	Rolling stocks	Planning and implementation of vehicle inspection plan	Work experience in inspection planning
			Control of vehicles, sheds, workshop facilities and inspection facilities	
			Planning and implementation of vehicle operation plan	Work experience in operation planning
			Vehicle cleaning	Experience in cleaning

Source: JICA Study Team

(2) Primary daily inspection plan

1) Summary of civil and architectural facilities maintenance plan

Category	Main relevant facilities and equipment	Inspection interval
Facility maintenance	All facilities	Daily
Monitoring duties	All facilities	Daily
Troubleshooting of faults and failures	All facilities	Daily
Periodic general inspection	Tunnels, bridges, and other structures	Once or more a year
	Checking stations and buildings for abnormalities	Once or more a year
	Checks on functions and damages	Once or more a year
Other statutory inspections		―――

Source: JICA Study Team

2) Summary of track facility maintenance plan

Category	Relevant facilities and equipment	Inspection interval
Facility maintenance	All facilities	Daily
Monitoring duties	All facilities	Daily
Troubleshooting of faults and failures	All facilities	Daily
Track condition inspection	Track displacement, vibration of trains, and continuous welded rails	4 times or more/year
	Rails, close inspection of turnouts, expansion joints, and sleepers	Once or more a year
	Expansion gaps	Twice or more a year
Track material inspection	Damaged or corroded materials, tie inspection, and solid bed tracks with resilient ties	Once or more a year
General inspection car		Once or more a year
Patrol inspection		Once or more/20 days
Other statutory inspections		―――

Source: JICA Study Team

3) Summary of power utility maintenance plan

Category	Relevant facilities and equipment	Inspection interval
Facility maintenance	All facilities	Daily
Monitoring duties	All facilities	Daily
Troubleshooting	All facilities	Daily
Checks and inspections of electric power facilities	Contact wires; transformers to be used for train operation; equipment capable of protecting equipment, contact lines, and other facilities at substations at a time of emergency; and other important electric power facilities	Once or more a year
	Electric power facilities other than those listed above	Once or more a year
Checks and inspections of operation safety facilities	Devices to ensure block, etc.; devices to ensure the interval between trains; rail signal indication devices; apparatus to interlock signals; automatic train decelerator or stopper; and other important operation safety facilities	Once or more a year
	Operation safety facilities other than those listed above	Once or more a year
Checks and inspections of substation facilities	Rectifiers and transformers	Once or more a year
Checks and inspections of electric power distribution lines and facilities	High-voltage power distribution lines and substations	Once or more a year
Checks and inspections of contact wire facilities	Feeders and return circuits; and contact wires	Once or more a year
Checks and inspections of signal equipment	CBTC, signal devices, switch-and-lock movement apparatuses; railway equipment; electronic interlocking devices; ATO; and ATC	Once or more a year
Checks and inspections of communication facilities	Digital train radio system; optical transfer devices; and telephone switchboards	Once or more a year
Patrol inspection		Three or more a year
General inspection car	Trolley wire abrasion loss Trolley wire height/deflection; and hard spots, etc. Mutual distance measurements at insulated overlaps or crossovers Continuous measurement of contact loss rate (current-type)/contact force	Once or more a year
Other statutory inspections		———

Source: JICA Study Team

4) Outline of the rolling stock maintenance plan

(a) Periodic inspections

○ 10-day interval inspection

Visual inspections and simplified measurements performed, with cars connected to each other, to ensure normal operation, and replace consumables.

○ Trimonthly inspection

Performed, with cars connected to each other, to check functions, insulation resistance, and the like. Visual inspection of parts conditions and replacement of consumables shall also be performed.

○ Overhauls

Bogies and car bodies shall be separated using lifting jacks to remove and disassemble electrical, pneumatic, and other equipment installed on the bogies and car bodies to perform close inspection and maintenance and parts replacement. It should be noted that inspections, etc., of these pieces of equipment shall be performed not at the same intervals; but rather the overhauling of important pieces of equipment shall be performed independently of general overhauling and at different intervals determined suitably for the degree of importance or deterioration.

Table 5.3.3 Standard schedule of periodic inspections (draft)

Category	Location	Interval	Required time
10-day interval inspection	Inspection pit	10 days (provisionally 7 days)	1 hour/train
Trimonthly inspection		90 days	1 day/train
Overhaul (important part)	Factory	4 years or 0.6 million km traveled	2 to 3 months/train
Overhaul (general part)		8 years	2 to 3 months/train

Source: JICA Study Team

(b) Unscheduled inspections

○ Wheel turning

Wheels deformed due to wear from travel or local wear (flattening, etc.) from slipping or skidding shall be subjected to lathe turning (under floor wheel lathe) for shape correction.

○ Wheel replacement

Wheels shall be replaced when reaching the limit of usability as the result of undergoing wheel turning. When the timing does not coincide with the overhaul interval, a lifting traverser on the casual repair track shall be used to separate the relevant bogie only and replace its wheels.

Table 5.3.4 Other major tasks

Category	Location	Interval	Required time
Modification machining of wheel	Lathe shop	1 year or when deformed	0.5 days/vehicle
Wheel replacement	Casual repair track	When the limit of usability is reached (approx. 10 years)	1 day/vehicle
Extra inspection	Factory or inspection yard	After any serious accident or significant modification	

Source: JICA Study Team

(c) Cleaning tasks

Table 5.3.5 Standard cleaning schedule (draft)

	Location	Interval	Required time	Descriptions
Daily cleaning	Storage track	Daily	10 minutes/train	Trash collection using brooms
Car washing	Car-washing track	5 days	20 minutes/train	Cleaning of outside plates using an automatic car washer
Monthly cleaning		30 days	2 hours/train	Mopping inside cars; window wiping; and cleaning of outside plates from a train-washing stand

Source: JICA Study Team

(3) Outline of the train operation system

The Train Operation Department provides daily train services on behalf of the Railway project implementing body. To provide train services, train dispatchers in charge of controlling the traffic of all trains, yard personnel in charge of signal indication, and train crews are necessary. Usually, the ATO system automatically operates trains, saving the need of daily train routing and signal indication. However, if automatic operation becomes unavailable due to an emergency, it is necessary to ensure that service control personnel will issue directions, yard personnel will operate signals, and train crew will manually operate trains. There is no telling what happens when. Therefore, personnel must be trained on a daily basis to develop preparedness for any kind of situations. It is also necessary to keep train crew stationed at the Maintenance Center just in case of an emergency.

It is also necessary to secure personnel not directly involved in train operation, such as personnel in charge of attendance management of train crews, personnel in charge of providing guidance on duties, and personnel in charge of preparing train crew shift schedules according to the train schedule prepared by the railway operator (Vietnamese government).

Table 5.3.6 Duties of Train Operations Dept. and train dispatchers

Department	Position	Work content
Train Operations Dept.	Master for Training/problem solving	Instructing crew manager and train crew; handling passenger complaints/rage incidents
	Administrative Mater	Attendance management of Train Operations Dept. personnel
	Switchyard Master	Control of operation sequences (signal indication, etc.) at depot
	Assistant Master	Assistance of other masters
	Train driver	Train driving
Train dispatchers	–	Train traffic control

Source: JICA Study Team

(4) Outline of the station management system

The Station Department vends tickets and collects train fares on behalf of the railway operator (Vietnamese government). Currently, it is planned to sell tickets face to face. Therefore, each station must be manned by at least one station official.

The operating manual for AFC devices shall be prepared after the core Vietnamese staff candidates complete OJT training programs aboard and the basic training course. While AFC devices manufacturer shall be asked to troubleshoot faults and failures of AFC devices, station personnel shall perform non-complicated maintenance and equipment cleaning tasks.

Light cleaning of the premises of stations will be outsourced to improve efficiency. Housekeeping of staffed areas shall be the responsibility of station personnel.

Table 5.3.7 Duties of Station Department personnel

Department	Position	Work content
Station Department	Deputy stationmaster	Instructing station personnel and handling passenger complaints/rage incidents at interlocking stations
	Station personnel	Train fare collection and passenger information services

Source: JICA Study Team

5.4 Annual operation and maintenance costs

5.4.1 Overview

Vietnam has no experience with operation and maintenance of urban electric railways. Hence, the annual operating and maintenance costs incurred on Line 5 after its inauguration was estimated based on the actual figures of Japanese railway operators. The following costs were assumed to estimate the operating and maintenance costs:

(1) Labor costs for local personnel
(2) Labor costs for Japanese personnel
(3) Annual power bill
(4) Spare parts costs
(5) Outsourcing expenses
(6) General expenses
(7) Costs incurred during preparation for inauguration of Line 5

5.4.2 Descriptions of the estimation parameters

(1) Local staff costs

The local staff costs at the inauguration of phase 1 and that of phase 2 were estimated as follows.

The required number of employees was estimated, as in Table 5.4.1, based on the number of trains, the condition of installed equipment, experience with operation in Japan, etc. The labor costs were estimated based on statistics published by JETRO.

Table 5.4.1: Number of local employees

Unit: persons

	Phase 1	Phase 2
1. Headquarter	8	10
2. Railway Management Dept. & CCP Dept.	6	11
3. Train Operations Dept.	47	72
4. Station Management Dept.	127	216
5. Maintenance Division	78	185
Total	266	494

Source: JICA Study Team

* Phase 1 … To be operated with four-car trains shuttling from Stations 1 to 10
Phase 2 …To be operated with six-car trains shuttling from Stations 1 to 17

Table 5.4.2 Rank-based reference salaries of local employees

Unit: USD

Rank	Monthly reference salary	Employer burden rate (22%) + bonus worth two months' salary + overtime payment for 15 extra hours per month + reserve for retirement allowances
A	1,500	2,353
B	1,200	1,883
C	1,000	1,569
D	650	1,020
E	500	784
F	400	628
Interpreter	500	784

(Excluding price escalation)
Source: JICA Study Team

(Reference) Table 5.4.3 Average monthly salaries and wages in Hanoi City, Vietnam

Manufacturing industry (Hanoi)		Non-manufacturing industry (Hanoi)	
Job type	Monthly pay (USD)	Job type	Monthly pay (USD)
General worker	96	Staff	372
Engineer (mid-level)	265	Middle manager (section manager)	1,013
Middle manager (section manager)	621		

Source: Comparative survey of investment-related costs in major cities and regions in Asia and Oceania (JETRO: Apr. 2011)

(Reference) Table 5.4.4 Monthly Staff Salary per SAPI Report

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

Source: Final Report of HCMC SAPI

Table 5.4.5 Social insurance premium burden ratios

		2010 to 2011		2012 to 2013		2014 and after	
		Employer	Employee	Employer	Employee	Employer	Employee
Social insurance	Sickness	3%		3%		3%	
	Maternity/childcare leave						
	Occupational accident and disease compensation	1%		1%		1%	
	Pension	12%	6%	13%	7%	14%	8%
	Death benefit						
Health insurance		Employer = 3% and employee = 1.5%					
Unemployment insurance		Employer = 1%, employee = 1%, and government = 1%					
Total burden ratio		20%		21%		22%	

Source: Detailed Enforcement Regulations concerning Labor Contract under the Labor Law
- Government Ordinance No. 44/2003/ND-CP
- Ministerial Ordinance No. 17/2009/TT-BLDTBXH
- Ministerial Ordinance No. 21/2003/TT-BLDTBXH

■ Overtime
- Eight hours per day and 48 per week max.
- The upper limits for overtime are four hours per day, 30 hours per month, and 200 hours per year.
- Extra pay … Usually 50 percent higher than normal wage, 30 percent extra pay for late shift hours (Northern region: 10 p.m. to 6 a.m.; Southern region: 9 p.m. to 5 a.m.)
- 100 percent extra pay for work on weekends; and 200 percent extra pay for work on holidays
- The number of statutory annual paid holidays is 12 days per year. After five years of continuous employment, an additional paid holiday is added. The maximum number of annual paid holidays is 15 days per year (under Articles 74 and 75 of the Vietnamese Labor Law).

■ Retirement allowance

- The Labor Law mandates that a company must pay a retirement allowance, calculated on the basis of 50 percent of the monthly salary for each of the years employed, to any employee who leaves the company after one or more years of continuous employment including the probationary employment period.

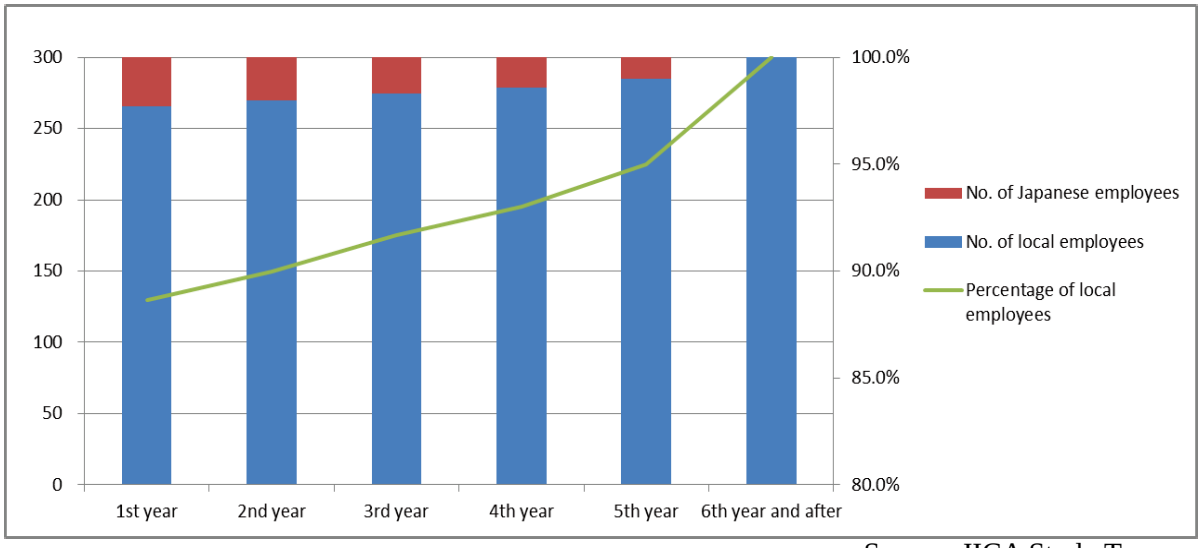
(2) Role of Japanese employees

Immediately after the inauguration, Japanese engineers shall lead and train the core local engineer candidates and then shall gradually give more responsibilities to local engineers so that the local engineers will stand on their feet within approximately five years after the inauguration.

The scope of the technology transfer agreement covers the OJT training of field workers on the aspects of work quality and safety and guidance and supervision of the core staff. It is difficult to describe in a manual some work skills, such as failure and accident handling or negotiations with the equipment manufacturer for compensation for defects and the like. It is expected that these difficult factors may require extension of the stay of railway engineers and specialists dispatched from Japan.

In the following, Figure 5.4.1 shows the transition in the numbers of local and Japanese employees. As shown in the figure below, expertise on operation and management shall be transferred gradually from Japanese employees to local employees, and operations shall be transferred to the local entity in the sixth year after the inauguration.

Figure 5.4.1 Transition in numbers of local employees



Source: JICA Study Team

(3) Power utility bill

A preliminary calculation was made of the power consumption by the Line 5 based on the operational electric power consumption and auxiliary electric power consumption incurred with railway operation in Japan. Here, “operational electric power consumption” is defined as the amount of electric power supplied through contact wires; and “auxiliary electric power consumption” as the amount of electric power used in the stations, office, depot, and the like.

For the EVN’s electricity unit price for factories, refer to Table 5.4.7.

Table 5.4.6 Estimated annual power consumption by the Line 5

Unit: kWh

	Phase 1 (in 2021)	Phase 2 (in 2030)
Total power consumption (kWh) (operational + auxiliary)	22,400,000	46,100,000
Power utility bill (100 million VND)	31,960	65,827
Power utility bill (1,000 USD)	1,534	3,161

Source: JICA Study Team
(Excluding price escalation)
VND = 0.00005 USD

*Phase 1: Station 1 to Station 10; and 4-car trains, Phase 2: Station 1 to Station 17; and 6-car trains

(Reference) Table 5.4.7 EVN's electricity unit price (for factories)

	Electricity unit price: VND/kWh	Applicable hours
a) Normal hours	1,184	4:00 to 9:30, 11:30 to 17:00, and 20:00 to 22:00 (Mon to Sat); and 4:00 to 22:00 (Sunday)
b) Off-peak hours	746	22:00 to 4:00
c) Peak hours	2,156	9:30 to 11:30 and 17:00 to 20:00 (Monday to Saturday)
Average unit price (operating hours of Line 5)	1,430	Operating hours: 5:00 to 23:00 ((a) × 12 + (b) × 1 + (c) × 5)/18

Source: Notice No. 17/2012/TT-BCT
Voltage level: 22 kV to 110 kV or less as of 01 July 2012, and onward

(4) Spare parts costs

Spare parts for vehicles and electrical and mechanical facilities introduced for use in Line 5 will be generally used in either of the following two types of cases:

Cases where spare parts are used:

1) Maintenance of the functions of installed equipment by regular replacement in accordance with equipment-specific inspection plans
2) Replacement due to equipment faults or failures

Generally speaking, equipment becomes more prone to frequent failures due to the increase in deterioration in proportion to the time elapsed from the point of time of its introduction. Assuming that each piece of equipment is replaced at the end of its service life under the Japanese Finance Ministry Ordinance on Durable Years of Depreciable Assets (service life of electric train car = 13 years; average service life of electrical and mechanical facilities = 8 years), the estimated annual average spare parts costs for railway vehicles, electrical facilities, and maintenance vehicles shall be respectively 1.5 percent, 1.0 percent, and 2.5 percent of the amount of initial investment.

It should be noted that, because none of the manufacturers of equipment used in the construction of the Line 5 has any parts supply hubs in Vietnam, where there is no urban railway operating, most spare parts will have to be imported from Japan.

(5) Outsourcing expenses and maintenance contract costs

Work that does not happen regularly and requires the recruitment of many employees shall be outsourced. In addition, for the maintenance of system-related basic facilities, a maintenance contract shall be concluded with manufacturers.

Table 5.4.8 Costs incurred by outsourced services and maintenance contracts

Unit: 1,000 USD

I) Outsourced services costs			after 2021: 2,233 after 2026: 2,294
(Breakdown)	Specific items	Period	
Civil engineering facilities repair work	Roadbeds, viaducts, fencing, etc.	Assuming work of first 10 years	
Track maintenance facilities repair work	Replacement of rails, sleepers, turnouts, etc.	Assuming work of first 10 years	
Architectural facilities repair work		Assuming work of first 10 years	
Cleaning of station premises and insides of vehicles			
II) Maintenance contract costs			1,165
(Breakdown)	Specific items		
Signal equipment maintenance contract	CCT and CBTC		
Electric power equipment maintenance contract	Electric power control system		
AFC maintenance contract	Automatic fare collection system		
IT system maintenance contract	Personnel and accounting	20% of initial investment per 5 years	
Total			after 2021: 3,398 after 2026: 3,459

(Excluding price escalation)

Source: JICA Study Team

(6) General expenses

The general expenses expected to be incurred mainly include consumable costs, clothing costs, water utility bills, fuel and oil costs, communications and transportation costs, fees, insurance premiums, and vehicle and station cleaning costs. The estimated total amount of general expenses is 30 percent of the total amount of labor costs, power utility bills, spare parts costs, repair costs, and outsourced maintenance services costs.

(7) Costs of liability insurance on train operation and fire insurance

The following insurance shall be attached in order to prepare for liability for damages of persons or property caused by expected accidents during train operation.

Table 5.4.9 Nonlife insurance rate (assuming insurance amount as 1 billion JPY)

	Insurance rate	Details
Liability insurance on train operation	3 %	For compensation in an accident paid for bodily injury liability and property damage liability due to railway operation.
Fire insurance	0.8 %	For compensation for damage to facilities due to fire, lightning, etc.

Source: JICA Study Team

(8) Management costs and entrepreneur's compensation

The management costs incurred with O&M contracts undertaken are estimated as 20 percent of direct labor costs.

The entrepreneur's compensation is estimated as 15.1 percent of the total cost according to the result of the study on establishment of basic case for the railway operation contractor (private SPC), as shown in Chapter 6.2.2.

5.4.3 Operation and maintenance fees

Table 5.4.10 shows the results of the preliminary calculation based on the above conditions. Payment of O&M fees from the railway operator (Vietnamese government) is expected to utilize an adjustment method with payment of a rough estimate for three months in advance to reduce risks.

Table 5.4.10 Result of preliminary calculation of operation and maintenance costs (single year-basis)

Unit: 1,000 USD

Item	Year 2021 and after	Year 2026 and after	Year 2030 and after
1. Labor costs	11,506	3,071	4,576
2. Management costs	2,301	—	—
3. Power utility bills	1,534	1,534	3,161
4. Spare parts costs	7,259	7,259	13,736
5. Outsourcing expenses and maintenance contract costs	3,641	3,641	4,915
6. General expenses , Costs of liability insurance on railway operation	7,643	5,113	8,377
Sub-total	33,886	20,619	34,765
Compensation (15.1%)	5,117	—	—
Total	39,003	20,619	34,765

(Excluding price escalation)

(Probable extra costs) natural disaster recovery costs and repair/improvement/replacement costs

Source: JICA Study Team

5.4.4 Work plan for recruiting, training, and preparations for the inauguration (Refer to Tables 5.4.14, 5.4.15, and 5.4.16)

Currently in Vietnam, there are no existing human resources with experience in electric railways. Accordingly, sufficient education and training shall be provided to field workers employed before the completion of the facilities of the Line 5. The pre-inauguration preparations mainly include the following:

(1) Basic railway training and prior training in Japan

An appropriate number of core staff candidates to be engaged in the training and guidance of the railway field workers of each division shall be selected from among local employees and sent to Japanese railway operators to receive basic and on-the-job training on railway duties so that they will grow into the core members of the workforce. The training period for Engineering Department Leaders shall be particularly long because these persons must develop a diverse range of professional knowledge and skills, including the understanding of facilities, equipment operation proficiency, and troubleshooting of failures.

(2) Establishment of manuals on the Line 5 and provision of on-the-job training

Japanese railway engineers (24 persons) shall be dispatched to Vietnam as OJT instructors. They shall directly train and educate the trainees to develop job proficiency in the actual operation of the Line 5, to understand and operate the installed equipment, and to become able to handle

accidents and failures. The mission of the OJT instructors is to provide the following training to the local staff and prepare them for the inauguration of the Line 5:

- Professional skills training on the railway system for the Line 5
- Establishment of operational and technical regulations and various manuals (to be prepared by the core staff)
- Classroom and on-site training using the established documents
- Follow-up training for department leaders dispatched to Japan for prior training

Table 5.4.11 Documents to be established (Example)

Type	Title
Provisions	Provisions on Train Driving Provisions on Civil Engineering Provisions on Station Duties
Directions notes	Directions Notes on Train Driving Directions Notes on Contact Wire Maintenance Directions Notes on Track Maintenance Directions Notes on Electric Facilities Directions Notes on Train Maintenance
Detailed regulations and standards	Civil Engineering Safety Standards Electrical Safety Standards Detailed Regulations on Electrical Facilities (signals, communication, transformers, cable run, and other facilities) Operational Staff Work Standards Station Staff Work Standards Train Crew Notebooks Regulations on Passenger Operations
Maintenance documents	Summary of Equipment Inspection Interval Table Equipment Checklists Inspection Manuals Procedures for AFC tasks

Source: JICA Study Team

(3) Support to training runs before the inauguration of the Line 5

During the period between the completion of both the railway construction work and the acceptance procedure by the Vietnamese government and the inauguration of the Line 5, the core staff shall use the actual Hanoi Line 5 for training runs and shall educate and train field workers to develop a good understanding and proficiency with the installed equipment and to become able to handle accidents and failures.

First, the local core staff shall enroll in skills training courses and the training in other lines, then obtain drivers' licenses. After that, they shall be in charge of train operations as drivers on other lines and accumulate experience.

With Japanese staff, in addition, they shall attend lectures specialized on Line 5 to acquire knowledge of the line from one month before the line can be utilized. Test will be conducted for one month. Then, they shall train local train drivers for two months.

Similar to the core staff, local train drivers shall take courses and obtain licenses. Next, training course programs on Line 5 shall be provided, and drivers shall participate in training through test runs by receiving guidance from local core staff and Japanese engineers for two months. As a reference, the number of hours in the skills training course program provided by Japanese laws and regulations is shown in the table below.

Table 5.4.12 Number of hours of practical training in Japan

Subject	Number of hours
Basic training course	14
Onboard training course	344
Inspection before departure from depot	7
Emergency procedures	35
Total	400

Source: Management of ministerial ordinance on train driver's license

(4) Failure and accident recovery training

To ensure safe and stable operation and maintenance of the railway system, it is important to improve the skills and competence of field workers and transfer technical expertise to subsequent generations. Crisis simulation exercises that train the local employees to develop preparedness for properly coping with train accidents, such as derailment or natural disasters and cataclysms, shall be conducted at least once a year, not only before but also after the inauguration of the Line 5.

(5) Support after the inauguration of the Line 5

Japanese railway engineers shall be stationed in Vietnam for a while after the inauguration of Line 5 to provide comprehensive onsite support to the respective divisions and shall be called back to Japan one by one as appropriate for the degree of work proficiency developed by local employees.

(6) Design and execution management support

Support shall be provided for the functions contracted out from the Vietnamese government to the GC, such as establishment of specifications, preparation of detailed designs, preparation of tender documents, and execution management, in order to ensure the safety of the railway including the infrastructure part.

5.4.5 Expenses for preparation for the inauguration of the Line 5

Expenses incurred with the implementation of the work plan in Tables 5.4.14, 5.4.15, and 5.4.16 shall be paid for at piece rates.

Table 5.4.13 Expenses for preparation for the inauguration

(Breakdown) Unit: 1,000 USD

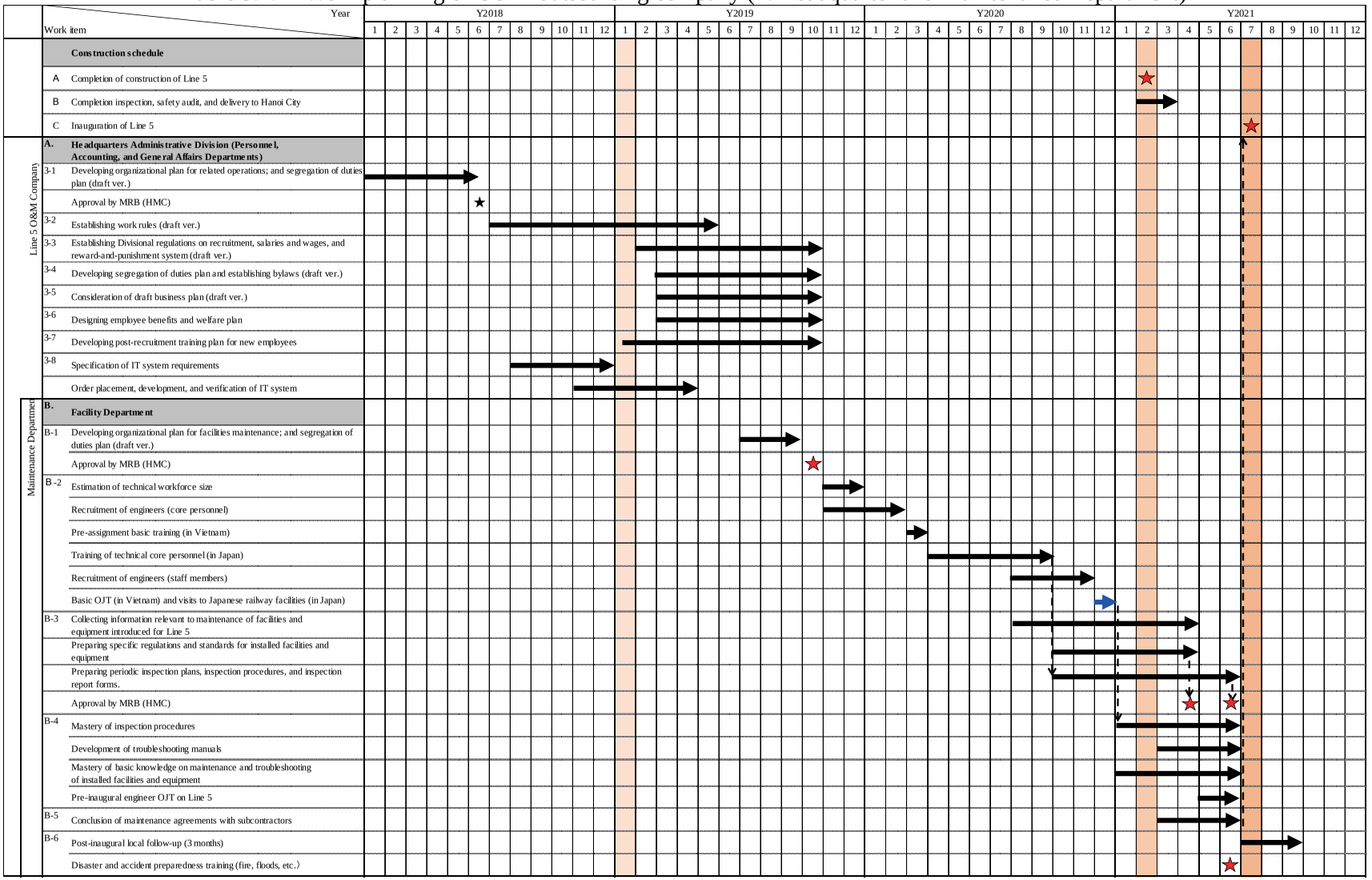
Preparation item	Amount
1) Headquarters management costs - Organization expenses - Office rent and driver's wages - HQ IT system construction (Personnel, Accounting, Drawing management, Facility management, etc.) - Recruitment costs (monthly salary × 2 months per person)	5,078
2) Labor costs	28,474
3) Business consignment expenses - Expenses for classroom training course materials (200,000 words) - Support to preparation of operation and maintenance manuals and checklists for Line 5 - Pre-inaugural failure and accident recovery training - Post-inaugural startup support	1,098
4) Design and execution management support expenses	4,490
5) General expenses	1,321
Subtotal	40,462
Compensation (15.1%)	6,110
Total	46,572

Source: JICA Study Team

(Excluding price escalation)

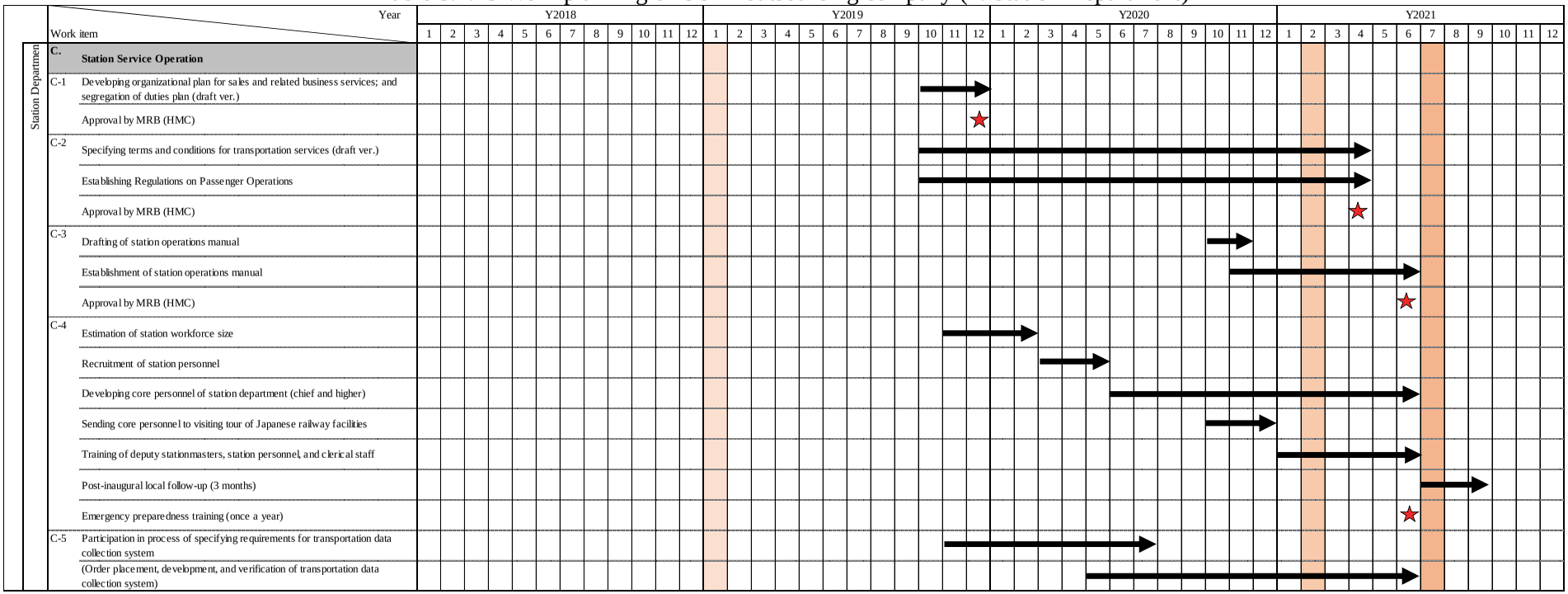
(Probable extra costs) costs for training of train drivers in other lines during construction of infrastructure

Table 5.4.14 Work planning of O&M outsourcing company (1: Headquarter and Maintenance Department)



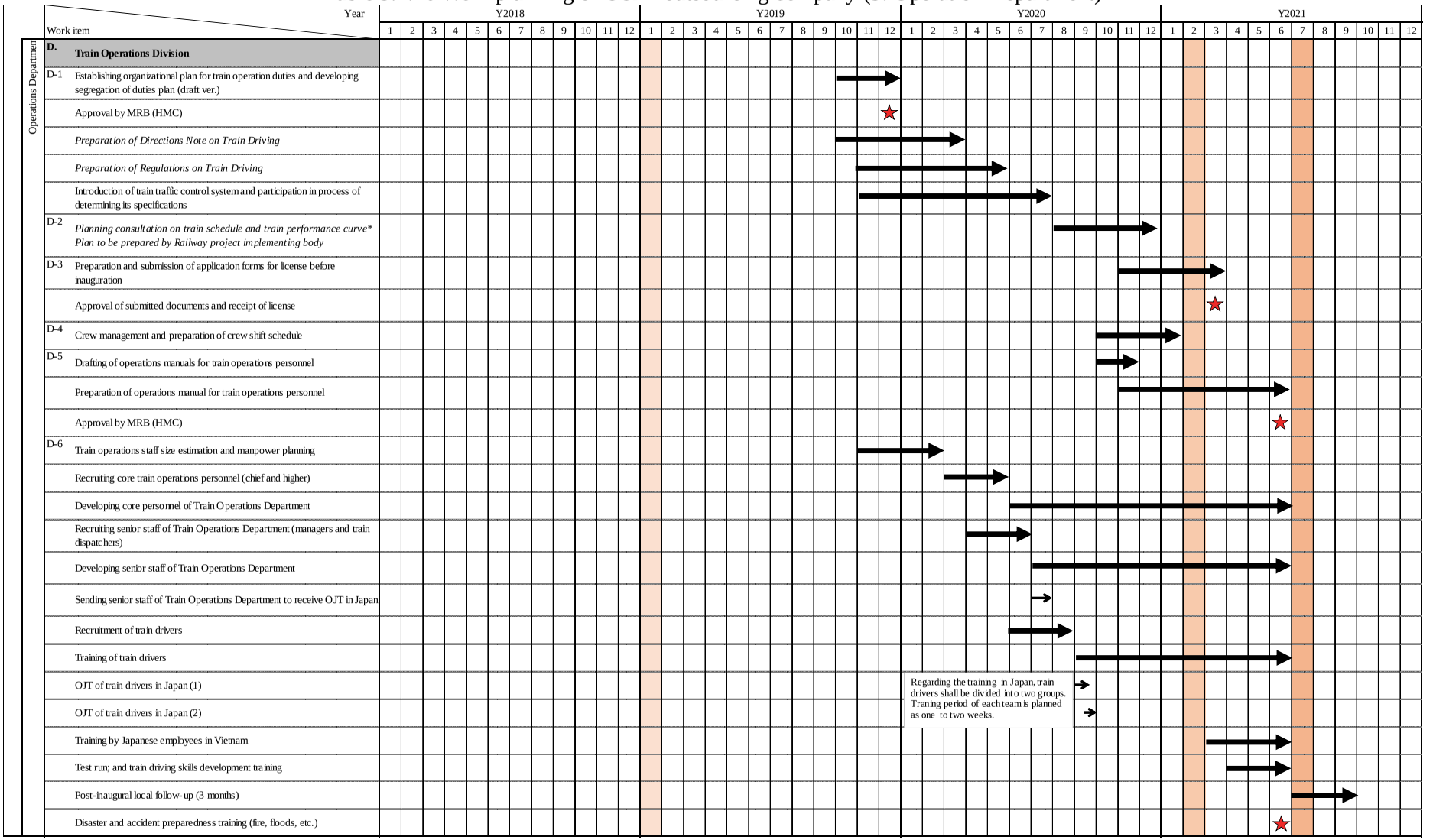
Source: JICA Study Team

Table 5.4.15 Work planning of O&M outsourcing company (2: Station Department)



Source: JICA Study Team

Table 5.4.16 Work planning of O&M outsourcing company (3: Operation Department)



Source: JICA Study Team

5.5 Advantages and characteristics of Japanese railway operators

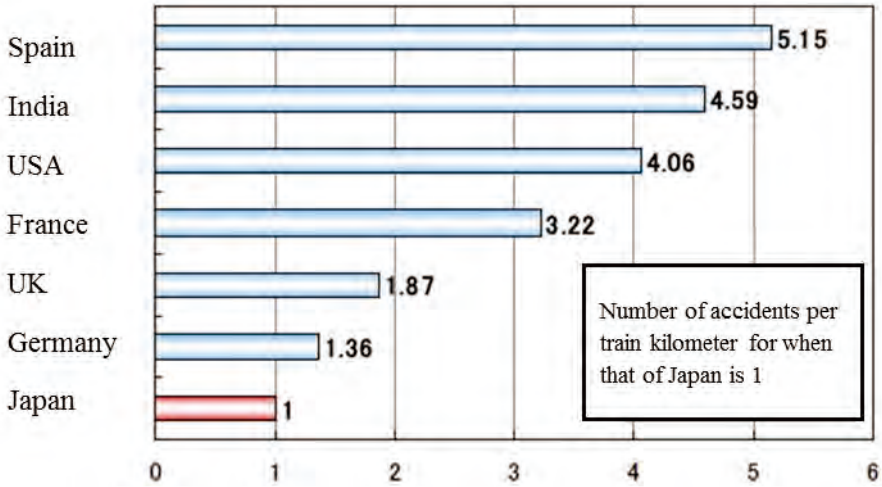
5.5.1 Advantages of Japanese railway operators

Vietnam has only experience with operations management of low-density intercity steam locomotive lines and is just about to develop and open high-speed, high-density intra-city electric railway lines on a full-scale basis. To achieve this, it is necessary to ensure high safety awareness and punctual provision of user-oriented services. Both of these aspects are the expertise of Japanese railway operators. In other words, Japanese railway operators can provide support not only in financial aspects but in extra aspects, such as facility maintenance methodology taking into consideration high-density train schedule planning, troubleshooting, and life cycle costs, as well as the know-how for coping with increasingly sophisticated passenger services.

Table 5.5.1 Comparison of punctuality

Japanese railway operators	Trying to ensure punctuality with no delays exceeding 30 seconds.
Foreign competitors	Tending to regard 10-minute or shorter delays as part of punctual arrivals/departures.

*In Japan, railway operators are involved in all processes from planning to construction execution supervision and to operation.



Source: 2004 Research Report on Measures for Improving Railway Safety by Accident Information Sharing with Major Foreign Countries (JARTS)

Figure 5.5.1 International comparison of safety

5.5.2 Characteristics of Japanese railway operators

(1) Safety

- High safety awareness
  Case studies of operational accidents experienced by railway operators are shared industry-wide to prevent recurrences and review design specifications to ensure constant safety improvement.
- Disaster recovery training assuming natural disasters, such as earthquakes, typhoons, and floods, or train derailment accidents
  ⇒ Capable of providing contractual services, including rules compilation, manual preparation, group training, and OJT programs, when Line 5 comes into operation.
- Railway operator (Vietnamese government) takes advantage of the rich practical experience of the railway operating entity and converts specifications for selected technologies and maintenance levels into sets of requirements to ensure safe, reliable operation.

(2) Punctuality

Management of regular train operations during rush hours and operation adjustments after disruption to train services

(3) Profit enhancement

- ●Provision of know-how on sales and profit enhancement through cooperation with local communities and municipalities
- ● Provision of know-how based on experiences in integrated complex station-front development
- ● Cooperation with feeder transport operators such as bus and taxi service operators

(4) Services

- ● Efficient train schedule planning based on ridership data accumulated from automatic ticket gates
- ● Provision of customer-oriented station services
- ● Barrier-free facilities for people who are elderly and physically challenged

5.5.3 Integration of operations with the Hanoi City Urban Railway Operating Company

The Preparatory Office for O&M Organization has been established under MRB to study the function of a railway operating organization in Hanoi City. Currently, Line 5 considers participating in railway operation in Hanoi City through the PPP scheme. In the future, however, it is desirable that the Line 5 together with other lines should be placed under the control of a single urban railway operating organization. The following shows several aspects where operational integration is possible.

(1) Integration of Work design Department and Purchase Department

Being a safe means of transportation is an indispensable prerequisite for an urban railway as a means of mass passenger transportation. Appropriate measures must be taken on the assumption that “any machine will fail and any operator will make operational mistakes.” Initially, it is difficult to unify design specifications submitted from various donors, leading to introducing systems and facilities that differ from each other in operating and inspection procedures. However, such systems and facilities will have to be renewed due to deterioration over time. Future renewal of electrical and mechanical facilities will provide the chance to unify purchase order specifications, thereby leading to many positive effects, such as a reduced work load on field personnel, a higher degree of commonality of parts, and hence reduced procurement costs, as well as an optimal stock of spare parts.

Additionally, adjustments to facility renewal schedules will even out the workload on the Design Department, thereby preventing overstaffing in the Design Department.

(2) Unified fare system

A unified fare system is a uniform fare pricing system shared among different public transportation service providers, such as railway and bus operators. This system has already been introduced in Germany and other European cities. Because this system eliminates the need of paying the base fare at every transfer from one operator to another, the fare will only increase progressively by the distance traveled.

In Japan, various operators, such as Japan Railway, Tokyo Metro, and private railway companies, provide public train and bus transportation services, which jointly form a very convenient network. However, because there are many operators involved in this public transportation network, each transfer from one operator to another adds one base fare on top of the other, resulting in a large sum of fares at the end of the travel.

It is not desirable that there are several fare pricing systems that differ between the individual operators involved because a sense of unfairness may arise. If a single organization enforces unified operational control of urban railway lines and adopts a unified fare system that also covers bus services, use of public transportation will be encouraged.

(3) Establishment of integrated train schedule

Hanoi City plans to construct a large-scale intra-city railway network, and Line 5 is merely one of the many lines constituting this network. It is currently under consideration to connect the Line 5 with Lines 2 and 3. According to the master plan for the future, the Line 5 is planned to connect with more lines. It is desirable to plan a user-oriented train schedule for each of all the lines in Hanoi City with consideration given to connection with other lines and the outer diameter of the

whole Hanoi City, rather than to plan line-specific train schedules with operating hours, last train departure times, and train intervals different from those of each other.

(4) Establishment of unified train driver training establishments

1) Definition under the Vietnamese Railway Law

The current Vietnamese Railway Law provides for the conditions of eligibility for obtaining a train drivers license. One of these conditions is “having worked as train assistant-drivers for 24 consecutive months or more.”

In the case of urban railways, there is no official position called a train assistant-driver. This statutory requirement is inappropriate for application to urban railways and should be reviewed and amended as early as possible. Trainee train drivers must undergo a wide range of theoretical training from safety training to vehicles, signals and tracks, electrification facilities, and driving theory. Therefore, full use should be made of teaching materials, such as simulators, computer assist instructors (CAI), and video media to provide an enhanced training environment and a high-quality training curriculum.

Table 5.5.2 Articles 46 and 47 of Vietnamese Railway Law

Article 46 (Conditions on railway personnel in direct service of train operation)

2. Railway personnel in direct service of train operation, defined in Clause 1 of this Article, when performing their tasks, must satisfy the following conditions:
   a) Possessing professional diplomas or certificates suitable to their titles, which are granted by training establishments recognized by the Ministry of Transport;
   b) Possessing health certificates issued periodically under the Health Ministry's regulations;
   c) For train drivers, apart from the conditions defined in Clause 2 of this Article, they must also possess train-driving licenses.
4. The Minister of Transport shall stipulate the training contents, programs, conditions for title-training establishments; criteria of the titles defined in Clause 1 of this Article; the test and examination contents and procedures and organize the grant, renewal, revocation of train-driving licenses.

Article 47 (Train-driving licenses)

3. Persons granted train-driving licenses must fully satisfy the following conditions:
   a) The age of between 23 and 55 for men, between 23 and 50 for women; possessing health certificates;
   b) Possessing professional diplomas, certificates in driving railway traffic means, granted by training establishments;
   c) Having worked as train assistant-drivers for 24 consecutive months or more;
   d) Having gone through a test prescribed for the types of railway traffic means in the train-driving licenses.

Source: Vietnamese Railway Law

2) Outsourcing to train driver training establishments

Instead of establishing a driver training center, this study proposes to give each trainee driver training as railway operation contractor (private SPC) by outsourcing the training of train drivers, including acquisition of train driver’s licenses. The training of train drivers and operation-related personnel shall be outsourced to a Training Center that would be established by other lines. Even practical training shall be conducted on other lines, and trainees shall receive drivers’ licenses. By outsourcing the training, the implementation of practical training on Line 5 for acquiring a license shall not be required. As a result, only training runs need to be conducted on Line 5, which it makes possible to shorten the period from completion of Line 5 facilities to inauguration.

Even if other lines or the Line 5 after its inauguration must increase the number of train drivers, the above training system will ensure the maintenance of a uniform quality of training, reduction of training costs and duration, and uniform control of training manuals.

(5) Non-railway business

Concerning the non-railway business, such as advertisement business and sale of goods in

stations and management of parking lots for motorcycles, it is natural for the Hanoi City Urban Railway Operating Company (tentative name) to be in charge of such non-railway business of Line 5 in order to realize stable management of the Hanoi City Urban Railway Operating Company at the earliest possible stage and to reduce subsidies from the government in Hanoi, as already discussed in MRB as a project to be implemented in the future. Including feeder transport from St.11 to Hoa Lac, in case the Hanoi City Urban Railway Operating Company (tentative name) shall outsource the management to private companies for the purpose of utilizing the vitality of the private sector and obtaining expertise on management, another contract shall be concluded.

Chapter 6 Economic and Financial Risk Analysis

6.1 Formulation of fare levels

(1) Rationale regarding setting and collecting fares

In this report, study team proposes a business model that separates the rail operation contractor (Private SPC), which is involved in operating the railway, from the railway operator (Vietnam government), which owns the infrastructure. Study team assumes that the railway operator will be Vietnam government, a public entity, and that the rail operation contractor (Private SPC) will be a private-sector entity. As the setting of fares, which will form the basis of revenues, has a direct connection with policy measures such as the promotion of the use of public transport, study team believes that it is the public entity that should bear the fare revenue risk. In that case, all fare revenues will be received by the public entity.

(2) Setting fare levels

As mentioned above, from the viewpoint of Hanoi City's urban policies and transport policies, it is assumed that the Vietnamese government will attempt to set appropriate fares and shift to a mean of transport that stimulates demand and is well used. Here, in regard to the level of fares, study team has set the average fare at USD0.50, which takes into account bus fares in Hanoi City, as described in "2.4 Assumptions for demand estimates".

Regarding current bus fares, as of 2012 the fare from the city center up to a distance of 25 km is a fixed amount of VND3,000 (due to be raised to VND5,000 from October 2012). This is equivalent to roughly USD0.24, but in view of the fact that the number of operating kilometers on Line 5 will extend for more than 30 km, including suburban areas, and in view of the level of consumer prices in Vietnam, an average fare of USD0.50 appears reasonable compared to bus fares.

As study team also mentioned in "2.4 Assumptions for demand estimates", study team will restate fare levels and per capita GDP in major Asian countries as one basis for setting fares. In Singapore, which aims to regulate car traffic volume and promote the use of public transport, urban railway fares have been politically kept low relative to per capita GDP.

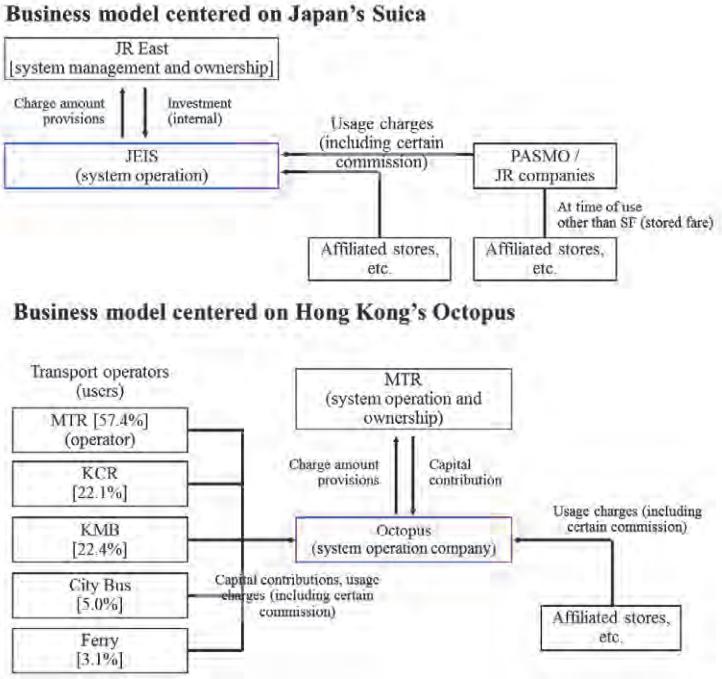
Table 6.1.1 Fare levels of urban transport organizations in major Asian countries

	Hong Kong	South Korea (Seoul)	Singapore	Thailand (Bangkok)	Indonesia (Jakarta)	Vietnam (Hanoi)
[1] Average fare level (median price, USD)	1.95	1.05	1.04	0.75	0.37	0.50 (price to be set)
[2] Per capita GDP (USD/person)	31,500	20,600	43,100	4,990	9,896	1,900
Index ([1]/[2])	0.006 %	0.005 %	0.002 %	0.015 %	0.0037%	0.026%

Source: JICA Study Team

(3) Consideration of fare collection method

In general, in countries with developed transport infrastructure, cities have introduced fare collection systems based on passenger tickets that utilize non-contact IC cards (referred to as IC tickets hereafter). This system is highly convenient for passengers in that it is possible to use various public transport organizations with a single card and the cards can be reissued if they are lost. For railway operator as well, this is a system with many advantages such as the reliable receipt of fares and resulting cost reductions. In the case of Hanoi Line 5 as well, it seems appropriate to take into account the receipt of fares based on IC tickets from the start of operation.



Source: JICA Study Team

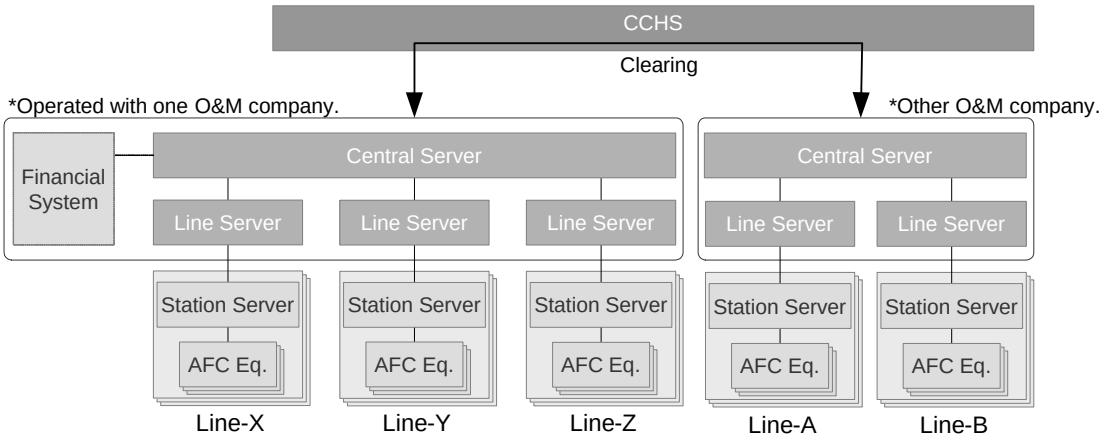
Figure 6.1.1 Ticketing operator business model based on transport IC cards

In Japan, railway companies directly issue and manage cards and operate fare collection systems on their own account. In Hong Kong and Singapore, however, there are business models in which railway companies and transport authorities have established specialist companies that issue and manage cards, and these companies operate the systems.

In Japan, several railway operators have issued their own respective IC tickets. However, as several railway operators have standardized non-contact IC card systems and data formats, a service enabling the common use of a single IC ticket anywhere in Japan has been realized. In the case of Hanoi and Ho Chi Minh as well, where different countries are involved in each railway line, it would be desirable for the railway operator (Vietnam government) to decide in advance to introduce IC tickets based on a uniform standard. Study team assumes that the introduction of a system that would be necessary for the standardization of IC tickets is not within the scope of this project. Nevertheless, it would be desirable to hold discussions with relevant organizations and carry out technical investigations in advance so that the standardization of IC tickets can be addressed without any hindrances.

(4) Rationale for introduction of AFC system on other Hanoi lines

In regard to the introduction of an AFC system on other Hanoi lines, details are being considered by the Hanoi Metropolitan Railway's O&M Organization Establishment Assistance SAPI (Special Assistance for Project Implementation), which is being promoted in tandem with the consideration of this project. SAPI has proposed a mechanism to integrate the AFC systems for several Hanoi lines at the level of a high-order system and to mutually use transport IC cards with unified specifications on several lines. As a result of this, passengers will be able to use a single transport IC card freely on several lines, as in the case of Japan, and convenience associated with changing trains, etc. will be enhanced. Furthermore, complex settlement of fares between the operators of each line will be reliably carried out under a secure environment based on a top-level CCHS (Central Clearing House System). These mechanisms are in agreement with the state of the AFC system assumed in this project, and moves to develop specifics in relation to the abovementioned business model and commercialization are expected.



Source: SAPI Team

Figure 6.1.2 Illustration of high-order AFC system to realize specifications integrated with other lines

6.2 Financial analysis

6.2.1 Establishment of financial analysis preconditions

(1) Entities subject to financial analysis

Study team will conduct a financial analysis of Hanoi Line 5 here based on “Chapter 4: Project Implementation Plan” and “Chapter 5: Project Implementation, Operation and Maintenance Management Organization”. The entities that will be subject to the financial analysis are the rail operation contractor (Private SPC) and the railway operator (Vietnam government).

1) Railway operator (Vietnam government)

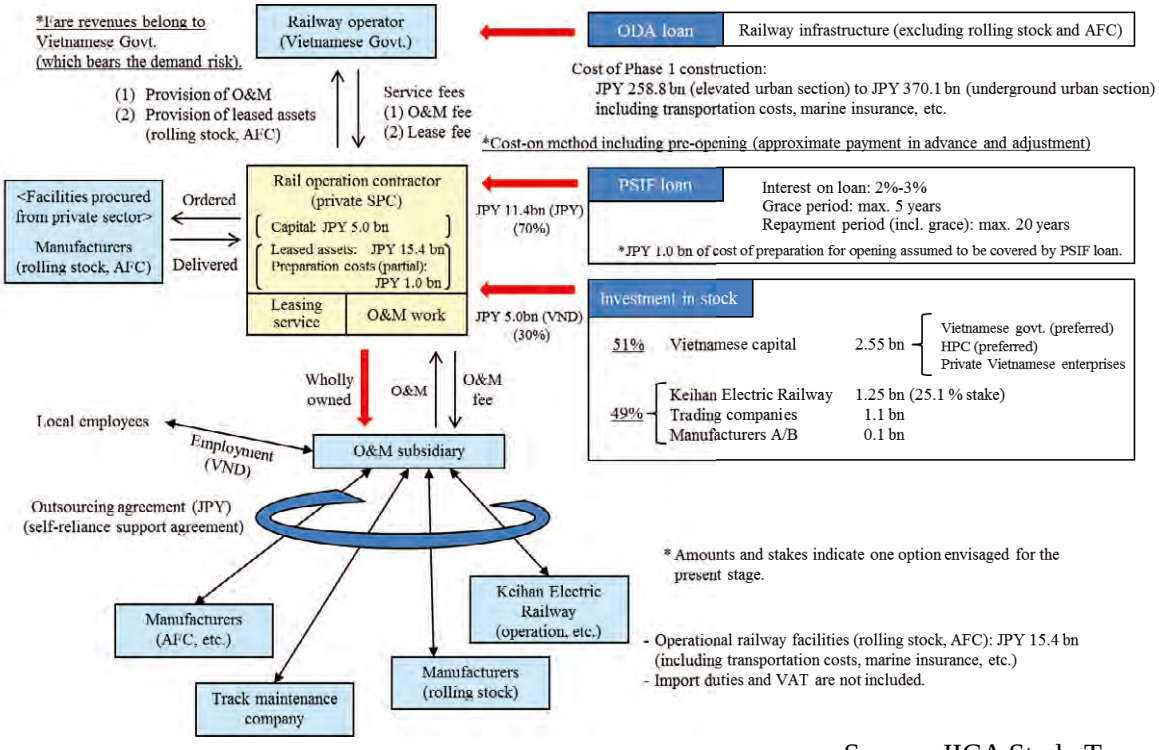
Vietnam government will become the railway operator, develop the railway infrastructure facilities (excluding the rolling stock and AFC system), and manage the railway business as the real obtainer of railway business income and expenditure.

Hanoi City will prepare for the establishment of the Hanoi Urban Rail Corporation (tentative name), to which management will be transferred five years after the start of operation (see “Chapter 5: Project Implementation, Operation and Maintenance Management Organization”).

2) Rail operation contractor (Private SPC)

The rail operation contractor (Private SPC) will be commissioned by the railway operator (Vietnam government) to procure the rolling stock and AFC system, as part of the railway infrastructure facilities, and lease them to the railway operator (Vietnam government), as well as to undertake O&M operations based on the cost-on system (see “Chapter 5: Project Implementation, Operation and Maintenance Management Organization”). The rail operation contractor (Private SPC) will establish the O&M management subsidiary with a 100% capital contribution and recommission it to carry out the practical management of O&M. Japanese railway operator and manufacturers that have abundant experience and know-how regarding urban railway management will support the O&M management subsidiary. The O&M management subsidiary is the corporation that is scheduled to transfer the management rights and the contractual position related to O&M practical management from the rail operation contractor (Private SPC) to the railway operator (Vietnam government) by means of a stock transfer five years after the start of business operation.

The project scheme is shown again in the figure below.



Source: JICA Study Team

Figure 6.2.1 PPP project scheme proposed in this study (restated)

(2) Project schedule

The project schedule will be as shown below, based on “Chapter 4: Project Implementation Plan”, as previously mentioned.

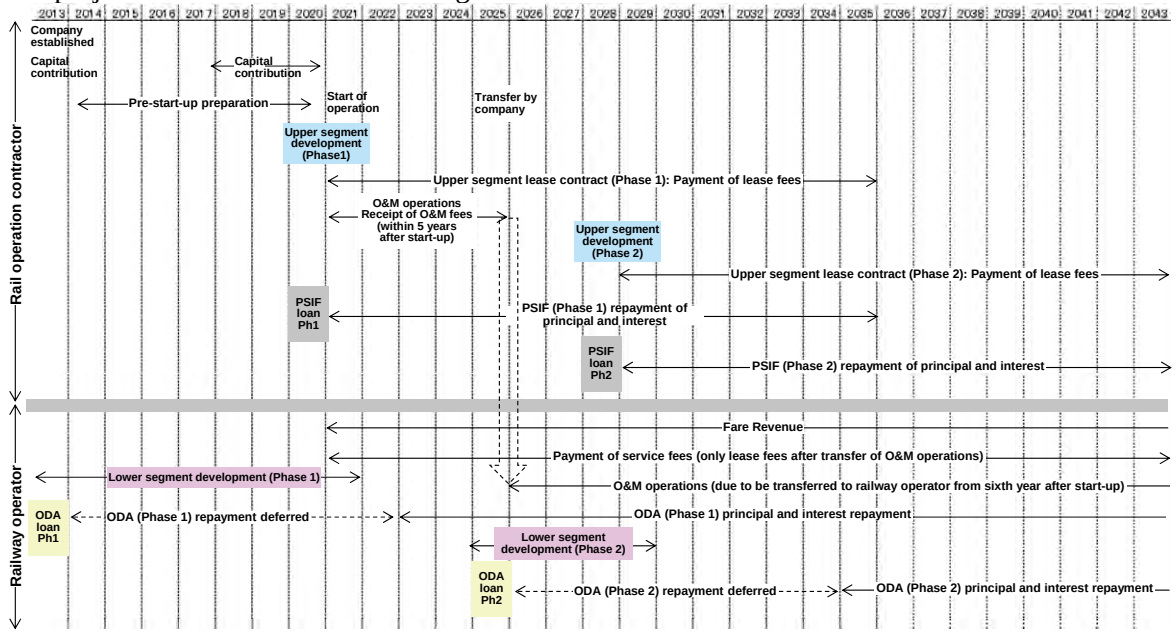
1) Project schedule of rail operation contractor (Private SPC)

Preparations before start of operation: 2014–2021
Phase 1 Development of rolling stock and AFC system: 2017-2021
Phase 1 operation (lease contract): 2021-2035
Start of operation: 2021
(2023 if inner-city structures are underground)
Provision of O&M operations: 2021-2025
Transfer of O&M operations to railway operator (Vietnam government):
from 2026 onward
Phase 2 Development of rolling stock and AFC system: 2028-2029
Phase 2 operation (lease contract): 2029-2043

2) Project schedule of railway operator (Vietnam government)

Phase 1 Lower segment infrastructure* development: 2013-2021
(2022 if inner-city structures are underground)
*Lower segment infrastructure:
civil engineering, railway line, depots, and electrical equipment, etc.
Phase 2 Lower segment infrastructure development: 2025-2029
(Phase 2 involves above-ground structures)

The project schedule is shown in the figure below.



Source: JICA Study Team

Figure 6.2.2 Summary of project schedule (example of base case)

(3) Assumptions for project cost estimates

For details regarding project cost estimates, please refer to “4.2 Project cost estimates”. Here, study team will restate a summary of these estimates.

1) Transportation costs and insurance premiums

Transportation costs and insurance premiums, etc. are shown in Table 6.2.1 and Table 6.2.2. Transportation costs include marine transportation costs and land transportation costs. Insurance premiums take into account marine insurance, construction insurance, PI insurance, and liability expenses. In addition, trade insurance premiums and bond expenses are taken into account.

Table 6.2.1 Transportation costs (restated)

Item	Transportation cost
Railway rolling stock	6 million yen per car
One set of signal equipment	30 million yen
One set of power substations	30 million yen
One set of AFC and communications equipment	30 million yen
Railway materials and equipment, including rails	500 million yen (700 million yen if inner-city portion is underground)

Source: JICA Study Team

Table 6.2.2 Insurance premiums, trade insurance premiums, and bond expenses (restated)

Item		Cost
Insurance premiums	Marine insurance	[Total cost of imported materials, equipment, machinery & tools] × 0.5%
	PI insurance	300 million yen
	Construction insurance and liability insurance	[Total cost of machinery and tools and construction work] × Overhead structures:1.0%, Underground:1.8%, Above ground:0.8%
	Trade insurance premiums	Contract value×1% * NEXI, Japan Overseas Rolling Stock Association, Japan Machinery Center for Trade and Investment
Bond expenses	Performance Bond	[Total cost of machinery and tools and construction work] × 0.5% × no. of contract years (from start of contract to end of defect warranty period) * Defect warranty period will be two years
	Advance Payment Bond	Deposits ([Total cost of machinery and tools and construction work] × 15%) × 0.5% × construction period

Source: JICA Study Team

2) Consulting costs

Consulting costs are for general consulting associated with railway construction operations, and assume management of the overall project, as well as research, design, preparation of construction work order documents, construction management, and completion inspection, etc. The remuneration portion comprises personnel expenses, accommodation costs, and daily allowances, while the non-remuneration portion comprises air travel costs, domestic transportation costs, office rental, communications expenses, car usage fees, and office supplies, etc. Consultant unit prices (billing rates) for international consultants, local experts, and local support staff will be 2,591,000 yen, VND49 million, and VND15 million per person per month, respectively.

3) Land acquisition and relocation costs

Study team will calculate costs associated with land acquisition and relocation. Referring to information on actual prices in the vicinity of lines departing from and arriving at the depot (St 10 to the depot), where land acquisition may occur, study team has set a unit price of VND2,850,000 per ㎡. (As Hanoi City is prepared to acquire land for the depot, this has been excluded from land acquisition costs.)

4) Start-up preparation costs

In terms of the rail operation contractor (Private SPC), which will implement Line 5 operation and maintenance management operations, study team assumes that it will be commissioned to undertake advance preparation operations, including educational and training expenses for local

employees until the start of operation and the preparation of various manuals. Study team assumes that there will be an agreement to adopt the cost-on system (advance payment of a rough estimate and settlement of actual costs later) in regard to these expenses (mentioned previously in Chapter 5). A 1 billion yen portion of start-up preparation costs (300 million yen in funds on hand and 700 million yen in the form of a JICA-PSIF overseas investment loan) has been posted as working capital.

5) Contingency costs

Contingency costs include two elements: funds related to a rise in prices (price escalation) and funds relating to an increase in physical work and construction work volume due to unforeseen factors. The price escalation rate, which includes consulting costs, is based on the producer price index (PPI) for general industrial goods (base year of 2000) and the consumer price index (CPI) (base year of 2000) prepared by the General Statistics Office (GSO) of Vietnam, and the annual rates to be adopted for foreign currency and local currency are 1.6% and 7.3%, respectively. The physical contingency rate will be 5% for both main project costs and consulting costs.

6) Other

In our financial analysis, study team has made calculations based on items subject to JICA loans for both costs related to yen loans and the railway rolling stock and the AFC system, while value added tax (VAT), customs duties, and general administration costs have been excluded.

If VAT and customs duties are imposed on main project costs, the Vietnamese government will ultimately end up bearing the cost of yen loans and lease transactions based on the PPP project scheme, so they have been excluded from this analysis.

- Interest during construction: 0.2%, applicable to main project costs related to yen loans
  0.01%, applicable to consulting costs related to yen loans
  2.5%, railway rolling stock and AFC system
- Commitment charge: 0.1%, applicable to expenses related to yen loans

(4) Breakdown of domestic and foreign currency expenses

Based on the formulated project plan, we have calculated expenses on a construction work item unit basis. As a reference, study team has used metropolitan railway construction plans in progress in Hanoi City and similar cases in Asia, based on actual results of new railway line construction in Japan. In addition, with regard to materials and equipment procurement associated with construction work and labor cost construction work, study team has separated items into domestic items and those imported from overseas, based on the establishment reasons below, in order to consider the rate of increase in prices.

1) Civil engineering work

In Vietnam, various kinds of infrastructure have been developed, there are many cases of road structures such as bridges that have been built, and in the case of railway structures as well, VNR has been established. Consequently, it is possible to procure materials and construction equipment in Vietnam. However, if an underground structure is used for the inner-city area, it will be necessary to procure some construction machinery overseas, depending on the selection of the retaining walls, including shield machines and tunnelling engineers. Accordingly, we have decided on a foreign currency ratio of about 10% for the general civil engineering portion and a foreign currency ratio of about 60% for the shield construction work.

2) Railway construction work

As railways are already being operated in Vietnam, it is possible to procure rails and sleepers in the country itself. Nevertheless, in the case of this line, as study team has proposed environmentally friendly tracks based on the introduction of heavy rails and direct fastened track with elastic sleepers, study team has assumed they will be procured overseas together with points and crossings. In terms of the foreign currency ratio, as items such as ballast and track laying workers will be procured locally, study team has set a ratio of 50%–80%.

3) Depot construction work

For depot construction work, study team has assumed land development work, track laying work, and building work. In Vietnam as well, there are various kinds of work ranging from the general type of works to the abovementioned track laying work. Therefore, study team has adopted a foreign currency ratio of about 10% for general civil engineering and building work and a ratio of 50%-70% for track construction work.

4) Electrical equipment-related expenses

Using the local and foreign currency ratios for unit construction work prices in the F/S survey for Line 2, study team has adopted a foreign currency ratio of 90% for railway power substations and electric line construction work, as it will be possible to procure electricity cable materials and cable laying workers locally; for other construction work, it is difficult to locally procure mainly system–related equipment, so we have posted a foreign currency ratio of 95% to ensure construction work quality.

5) Design management costs and contingency costs

Study team has posted about 2/3 as the foreign currency ratio.

(5) Exchange rates and price escalation rates

In regard to the foreign currency portion (yen/USD rate), study team has used the value of the “Tokyo market (per dollar) / median rate (b) / monthly average” (March 2012) published by the Bank of Japan.

For the local currency portion (local currency versus the dollar rate), study team has used the value of the State Bank of Vietnam’s inter-bank average exchange rate on the most recent usable date before FF (April 27, 2012). The exchange rates are 1 USD = 82.4 JPY, 1 USD = 20,828 VND, and 1 JPY = 252.8 VND. In regard to price escalation, study team has established the rates below.

(Local Currency Price Escalation Rates)		(Foreign Currency Price Escalation Rates)	
~2030	: 7.3%	~2030	: 1.6%
2031~2040	: 3.2%	2031~2040	: 0.6%
2041 onward	: 2.5%	2041 onward	: 0.0%

Table 6.2.3 Phase 1 construction project costs
(inner city area: overhead structures, suburban areas: above ground proposed)

FC & Total: million JPY
LC: million VND

Item		Total		
		FC	LC	Total
A. ELIGIBLE PORTION				
Ⅰ)	Procurement / Construction	76,600	43,540,364	248,855
	Civil	10,100	17,970,160	81,193
	Track	6,231	1,033,915	10,321
	Depot	8,536	5,966,732	32,142
	Electricity	37,845	609,008	40,254
	Maintenance car	2,487	0	2,487
	Base cost for JICA financing	65,198	25,579,814	166,397
	Price escalation	7,755	15,887,199	70,608
	Physical contingency	3,648	2,073,351	11,850
Ⅱ)	Consulting services	5,370	180,536	6,085
	Base cost	4,613	108,160	5,041
	Price escalation	501	63,779	754
	Physical contingency	256	8,597	290
Total (Ⅰ+Ⅱ)		81,971	43,720,900	254,940
Ⅲ)	PSIF portion	14,829	0	14,829
	Rolling stock	9,342	0	9,342
	AFC	2,998	0	2,998
	Price escalation	1,783	0	1,783
	Physical contingency	706	0	706
Total (Ⅰ+Ⅱ+Ⅲ)		96,800	43,720,900	269,769
B. NON ELIGIBLE PORTION				
a	Land Acquisition	0	67,575	267
	Base cost	0	51,600	204
	Price escalation	0	12,757	50
	Physical contingency	0	3,218	13
b	Administration cost	0	6,825,624	27,004
c	VAT	0	6,825,624	27,004
d	Import Tax	0	749,655	2,966
Total (a+b+c+d)		0	14,468,478	57,240
TOTAL (A+B)		96,800	58,189,378	327,009
C. Interest during Construction		2,080	0	2,080
	Interest during Construction(Const.)	1,519	0	1,519
	Interest during Construction (Consul.)	2	0	2
	Interest during Construction (PSIF)	559	0	559
D. Commitment Charge		2,308	0	2,308
GRAND TOTAL (A+B+C+D)		101,188	58,189,378	331,397
E. JICA ODA Finance portion incl. IDC (A-Ⅰ + A-Ⅱ + C+ D)		85,800	43,720,900	258,769
JICA PSIF portion incl. IDC (A-Ⅲ + C)		15,388	0	15,388

*Besides the above table, 1 billion yen of JICA PSIF portion are added up as a part of cost for preparation of inauguration.

*Automatic Fare Collection devices and rolling stocks will be procured by railway operation contractor (private SPC).

(Excluding) cost of excessive soil improvement, approach road to depot, cost of equipment reinforcement and repair works in EVN substations, and cost of constructing station plazas.

Source: JICA Study Team

Table 6.2.4 Phase 1 construction project costs
(inner city area: underground, suburban areas: above ground proposed)

FC & Total: million JPY
LC: million VND

Item		Total		
		FC	LC	Total
A. ELIGIBLE PORTION				
Ⅰ)	Procurement / Construction	110,382	61,863,610	355,128
	Civil downtown	29,399	17,265,176	97,704
	Civil suburb	4,391	7,774,712	35,149
	Track	6,262	1,028,387	10,330
	Depot	8,536	5,966,732	32,142
	Electricity	40,488	640,270	43,021
	Maintenance car	2,487	0	2,487
	Base cost for JICA financing	91,562	32,675,276	220,832
	Price escalation	13,564	26,242,448	117,385
	Physical contingency	5,256	2,945,886	16,911
Ⅱ)	Consulting services	7,388	268,940	8,452
	Base cost	6,215	146,176	6,793
	Price escalation	821	109,958	1,256
	Physical contingency	352	12,807	402
Total (Ⅰ+Ⅱ)		117,770	62,132,551	363,580
Ⅲ)	PSIF portion	15,066	0	15,066
	Rolling stock	9,342	0	9,342
	AFC	2,998	0	2,998
	Price escalation	2,009	0	2,009
	Physical contingency	717	0	717
Total (Ⅰ+Ⅱ+Ⅲ)		132,836	62,132,551	378,646
B. NON ELIGIBLE PORTION				
a	Land Acquisition	0	67,575	267
	Base cost	0	51,600	204
	Price escalation	0	12,757	50
	Physical contingency	0	3,218	13
b	Administration cost	0	9,577,685	37,891
c	VAT	0	9,577,685	37,891
d	Import Tax	0	761,650	3,013
Total (a+b+c+d)		0	19,984,595	79,063
TOTAL (A+B)		132,836	82,117,146	457,709
C. Interest during Construction		3,046	0	3,046
	Interest during Construction(Const.)	2,474	0	2,474
	Interest during Construction (Consul.)	3	0	3
	Interest during Construction (PSIF)	568	0	568
D. Commitment Charge		4,027	0	4,027
GRAND TOTAL (A+B+C+D)		139,909	82,117,146	464,782
E. JICA ODA Finance portion incl. IDC (A-Ⅰ + A-Ⅱ + C+ D)		124,275	62,132,551	370,085
JICA PSIF portion incl. IDC (A-Ⅲ + C)		15,634	0	15,634

*Besides the above table, 1 billion yen of JICA PSIF portion are added up as a part of cost for preparation of inauguration.

*Automatic Fare Collection devices and rolling stocks will be procured by railway operation contractor (private SPC).

(Excluding) cost of excessive soil improvement, approach road to depot, cost of equipment reinforcement and repair works in EVN substations, and cost of constructing station plazas.

Source: JICA Study Team

Table 6.2.5 Phase 2 construction project costs

FC & Total: million JPY
LC: million VND

Item		Total		
		FC	LC	Total
A. ELIGIBLE PORTION				
Ⅰ)	Procurement / Construction	63,024	38,455,669	215,163
	Civil	4,548	9,122,198	40,638
	Track	8,408	1,753,751	15,346
	Electricity	32,576	560,898	34,795
	Maintenance car	552	0	552
	Base cost for JICA financing	46,083	11,436,847	91,330
	Price escalation	13,940	25,187,600	113,587
	Physical contingency	3,001	1,831,222	10,246
Ⅱ)	Consulting services	3,480	191,335	4,237
	Base cost	2,582	59,904	2,819
	Price escalation	733	122,320	1,217
	Physical contingency	166	9,111	202
Total (Ⅰ+Ⅱ)		66,505	38,647,005	219,400
Ⅲ)	PSIF portion	11,419	0	11,419
	Rolling stock	7,752	0	7,752
	AFC	617	0	617
	Price escalation	2,506	0	2,506
	Physical contingency	544	0	544
Total (Ⅰ+Ⅱ+Ⅲ)		77,924	38,647,005	230,819
B. NON ELIGIBLE PORTION				
a	Land Acquisition	0	0	0
	Base cost	0	0	0
	Price escalation	0	0	0
	Physical contingency	0	0	0
b	Administration cost	0	5,834,353	23,082
c	VAT	0	5,834,353	23,082
d	Import Tax	0	577,269	2,284
Total (a+b+c+d)		0	12,245,975	48,448
TOTAL (A+B)		77,924	50,892,980	279,267
C. Interest during Construction		1,050	0	1,050
	Interest during Construction(Const.)	618	0	618
	Interest during Construction (Consul.)	1	0	1
	Interest during Construction (PSIF)	431	0	431
D. Commitment Charge		1,100	0	1,100
GRAND TOTAL (A+B+C+D)		80,074	50,892,980	281,418
E. JICA ODA Finance portion incl. IDC (A-Ⅰ + A-Ⅱ + C+ D)		68,224	38,647,005	221,120
JICA PSIF portion incl. IDC (A-Ⅲ + C)		11,850	0	11,850

*Automatic Fare Collection devices and rolling stocks will be procured by railway operation contractor (private SPC).
(Excluding) cost of excessive soil improvement, approach road to depot, cost of equipment reinforcement and repair works in EVN substations, and cost of constructing station plazas.

Source: JICA Study Team

(6) Income items and expenditure items

1) Income items and expenditure items of rail operation contractor (Private SPC)

i) Income items

Income items for the rail operation contractor (Private SPC) consist of “start-up preparation costs” and “service fees” after start-up, which are paid to the rail operation contractor (Private SPC) by the railway operator (Vietnam government).

“Start-up preparation costs” represent what the rail operation contractor (Private SPC) posts as expenses before the start of operation of Line 5 plus the addition of remuneration equivalent to a reasonable profit (assumed to be 15.1%).

“Service fees” consist of “lease fees” and “O&M fees” mentioned below, and will be invoiced by the rail operation contractor (Private SPC) to the railway operator (Vietnam government).

When procuring the facilities procured by the private sector (rolling stock and AFC system), the rail operation contractor (Private SPC) will make a capital contribution equivalent to 30% of the procurement value with the remaining 70% to be procured by means of a JICA-PSIF loan.

At the same time, the rail operation contractor (Private SPC) will provide the facilities procured by the private sector to the railway operator (Vietnam government) through a finance lease. With regard to the amount of lease fees at this time, a lease rate will be set that will generate an internal rate of return of at least 20% for the cash flow consisting of total principal and interest repayments during the PSIF repayment period (15 years) by the rail operation contractor (Private SPC) to JICA, and “lease fees” based on this will be invoiced to the railway operator (Vietnam government).

In addition, the establishment of lease fees in this study has been carried out based on the facilities procured by the private sector (rolling stock and AFC system), which do not include administration costs, VAT, or import tax.

On the other hand, the O&M fees will be invoiced to the railway operator (Vietnam government) in an amount that consists of all costs required to implement the kind of O&M described below, in terms of expenses required for the operation of Line 5 after start-up, plus the addition of remuneration equivalent to a reasonable profit (assumed to be 15.1%).

O&M fees will comprise the following items.

Table 6.2.6 Trial calculation example regarding operation & maintenance costs (single year)

(Unit: USD 1,000)

Item	Y2021~	Y2026~	Y2030~
1.Personnel expenses	11,506	3,071	4,576
2.Management costs	2,301	—	—
3.Electricity charges	1,534	1,534	3,161
4.Cost of spare parts	7,259	7,259	13,736
5.Business consignment expenses and maintenance contract expenses	3,641	3,641	4,915
6.Administration costs, rail operation liability insurance	7,643	5,113	8,377
Subtotal	33,886	20,619	34,765
Remuneration (15.1%)	5,117	—	—
Total	39,003	20,619	34,765

Source: JICA Study Team

(Excluding Price Escalation)

*(Separately required) Recovery expenses due to natural disasters, repair, improvement and renewal expenses

ii) Cost items

The cost items for the rail operation contractor (Private SPC) will be expenses incurred by the rail operation contractor (Private SPC) before the start-up of Line 5 and expenses required for the operation and maintenance of Line 5 during a period of five years after start-up.

Corporation tax has been set at the standard rate of 25%.

2) Income items and expenditure items of railway operator (Vietnam government)

i) Income items

The income item of the railway operator (Vietnam government) is the fare revenue for Line 5. Fare revenue can be expressed as: Fare revenue = fare unit price x number of passengers

A fare unit price of US$0.50 per person per ride (2012 price) will be adopted as mentioned in "6.1 Setting fare levels".

The number of passengers, based on the demand estimate results in "Chapter 2 Transport Demand Estimates", has been set as follows:

2021: about 158,000 per day (including connecting rides: 171,000 per day)
2030: about 400,000 per day (including connecting rides: 432,000 per day)
2040: about 411,000 per day (including connecting rides: 444,000 per day)

Study team has calculated a CAGR (average growth rate) for 2021–2030 and 2030–2040 and then established the number of passengers for each year from 2021.

In the base case, study team has assumed the revision of fare levels will be linked to consumer prices, but in the sensitivity analysis 4 described later, fares are not connected with them but calculated based on the case fares increase at the rate of 50 percent of price escalation rate.

ii) Cost items

The cost items for the railway operator (Vietnam government) will be start-up preparation costs, service fees after the start of operation, O&M costs, which will be transferred from the rail operation contractor (Private SPC) from 2026 onward, repayment of principal and interest on yen loans, which were borrowed to procure the lower segment, and renewal costs for the upper segment and lower segment as a whole. In addition, as O&M operations will be transferred from the rail operation contractor (Private SPC) to the railway operator (Vietnam government) five years after the start of operation, the service fees will become the payment of lease fees only.

Table 6.2.7 Start-up preparation costs

(Unit: Million JPY)

	2013	2014	2015	2016	2017	2018	2019	2020
Start-up preparation costs	0	142	203	212	268	655	694	3,012

Source: JICA Study Team

Table 6.2.8 O&M Fee, Lease payment, Service Fee

(Unit: Million JPY)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
O&M Fees	4,535	4,552	4,534	4,514	4,459	0	0	0	0	0	0	0
Lease payment	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	3,440	3,440	3,440	3,440
Service Fees	6,479	6,496	6,478	6,457	6,403	1,944	1,944	1,944	3,440	3,440	3,440	3,440

	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
O&M Fees	0	0	0	0	0	0	0	0	0	0	0	0
Lease payment	3,440	3,440	3,440	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	0
Service Fees	3,440	3,440	3,440	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	0

Source: JICA Study Team

Table 6.2.9 Yen loan principal and interest repayments
Phase 1: Borrowed in 2013 (repayment deferred: 10 years, repayment period: 40 years (inc. deferment period))
Phase 2: Borrowed in 2025(repayment deferred: 10 years, repayment period: 40 years (inc. deferment period))

(million JPY)

	2023	2024	2025	2026	2027	2028	2029	2030
ODA pay back of principal and interest (Ph 1)	9,143	9,126	9,109	9,091	9,074	9,057	9,040	9,022
ODA residual principal (Ph 1)	250,144	241,518	232,892	224,267	215,641	207,016	198,390	189,764
ODA pay back of principal and interest (Ph 2)								
ODA residual principal (Ph 2)								

(million JPY)

	2031	2032	2033	2034	2035	2036	2037	2038
ODA pay back of principal and interest (Ph 1)	9,005	8,988	8,971	8,953	8,936	8,919	8,902	8,884
ODA residual principal (Ph 1)	181,139	172,513	163,887	155,262	146,636	138,010	129,385	120,759
ODA pay back of principal and interest (Ph 2)					7,813	7,798	7,783	7,769
ODA residual principal (Ph 2)					213,749	206,379	199,008	191,637

(million JPY)

	2039	2040	2041	2042	2043	2044	2045	2046
ODA pay back of principal and interest (Ph 1)	8,867	8,850	8,833	8,815	8,798	8,781	8,764	8,746
ODA residual principal (Ph 1)	112,133	103,508	94,882	86,256	77,631	69,005	60,380	51,754
ODA pay back of principal and interest (Ph 2)	7,754	7,739	7,724	7,710	7,695	7,680	7,665	7,651
ODA residual principal (Ph 2)	184,267	176,896	169,525	162,155	154,784	147,413	140,043	132,672

(million JPY)

	2047	2048	2049	2050	2051	2052	2053	2054
ODA pay back of principal and interest (Ph 1)	8,729	8,712	8,695	8,677	8,660	8,643		
ODA residual principal (Ph 1)	43,128	34,503	25,877	17,251	8,626			
ODA pay back of principal and interest (Ph 2)	7,636	7,621	7,607	7,592	7,577	7,562	7,548	7,533
ODA residual principal (Ph 2)	125,301	117,931	110,560	103,189	95,819	88,448	81,077	73,707

(million JPY)

	2055	2056	2057	2058	2059	2060	2061	2062
ODA pay back of principal and interest (Ph 1)								
ODA residual principal (Ph 1)								
ODA pay back of principal and interest (Ph 2)	7,518	7,503	7,489	7,474	7,459	7,444	7,430	7,415
ODA residual principal (Ph 2)	66,336	58,965	51,595	44,224	36,853	29,483	22,112	14,741

(million JPY)

	2063	2064	2065	2066	2067	2068	2069	2070
ODA pay back of principal and interest (Ph 1)								
ODA residual principal (Ph 1)								
ODA pay back of principal and interest (Ph 2)	7,400	7,385						
ODA residual principal (Ph 2)	7,371	-0						

Source: JICA Study Team

Table 6.2.10 Facility renewal expenses(Elevated)

(million yen)

Facility renewal expenses（Elevated）	2021	2022	2023	2024	2025	2026	2027	2028
Civil, Track maintenance	0	0	0	0	0	300	0	0
Price Escalation	0	0	0	0	0	504	0	0
Electricity,AFC,Rolling Stock	0	0	0	0	0	2,038	2,199	550
Price Escalation	0	0	0	0	0	507	591	159
Facility renewal expenses (Total)	0	0	0	0	0	3,350	2,790	709

(million yen)

Facility renewal expenses（Elevated）	2029	2030	2031	2032	2033	2034	2035	2036
Civil, Track maintenance	0	0	300	0	0	258	258	100
Price Escalation	0	0	801	0	0	782	816	329
Electricity,AFC,Rolling Stock	0	5,851	5,851	1,649	1,649	550	4,899	3,373
Price Escalation	0	1,935	1,982	572	585	200	1,818	1,280
Facility renewal expenses (Total)	0	7,786	8,934	2,221	2,234	1,790	7,791	5,083

(million yen)

Facility renewal expenses（Elevated）	2037	2038	2039	2040	2041	2042	2043	2044
Civil, Track maintenance	0	0	0	0	630	530	530	530
Price Escalation	0	0	0	0	2,515	2,182	2,250	2,319
Electricity,AFC,Rolling Stock	550	2,495	7,500	6,789	6,789	6,789	6,789	6,789
Price Escalation	213	988	3,033	2,802	2,802	2,802	2,802	2,802
Facility renewal expenses (Total)	763	3,482	10,533	9,592	12,737	12,304	12,372	12,441

(million yen)

Facility renewal expenses（Elevated）	2045	2046	2047	2048	2049	2050	2051	2052
Civil, Track maintenance	702	530	530	530	788	788	150	150
Price Escalation	3,167	2,464	2,539	2,615	4,005	4,125	809	833
Electricity,AFC,Rolling Stock	6,789	6,789	6,789	6,789	6,789	6,789	6,789	6,789
Price Escalation	2,802	2,802	2,802	2,802	2,802	2,802	2,802	2,802
Facility renewal expenses (Total)	13,460	12,585	12,660	12,737	14,385	14,505	10,550	10,574

(million yen)

Facility renewal expenses（Elevated）	2053	2054	2055	2056	2057	2058	2059	2060
Civil, Track maintenance	150	150	150	150	150	150	150	322
Price Escalation	857	882	908	935	962	989	1,018	2,248
Electricity,AFC,Rolling Stock	6,789	6,789	6,789	6,789	6,789	6,789	6,789	6,789
Price Escalation	2,802	2,802	2,802	2,802	2,802	2,802	2,802	2,802
Facility renewal expenses (Total)	10,599	10,624	10,650	10,676	10,703	10,731	10,760	12,162

Source: JICA Study Team

(7) Sources of finance related to Hanoi Line 5 railway business

1) Procurement of funds by rail operation contractor (Private SPC) and use of funds

i) Capital contributions

It is assumed that the rail operation contractor (Private SPC) will procure 1 billion yen in funds as working capital to be allocated to start-up preparation costs by using a JICA-PSIF loan. At that time, 300 million yen, or 30% of that amount, will be posted as a capital contribution (10 million yen: capital contribution for establishment) in 2013, followed by another 30% in 2018 (90 million yen: working capital), another 30% in 2019 (100 million yen: working capital), and another 30% in 2020 (100 million yen: working capital). In addition, as a JICA-PSIF loan will also be used for the procurement of facilities procured by the private sector (rolling stock and AFC system), for the base case of Phase 1, 30% (4,616 million yen) of the procurement value (15,388 million yen) will be posted as a capital contribution in 2020.

ii) JICA-PSIF loans

It is assumed that the rail operation contractor (Private SPC) will post an amount of 700 million yen, 70% of start-up preparation costs, in 2020. In addition, as a JICA-PSIF loan will also be used for the procurement of facilities procured by the private sector (rolling stock and AFC system), for the base case of Phase 1, 70% (10,772 million yen) of the procurement value (15,388 million yen) will be posted as a JICA-PSIF loan in 2020.

2) Procurement of funds by railway operator (Vietnam government) and use of funds

i) Government funds and yen loans

The railway operator (Vietnam government) will procure the lower segment of infrastructure for Line 5 (land for the railway, civil engineering structures, buildings, track bed and tracks, power substations, and the operation management system, etc.) with government funds, including yen loans. For the base case, it is assumed that procurement will be fully funded by yen loans.

Study team has summarized the sources of finance related to the Hanoi Line 5 railway business in the table below.

Table 6.2.11 Various entities and sources of finance associated with Hanoi Line 5 railway business

<Construction stage>

Item	Investment target	Implementing body	Source of finance
Lower segment of infrastructure (facilities procured by private sector)	Procurement of rolling stock and AFC system	Rail operation contractor (Private SPC)	Private sector capital contributions JICA-PSIF
Lower segment of infrastructure (facilities procured by government)	Land for railway Civil engineering structures Buildings Track bed and tracks Signal and communications facilities Power substation equipment Operation management system	Railway operator (Vietnam government)	Government funds (yen loans)

<Operation stage>

Item	Targets of investment and expenses paid	Implementing entity	Sources of finance and revenue
Railway management	Service fees Facility renewal expenses	Railway operator (Vietnam government)	Fare revenue, government funds
Railway operation	O&M fees JICA-PSIF principal and interest repayments	Rail operation contractor (Private SPC) and O&M subsidiary	Service fees

Source: JICA Study Team

6.2.2 Assumption of “base case” for financial analysis

Study team has made the assumptions below as the base case for financial analysis.

(1) The precondition of a railway operation contractor (private sector SPC) a financial analysis (conclusion)

Based on an investigation above, the precondition of a railway operation contractor's (private sector SPC) financial analysis is summarized as following table.

Table 6.2.12 The precondition of a railway operation contractor's (private sector SPC) financial analysis (conclusion)

Clause Eyes	A precondition and a view
Object phase	Only Phase1 (St1-St10)
Business period Lease period	Incorporation procedures : 2013 Openning : 2021 O&M operating period : For five years (It will be transfered to railway operator (Vietnam government) for five years) after commencement of business) Lease period : 15 years (2021 – 2036)
Working expenses	The private sector procured facilities (Rolling stocks and AFC) of 15,388 million yen (70%:JICA-PSIF debt and 30%: investment)
O&M cost	It adopts a cost-on system and adds up preparation expense and expense required for management of the No. 5 line after opening of business.
Dividend policy	It is paid within the limits of a current income after O&M cost and PSIF principal-and-interest payment (various reserves do not assume).
Savings / investment plan	2013 : 10 million yen (investment for establishment) 2018 : 90 million yen (circulating fund) 2019 : 100 million yen (circulating fund) 2020 : 100 million yen (circulating fund) 4,616 million yen (30% of the private sector supply institutions (vehicles and AFC) of 15,388 million yen)
Borrowing plan	2020 : 10,772 million yen (70% of leased assets (vehicles +AFC) of 15,388 million yen) 700 million yen (circulating fund of preparation expense 1 billion yen 70%)
Borrowing rate of interest Grace period for repayment	Interest rates : 3% Grace period for repayment: Zero-year (a maximum of five years) Payment period: 15 years (JICA-PSIF))
The minimum Equity IRR	The minimum Equity IRR ≧15.00%
The minimum DSCR	The minimum DSCR ≧ 1.2

Source: JICA Study Team

(2) Base case for rail operation contractor (Private SPC)

For the inner-city area structures under the base case, study team assumes that the overhead system will be adopted.

As regards the base case for the rail operation contractor (Private SPC), study team has decided on the following period as the period subject to financial analysis: from the establishment of the company in 2013 onward, the start of operation in 2021, and the transfer of the O&M business division to the railway operator (Vietnam government) in 2026, to the end of the Phase 1 lease contract in 2035.

Based on these conditions, study team has assumed a base case for the rail operation contractor (Private SPC) where the lease fee rate is 1.0525% per month (IRR of 20%) and the O&M fee remuneration rate is 15.1%, under the condition where the Equity IRR based on cash flow from 2013 to 2035 reaches 15%. In addition, the minimum DSCR (debt service coverage ratio) during the PSIF loan repayment period at this time is assumed to be 1.810.

Table 6.2.13 Establishment of base case for rail operation contractor (Private SPC)

Financial analysis item	Value in base case
EIRR (time of company establishment ~ end of Phase 1 lease contract)	15.00%
The minimum DSCR	1.815
The average of DSCR	1.990
Lease fee rate (IRR=20%)	1.0525% per month
Single fiscal year lease fees	6,290 million yen per year
O&M fee remuneration rate	15.100%

Source: JICA Study Team

(3)The precondition of a railway operator's(Vietnam government) financial analysis (conclusion)

Based on an investigation above, the precondition of a railway operator's(Vietnam government) financial analysis is summarized as following table.

Table6.2.14 The precondition of a railway operator's (Vietnam government) financial analysis (conclusion)

Condition item	A condition setup of a basic case
Lower Infrastructure substructure	Center of Hanoi City: Elevated structure, Suburban: Ground structure
Passenger demand	(2021) No. 5 line' Main demand: -- 158,000 people/day Connection ride demand: -- 14,000 people/day (2030) No. 5 line' Main demand: -- 400,000 people/day Connection ride demand: -- 32,000 people/day (2040) No. 5 line' Main demand: -- 411,000 people/day Connection ride demand: -- 33,000 people/day
Average fare unit	No. 5 line' Main: From 0.5US$ / person (setting fare in the 2012 time) to prices linkage (2021 : 0.94US$ /person, 2030 : 1.26US$ / person, 2040 : 1.50US$ / person) Connection ride: 0.25US$ / person (installation fare in the 2012 time)
The method of development maintenance	Gradual development Phase 1:2017-year groundbreaking, 2021 opening of business Phase 2:2028-year groundbreaking, 2030 opening of business
Yen loan lending conditions	Phase 1:258,769million yen (2013), Phase 2:221,120million yen (2025) Interest rates: 0.20% , Grace-period-for-repayment : ten years, Payment period : 40 years (Including the grace of repayment)

Source: JICA Study Team

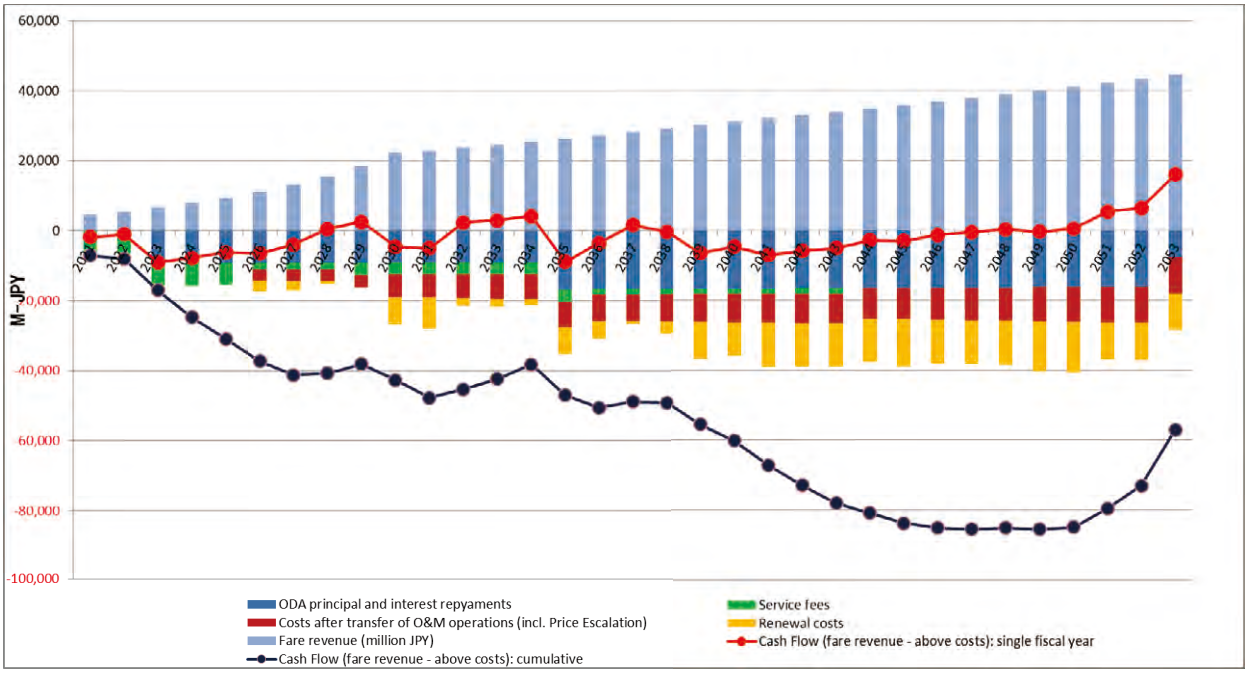
(4) Base case for railway operator (Vietnam government)

For the inner-city area structures under the base case, study team assumes that the overhead system will be adopted.

As regards the financial analysis of the railway operator (Vietnam government), study team has valued cash flow after deducting from fare revenue the start-up preparation costs and the service fees after start-up that will be paid to the rail operation contractor (Private SPC) as well as the O&M costs that have been transferred from the rail operation contractor (Private SPC) from 2026 onward, the principal and interest repayments on yen loans borrowed to procure the infrastructure portion, and renewal expenses for all facilities. This valuation period will be from the borrowing of yen loans scheduled for 2013 until the end of principal and interest repayments 40 years later (including the repayment deferment period of 10 years).

Study team assumes O&M costs after the transfer of O&M operations in 2026 and the fact that the Phase 2 rolling stock and AFC system will be procured based on a lease, as in the case of Phase 1, in 2028. During the period until the end of the lease contract in 2043, study team has made a trial calculation based on the condition of a lease rate of 1.0525% per month (IRR of 20%), and the resulting cash flow is shown in Figure 6.2.5.

It should become possible to cover other costs with fare revenue in a stable manner in the 30th year after the start of operation (2050). In other words, it is evident that it will be difficult to cover the service fees and principal and interest repayments on yen loans just with fare revenue.



Source: JICA Study Team

Figure 6.2.3 Base case (Phase1+Phase 2, inner-city area: overhead structures)

6.2.3 Sensitivity analysis

(1) Sensitivity analysis items

Based on the characteristics of this project under the base case up to the previous page, study team has conducted the sensitivity analysis outlined below.

Table 6.2.15 Sensitivity analysis items

	Target	Sensitivity analysis item	Specific sensitivity analysis variables
Sensitivity analysis 1	Rail operation contractor (Private SPC) (Phase 1 only)	O&M fees	Comparison in the case of a ±5 point change to O&M fee remuneration rate relative to the base case (15.1%)
Sensitivity analysis 2	Railway operator (Vietnam government) (Phase 1+Phase 2)	Construction costs	Comparison of inner-city area structures under the base case (overhead) and in the case of underground structures
Sensitivity analysis 3		Passenger demand	After burden rate is gradually raised from 2030, it has been set at 20.1% in 2040, which is +5% of base case. Comparison with the case.
Sensitivity analysis 4		Fare revisions	Comparison in the case of revision of 50% of the rate of the rise in consumer prices

Source: JICA Study Team

The valuation indicators study team uses for the sensitivity analysis of the rail operation contractor (Private SPC) (Sensitivity Analysis 1) are EIRR and minimum DSCR.

Study team will look at the valuation indicators for the sensitivity analysis of the railway operator (Vietnam government) (Sensitivity Analysis 2 - Sensitivity Analysis 4) in terms of cash flow after the deduction from fare revenue of start-up preparation costs, service fees, O&M costs, principal and interest repayments on yen loans, and renewal expenses for all facilities.

(2) Results of sensitivity analysis

1) Sensitivity analysis 1 (increase/decrease in O&M fee remuneration rate)

In the case where the O&M fee remuneration rate is raised by 5 points from the base case (remuneration rate = 20.1%), EIRR will become 17.10% (1.14 times) and minimum DSCR will become 1.815. Conversely, in the case where the O&M fee remuneration rate is lowered by 5 points from the base case (remuneration rate = 10.1%), EIRR will become 13.20% (0.88 times) and minimum DSCR will become 1.814. Although a minimum DSCR of 1.2 as a one of measure of the one seen from the lender credit will be satisfied, it will not reach the level of earnings required by private-sector investors. Therefore, it will be necessary to consider a balance with the lease fee rate, but a remuneration rate of 15.1% is one yardstick in terms of seeking capital contributions by private-sector investors in this project.

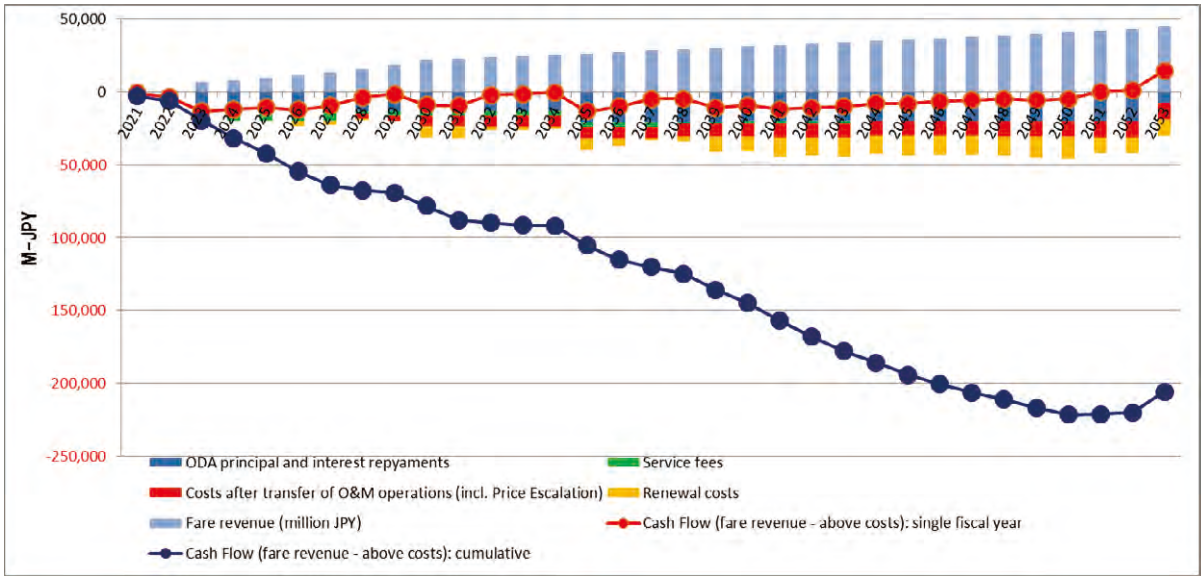
Table 6.2.16 Results of Sensitivity Analysis 1 (O&M fees)

O&M fee remuneration rate	EIRR(company establishment–Phase 1 lease period)	Minimum DSCR
Base case: 15.1%	15.00%	1.815
Case of 5-point increase:20.1%	17.10%	1.814
Case of 5-point decrease:10.1%	13.20%	1.815

Source: JICA Study Team

2) Sensitivity analysis 2 (increase/decrease in construction costs→inner-city area: in the case of underground structures)

In the figure below, study team looked at cash flow after deducting expenditure from fare revenue in the case where construction costs increase due to the adoption of underground structures for the inner-city area.



Source: JICA Study Team

Figure 6.2.4 Sensitivity analysis 2 (inner-city area: case of underground structures)

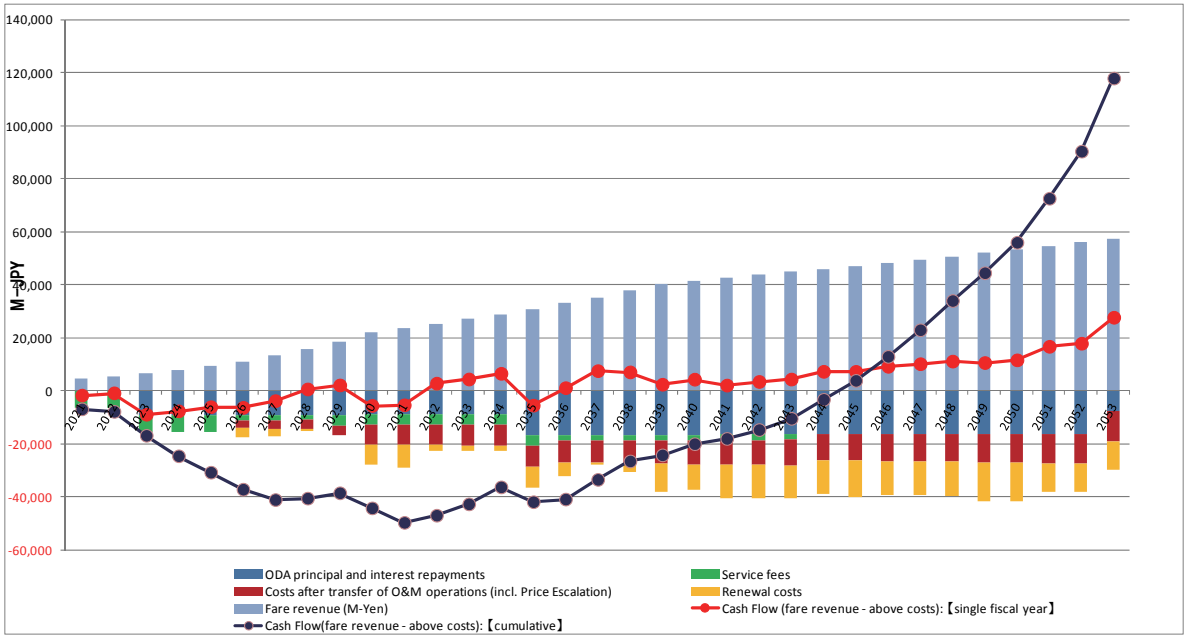
At first glance, when making a comparison with the base case (Figure 6.2.3), the difference in a single fiscal year is not great, but in proportion to the rise in construction costs, the time when cash flow in each year continually turns positive is one year later. What should be noted here is that cumulative cash flow has deteriorated from the base case of a maximum of about 149 billion yen.

For the railway operator (Vietnam government), it should be noted that the financial burden will become significantly heavier if underground structures are used for the inner-city area.

3) Sensitivity analysis 3 (increase in passenger demand)

Here, study team has looked at the impact of an increase in passenger demand. The following things about the below figure are assumed. Namely, by political guidance of government authorities, use of public transportation facilities (railroad and bus) is promoted. As the result, the burden rate increases to 20% in 2040 and does not change after that. In this case, demand in 2040 will increase to 565,000 passengers per day from 411,000 passengers per day. In this case, the time when single fiscal-year cash flow continually turns positive will be 2036, which is 14 years earlier than the base case of 2050.

As such, it is evident that an increase in passenger demand will substantially improve the cash flow of the railway operator (Vietnam government). Therefore, various measures to generate passenger demand will be required.



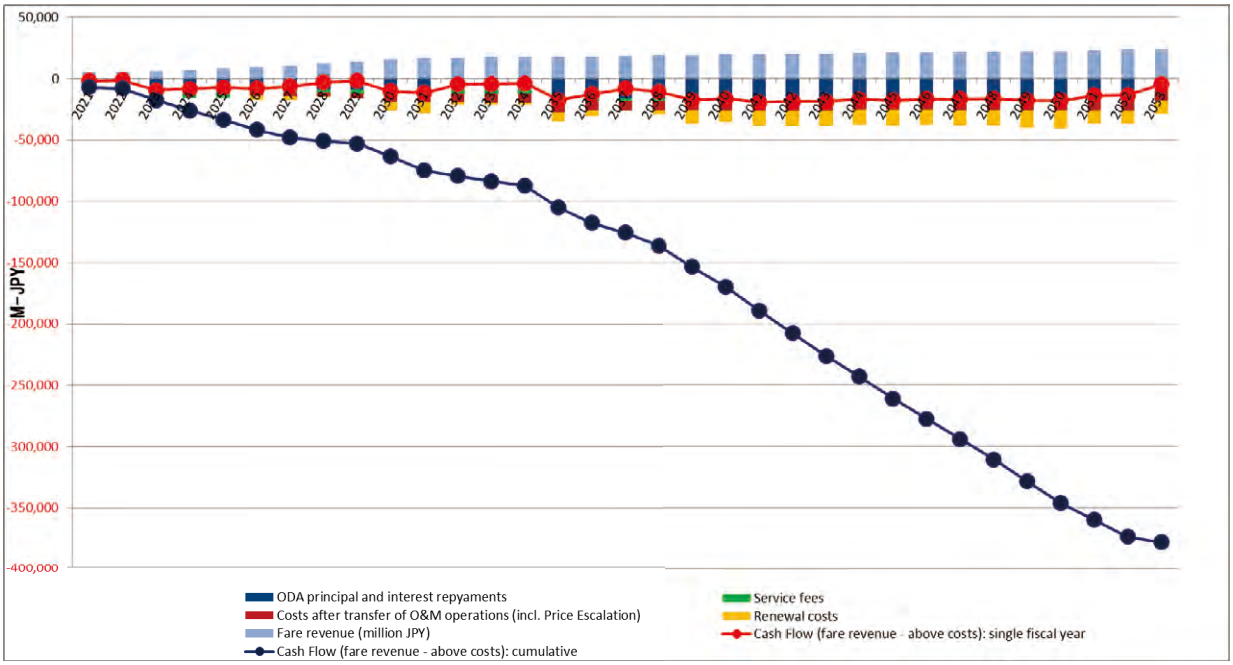
Source: JICA Study Team

Figure 6.2.5 Sensitivity analysis 3(case where burden ratio is 20% in 2040)

4) Sensitivity analysis 4 (revision of fares)

Here, study team has looked at the impact of fare revisions on the cash flow of the railway operator (Vietnam government). In the base case, the setting of fares is directly linked to the rate of increase in consumer prices, but in this case, In this case, it shows that fares are raised at 50% of the rate of the rise in consumer prices in order to boost demand at an early stage.

In this case, the average fare unit price will be US$0.94 per person in 2021, and it will rise to US$1.30 ten years after start-up (2030) and then to US$1.53 20 years after start-up (2040). By multiplying these figures with passenger demand volume, study team calculated fare revenue. As a result, cash flow did not turn positive during the valuation period, but as study team saw in Sensitivity Analysis 3, there is room for improvement if factors that boost the number of users are added.



Source: JICA Study Team

Figure 6.2.6 Sensitivity analysis 4
(case where fares are revised by 50% of rate of increase in consumer prices once every two years)

6.2.4 Matters to consider regarding commercialization

(1) Measures to reduce government debt burden

In the scheme study team is currently considering, as the rail operation contractor (Private SPC), which is the private sector, needs to conduct stable, reliable railway operation, study team has assumed that it will be allowed to receive O&M fees based on the cost-on system and lease fees from the railway operator (Vietnam government).

In this case, it will be difficult to bring the cash flow of the railway operator (Vietnam government) into balance only with fare revenue, as shown in the previously described financial analysis. A measure that is likely to improve this situation is a reduction in principal and interest repayments on yen loans, that is, measures to mitigate the government debt burden. Specifically, study team has considered the following measures in the previous section entitled “4.3 Alleviating the government debt burden”

1) Appropriation based on taxation measures such as the increased revenue portion of fixed asset taxes
2) Development of new stations that adopt the benefit principle system based on applications by developers, etc.
3) Adoption of the user-pays principle based on the City Planning Law
4) Adoption of the developer-pays principle based on negotiation between parties
5) Sharing of Line 2 rolling stock inspection facilities and inspection personnel

To implement these measures to mitigate the government debt burden, it will be necessary to study and prepare the establishment of grounds for legislation, as well as specific beneficiary selection criteria and a system and criteria for the establishment of beneficiary charge amounts. In addition, when introducing specifics regarding “v) Sharing of Line 2 rolling stock inspection facilities and inspection personnel”, it would be essential to conduct prior discussions with the parties involved with Line 2, the MOT, and the HPC, and so forth, as well as to determine their agreement.

(2) Verification of the validity of progressive development

Now, study team will verify the validity of the progressive development of Line 5, which study team discussed in 3.1.1(2).

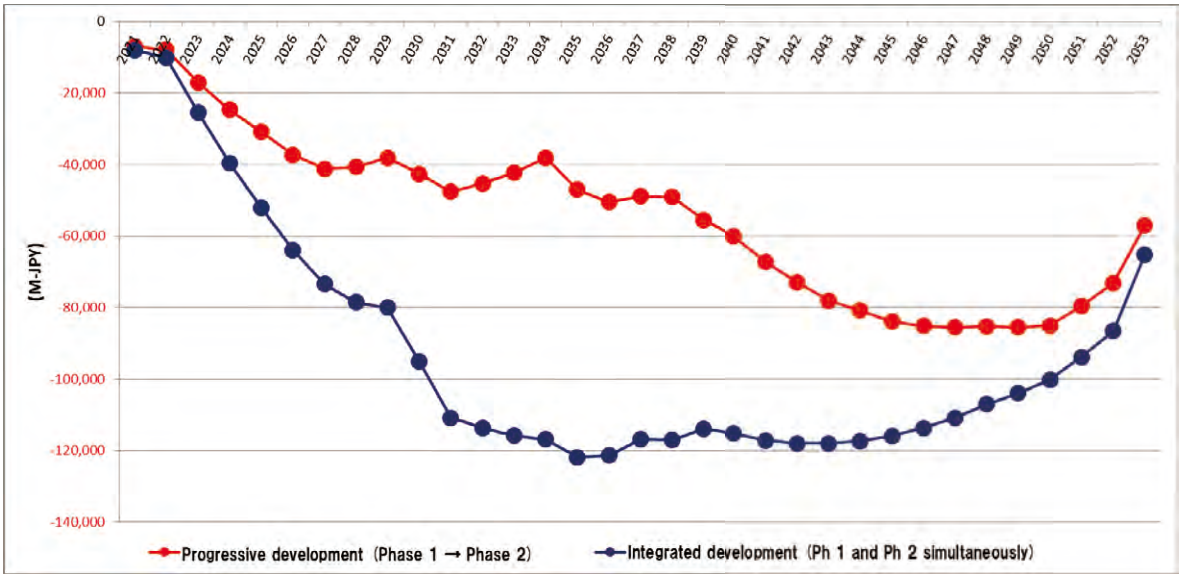
Line 5 is a line that will link the city center of Hanoi and the suburban areas, which are expected to be developed going forward. However, in this study, study team has proposed

progressive development in the form of two phases. Phase 1 covers the inner-city area of Hanoi section, where it would be desirable to improve the road environment at an early stage and where demand is projected. Phase 2 covers the suburban section, where future demand is expected as a result of development.

With regard to the verification method, study team have decided to test the validity by making a trial calculation comparison of the cumulative cash flow of the railway operator (Vietnam government), which will manage the railway, until 2053. This comparison is based on the case of progressively developing the Phase 1 section in 2021 and the Phase 2 section in 2030, as proposed in this study, and the case of developing all sections (Phase 1 section + Phase 2 section) in an integrated way in 2021.

The result was that the extent of negative cumulative cash flow based on integrated development was greater, as shown in the next Figure. (In the case of progressive development, it was a maximum of -85,536 million yen, and in the case of integrated development, a maximum of -121,841 million yen.)

Therefore, as developing the railway at an early stage in the developing suburban section will result in a huge initial investment burden and the burden of increased management costs, when compared to the scale of demand, progressive development that is commensurate with growth in demand is desirable.



Source: JICA Study Team

Figure 6.2.7 Comparison of change in cumulative cash flow of railway operator (Vietnam government) until 2053 based on difference in time of development

6.2.5 Economic and financial evaluation of project

(1) Economic evaluation of project

Here, study team conducts an economic evaluation associated with the implementation of this project.

Economic evaluation will be computed with an Economic Internal Rate of Return (EIRR) by the following formulas.

$$0 = \sum_{t=1}^{n} (Bt-Ct)/(1+EIRR)_{t-1}$$ (n: Analysis period, Bt: Benefit of each year, Ct: Cost of each year)

"Benefit of each year" mentioned in the above formula consists of the following elements:

(i) Time reduction value based on shift from motorbike travel to railway transport

(ii) Fuel cost reduction value

(iii) CO2 emission reduction value
(iv) Effect of industry attraction in industry-related analysis

"Cost of each year" consists of the "Initial Investment" and the "Renewal Investment" which were examined in Chapter 4.

When studying Economic evaluation of project, the influence of price escalation and Taxes (VAT, import duties) are eliminated.

The analysis period is from the investment start time which is added up in economic analysis until the time when yen loan repayment of principal and interest of Phase 2 is completed.

1) “Benefit of each year”

(i) Time reduction value based on shift from motorbike travel to railway transport

The development of this project will result in the shortening of travel time, as users will transfer from motorbikes to the railway. Here, study team has converted the time reduction effect to monetary value by multiplying the quantity of reduction in travel time by a time unit price (personnel cost). When estimating the quantity of reduction in travel time, study team set the burden ratio from 2021 to 2029 at 5% for the neighboring section and 10% for the other section. In addition, from 2030 onward, study team set the rate at 10% for the neighboring section and 15% for the other section. The speed when travelling by motorbike or car has been set at 20 km/hour for the inner-city area of St. 1–St. 5 and 40 km/hour for the suburban area of St. 5-St. 17.

In regard to the time unit price, study team has used the average value of the annual total pay burden (total annual payout per employee including base salary, allowances, social insurance premiums, overtime and bonuses, and excluding retirement allowances) for manufacturing industry workers and for non-manufacturing industry personnel in Vietnam, based on JETRO’s Survey of Japanese-Affiliated Firms in Asia and Oceania (FY2011 Survey).

Table 6.2.17 Time reduction value based on shift from travel by motorbike etc. to railway travel

Year	St.1～St.17(hour)			Time reduction effect	Annual Total
	Train	Motorbike	Difference	million-JPY/day	million-JPY/year
2021	20,023	34,709	-14,686	2.31	842
2022	20,357	35,244	-14,887	2.34	853
2023	20,695	35,785	-15,090	2.37	865
2024	21,035	36,331	-15,296	2.40	877
2025	21,377	36,880	-15,503	2.43	889
2026	21,719	37,429	-15,710	2.47	901
2027	22,061	37,978	-15,917	2.50	912
2028	22,400	38,523	-16,123	2.53	924
2029	22,736	39,063	-16,327	2.56	936
2030	35,261	60,818	-25,557	4.01	1,465
2031	35,372	61,001	-25,629	4.02	1,469
2032	35,483	61,184	-25,700	4.04	1,473
2033	35,595	61,367	-25,772	4.05	1,477
2034	35,707	61,551	-25,845	4.06	1,481
2035	35,819	61,736	-25,917	4.07	1,486
2036	35,931	61,920	-25,989	4.08	1,490
2037	36,043	62,105	-26,062	4.09	1,494
2038	36,156	62,291	-26,135	4.10	1,498
2039	36,269	62,477	-26,208	4.12	1,502
2040	36,382	62,663	-26,281	4.13	1,506
2041	36,496	62,850	-26,354	4.14	1,511
2042	36,610	63,038	-26,428	4.15	1,515
2043	36,725	63,227	-26,502	4.16	1,519
2044	36,840	63,416	-26,576	4.17	1,523
2045	36,956	63,606	-26,650	4.19	1,528
2046	37,071	63,796	-26,724	4.20	1,532
2047	37,187	63,987	-26,799	4.21	1,536
2048	37,304	64,178	-26,874	4.22	1,540
2049	37,421	64,370	-26,949	4.23	1,545
2050	37,538	64,563	-27,025	4.24	1,549
2051	37,625	64,700	-27,075	4.25	1,552
2052	37,712	64,838	-27,126	4.26	1,555
2053	37,800	64,976	-27,177	4.27	1,558
2054	37,887	65,115	-27,228	4.28	1,561
2055	37,975	65,254	-27,279	4.28	1,564
2056	38,063	65,393	-27,330	4.29	1,567
2057	38,151	65,532	-27,381	4.30	1,570
2058	38,240	65,672	-27,432	4.31	1,573
2059	38,328	65,812	-27,484	4.32	1,575
2060	38,417	65,952	-27,535	4.32	1,578
2061	38,506	66,093	-27,587	4.33	1,581
2062	38,595	66,234	-27,639	4.34	1,584
2063	38,685	66,375	-27,690	4.35	1,587
2064	38,774	66,517	-27,742	4.36	1,590

Source: JICA Study Team

(ii) Fuel cost reduction value

As a result of the development of this project, users will transfer from motorbikes and so forth to the railway, and to that extent, it will be possible to reduce gasoline consumption. Study team has calculated the fuel cost reduction value based on travelling distance by motorbike etc. ÷ fuel consumption of motorbike and so on (20 km/liter) x gasoline cost (VND22,900/liter: 2012).

(iii) CO2 emission reduction value

Here, study team has calculated the CO2 emission reduction value based on motorbike travelling distance ÷ motorbike fuel consumption x CO2 emission volume per liter of gasoline. CO2 emission volume per liter of gasoline was set at 2.3kg-CO2/liter by using Ministry of Land, Infrastructure, Transport and Tourism data. In addition, study team used JPY10,600 (price in 2006) as the unit load converted into monetary value per ton of CO2 emission volume (Source: Technical Guidelines of Cost-Benefit Analysis for Public Works Projects (Common Edition)).

Table 6.2.18 Fuel cost reduction value and CO2 emission reduction value

Year	Motorbike Travel km	CO2 reduction	CO2 reduction(value)	Total Annual CO2 reduction	Gasoline cost reduction	Total Gasoline cost reduction
	St.1～St.17	(kg-CO2)	million-JPY/day	million-JPY/year	JPY/day	million-JPY/year
2021	1,061,355	122,056	1.29	472	4,807,793	1,755
2022	1,086,702	124,971	1.32	484	4,922,611	1,797
2023	1,112,705	127,961	1.36	495	5,040,403	1,840
2024	1,139,316	131,021	1.39	507	5,160,947	1,884
2025	1,166,475	134,145	1.42	519	5,283,973	1,929
2026	1,194,111	137,323	1.46	531	5,409,160	1,974
2027	1,222,143	140,546	1.49	544	5,536,140	2,021
2028	1,250,478	143,805	1.52	556	5,664,494	2,068
2029	1,279,014	147,087	1.56	569	5,793,759	2,115
2030	1,995,640	229,499	2.43	888	9,039,976	3,300
2031	2,002,830	230,325	2.44	891	9,072,547	3,311
2032	2,010,039	231,154	2.45	894	9,105,202	3,323
2033	2,017,267	231,986	2.46	898	9,137,943	3,335
2034	2,024,513	232,819	2.47	901	9,170,768	3,347
2035	2,031,778	233,655	2.48	904	9,203,679	3,359
2036	2,039,062	234,492	2.49	907	9,236,674	3,371
2037	2,046,365	235,332	2.49	910	9,269,754	3,383
2038	2,053,686	236,174	2.50	914	9,302,918	3,396
2039	2,061,026	237,018	2.51	917	9,336,168	3,408
2040	2,068,385	237,864	2.52	920	9,369,502	3,420
2041	2,073,990	238,509	2.53	923	9,394,890	3,429
2042	2,079,609	239,155	2.54	925	9,420,346	3,438
2043	2,085,244	239,803	2.54	928	9,445,872	3,448
2044	2,090,895	240,453	2.55	930	9,471,467	3,457
2045	2,096,560	241,104	2.56	933	9,497,131	3,466
2046	2,102,241	241,758	2.56	935	9,522,865	3,476
2047	2,107,937	242,413	2.57	938	9,548,669	3,485
2048	2,113,649	243,070	2.58	940	9,574,542	3,495
2049	2,119,376	243,728	2.58	943	9,600,486	3,504
2050	2,125,119	244,389	2.59	946	9,626,500	3,514
2051	2,130,877	245,051	2.60	948	9,652,584	3,523
2052	2,136,651	245,715	2.60	951	9,678,739	3,533
2053	2,142,441	246,381	2.61	953	9,704,965	3,542
2054	2,142,441	247,048	2.62	956	9,731,262	3,552
2055	2,142,441	247,718	2.63	958	9,757,630	3,562
2056	2,142,441	248,389	2.63	961	9,784,070	3,571
2057	2,142,441	249,062	2.64	964	9,810,581	3,581
2058	2,142,441	249,737	2.65	966	9,837,164	3,591
2059	2,142,441	250,414	2.65	969	9,863,820	3,600
2060	2,142,441	251,092	2.66	971	9,890,547	3,610
2061	2,142,441	251,772	2.67	974	9,917,347	3,620
2062	2,142,441	252,455	2.68	977	9,944,219	3,630
2063	2,142,441	253,139	2.68	979	9,971,165	3,639
2064	2,142,441	253,825	2.69	982	9,998,183	3,649

Source: JICA Study Team

(iv) Effect of industry attraction in industry-related analysis

In the case of infrastructure projects associated with large-scale investments, demand is generated through the development of infrastructure, and there is the effect of stimulation to regional economies in terms of economic effects and employment effects.

In regards to Line 5, the amount of investment in infrastructure and equipment will have ripple effects on Vietnam's regional economies and the economies of related countries via construction and procurement. In general, the economic ripple effects relating to investment are calculated by using industry-related tables, and are disbursed by public entities as consideration for the value added of economic entities that receive construction and procurement. While the value added becomes the profits of the entities concerned (companies) and the salaries of employees, the raw materials and services required to generate the value added are paid to other entities, and the value added portion similarly belongs to the companies concerned and their employees. As this cycle will be repeated, if study team designates the ratio of value added as V, cumulative demand when the amount of investment is 1, can be reduced to 1 / (1-V).

In general, as the ratio of value added is 20-30%, 1÷0.7=1.4, and if study team combines the initial investment amount (1.0), the economic ripple effect becomes 2～3(1.4+1.0=2.4) times. As the lower the ratio of value added of the country concerned is (the higher the cost ratio is), the greater the degree of ripple will be, the ripple effect will increase. In regard to Hanoi Line 5 as well, study team can anticipate an effect of around 2.4 times relative to the development cost of 304.9 billion yen (the influence of price escalation and Taxes (VAT, import duties) are eliminated.) for all sections (St. 1-St. 17).

2) “Cost of each year”

The costs of each year consist of "initial investment" and "replacement investment." "Initial Investment" is private investment (Rolling stocks + AFC devices) +ODA investment (except Rolling stocks and AFC devices). The investment of Phase 1will be added up during 2017 and 2020.This is a period of top four years which involves the largest investment in Phase 1 from 2013 to 2021. Similarly, the investment of Phase 2 will be added up during 2028 and 2029.
When study team calculates “Cost of each year,” the influence of price escalation and Taxes (VAT, import duties) are eliminated.

Table 6.2.19 Cost of each year (Unit: million JPY, excluding price escalation and taxes)

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Rollingstock＋AFC							6,640	6,806					
ODA	181	281	482	482	19,279	45,717	52,582	56,957	6,761				403
Renual Investment													
Total Investment	181	281	482	482	19,279	45,717	59,222	63,763	6,761	0	0	0	403

Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Rollingstock＋AFC			4,504	4,616										
ODA	403	403	41,556	56,861										
Renual Investment	2,338	2,199	550	0	5,851	6,151	1,649	1,649	808	5,157	3,473	550	2,495	7,500
Total Investment	2,741	2,602	46,610	61,477	5,851	6,151	1,649	1,649	808	5,157	3,473	550	2,495	7,500

Year	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Rollingstock＋AFC														
ODA														
Renual Investment	6,789	7,419	7,319	7,319	7,319	7,491	7,319	7,319	7,319	7,577	7,577	6,939	6,939	6,939
Total Investment	6,789	7,419	7,319	7,319	7,319	7,491	7,319	7,319	7,319	7,577	7,577	6,939	6,939	6,939

Year	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064
Rollingstock＋AFC											
ODA											
Renual Investment	6,939	6,939	6,939	6,939	6,939	6,939	7,111	6,939	6,939	6,939	6,939
Total Investment	6,939	6,939	6,939	6,939	6,939	6,939	7,111	6,939	6,939	6,939	6,939

Source: JICA Study Team

3) The computation result of EIRR (economic internal rate of return)

"The computation period of EIRR" is 48 years until 2064 when the yen loan repayment of principal and interest of Phase 2 will end from 2017 when cost appropriation mentioned in above 2) starts.

The calculated economic internal rate of return (EIRR) was 10.90%. This is slightly lower than the 12% stipulated in the “Guideline for Preparing Performance Evaluation Reports for Public Sector Operations,” the standard of the Asian Development Bank for adoption projects. As the benefits of this project, reduction in traffic congestion, traffic noise, and traffic accidents is expected but not calculated as benefits since inclusion of the value is difficult. Considering the benefits, it is assumed that EIRR is improved more; therefore, the implementation of this project is evaluated as economically effective.

Table 6.2.20 The computation data of EIRR (Unit: million JPY)

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Time reduction effect									842	853	865	877	889	901
CO2 reduction effect									472	484	495	507	519	531
Gasoline cost reduction effect									1,755	1,797	1,840	1,884	1,929	1,974
Production Inducement effect					2,452	4,904	7,356	9,808	9,808	9,808	9,808	9,808	9,808	9,808
Rollingstock＋AFC+ODA					-49,042	-49,042	-49,042	-49,042						
Replacement investment	0	0	0	0	0	0	0	0	0	0	0	0	0	-2,338
Total	0	0	0	0	-46,590	-44,138	-41,686	-39,234	12,877	12,942	13,008	13,076	13,145	10,876
Year	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Time reduction effect	912	924	936	1,465	1,469	1,473	1,477	1,481	1,486	1,490	1,494	1,498	1,502	1,506
CO2 reduction effect	544	556	569	888	891	894	898	901	904	907	910	914	917	920
Gasoline cost reduction effect	2,021	2,068	2,115	3,300	3,311	3,323	3,335	3,347	3,359	3,371	3,383	3,396	3,408	3,420
Production Inducement effect	9,808	12,527	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246
Rollingstock＋AFC+ODA		-54,372	-54,372											
Replacement investment	-2,199	-550	0	-5,851	-6,151	-1,649	-1,649	-808	-5,157	-3,473	-550	-2,495	-7,500	-6,789
Total	11,086	-38,847	-35,507	15,047	14,766	19,288	19,307	20,167	15,837	17,541	20,484	18,558	13,573	14,303
Year	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
Time reduction effect	1,511	1,515	1,519	1,523	1,528	1,532	1,536	1,540	1,545	1,549	1,552	1,555	1,558	1,561
CO2 reduction effect	923	925	928	930	933	935	938	940	943	946	948	951	953	956
Gasoline cost reduction effect	3,429	3,438	3,448	3,457	3,466	3,476	3,485	3,495	3,504	3,514	3,523	3,533	3,542	3,552
Production Inducement effect	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246
Rollingstock＋AFC+ODA														
Replacement investment	-7,419	-7,319	-7,319	-7,319	-7,491	-7,319	-7,319	-7,319	-7,577	-7,577	-6,939	-6,939	-6,939	-6,939
Total	13,689	13,805	13,821	13,837	13,681	13,870	13,886	13,902	13,660	13,677	14,330	14,345	14,360	14,375
Year	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064				
Time reduction effect	1,564	1,567	1,570	1,573	1,575	1,578	1,581	1,584	1,587	1,590				
CO2 reduction effect	958	961	964	966	969	971	974	977	979	982				
Gasoline cost reduction effect	3,562	3,571	3,581	3,591	3,600	3,610	3,620	3,630	3,639	3,649				
Production Inducement effect	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246	15,246				
Rollingstock＋AFC+ODA														
Replacement investment	-6,939	-6,939	-6,939	-6,939	-6,939	-7,111	-6,939	-6,939	-6,939	-6,939				
Total	14,390	14,405	14,420	14,436	14,451	14,294	14,482	14,497	14,513	14,528				

Source: JICA Study Team

(2) Financial evaluation of project

Here, study team conducts a financial evaluation associated with the implementation of this project.

Financial evaluation will be computed with a Financial Internal Rate of Return (FIRR) by the following formulas.

$$0 = \sum_{t=1}^{n} (\text{Revenue} - \text{Investment cost} - \text{Expense})_t / (1+\text{FIRR})^{t-1}$$

In "a basic case (Ph1+Ph2: elevated in the city center)", FIRR (financial internal rate of return) of the government side will be computed in the following processes.

1) The precondition for FIRR (financial internal rate of return) computation

- The income (market price) computed based on the demand forecasting calculated in Chapter 2 was used for the "Revenue."
- "The computation period of EIRR" is 48 years until 2064 when the yen loan repayment of principal and interest of Phase 2 will end from 2017 when cost appropriation starts.
- “Investment cost” is considered as the project investment cost (market price) excluding rolling stocks and AFC devices, which the government side set.
- The following items of expenditure (market price) are considered as "Expense":
  - ✓ The amount of ODA repayment of principal and interest
  - ✓ Cost after transferring O&M
  - ✓ Service fee
  - ✓ Replacement investment
  - ✓ Pre-opening expenses

2) The computation result of FIRR (Financial Internal Rate of Return)

FIRR was computed on the basis of the precondition of 1). However, FIRR did not become a positive value. As investigated in the above-mentioned 6.2.2 (4) "basic case of the railway operator (Vietnamese government)", it was difficult to balance "investment and expense" with "fare revenue" since railway operation requires the installation of large equipment and planned replacement of facilities which involve large amount of expense with viewpoint of ensuring safety. Measures for improvement include increasing demand by promoting the use of public transportation as a policy and implementing measures to reduce the financial burden of the government.

Table6.2.21 The computation data of FIRR (Unit:million-JPY)

Year			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Revenue		Fare Revenue	0	0	0	0	0	0	0	0	4,665	5,549	6,600	7,849	9,336	11,104
Total Cost	Capital Cost	ODA investment	0	0	0	0	-64,692	-64,692	-64,692	-64,692	0	0	0	0	0	0
	Variable Cost	ODA repayment of principal and interest	0	0	0	0	0	0	0	0	0	0	-9,143	-9,126	-9,109	-9,091
		Service Fee	0	0	0	0	0	0	0	0	-6,479	-6,496	-6,478	-6,457	-6,403	-1,944
		Pre-opening expenses	0	-142	-203	-212	-268	-655	-694	-3,012	0	0	0	0	0	0
		Cost after O&M change of jurisdiction	0	0	0	0	0	0	0	0	0	0	0	0	0	-3,143
		Replacement investment	0	0	0	0	0	0	0	0	0	0	0	0	0	-3,350
Revenue－Total Cost			0	-142	-203	-212	-64,961	-65,348	-65,386	-67,704	-1,814	-947	-9,021	-7,734	-6,175	-6,423
Year			2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Revenue		Fare Revenue	13,207	15,709	18,684	22,223	22,996	23,796	24,624	25,481	26,368	27,285	28,235	29,217	30,234	31,286
Total Cost	Capital Cost	ODA investment	0	-49,813	-49,813	0	0	0	0	0	0	0	0	0	0	0
	Variable Cost	ODA repayment of principal and interest	-9,074	-9,057	-9,040	-9,022	-9,005	-8,988	-8,971	-8,953	-16,749	-16,717	-16,685	-16,653	-16,621	-16,589
		Service Fee	-1,944	-1,944	-3,440	-3,440	-3,440	-3,440	-3,440	-3,440	-3,440	-1,497	-1,497	-1,497	-1,497	-1,497
		Pre-opening expenses	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Cost after O&M change of jurisdiction	-3,302	-3,471	-3,652	-6,494	-6,644	-6,799	-6,958	-7,123	-7,292	-7,466	-7,645	-7,830	-8,020	-8,217
		Replacement investment	-2,790	-709	0	-7,786	-8,934	-2,221	-2,234	-1,790	-7,791	-5,083	-763	-3,482	-10,533	-9,592
Revenue－Total Cost			-3,902	-49,285	-47,261	-4,520	-5,027	2,349	3,021	4,175	-8,904	-3,477	1,644	-245	-6,437	-4,608
Year			2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
Revenue		Fare Revenue	32,155	33,048	33,966	34,909	35,879	36,876	37,900	38,953	40,035	41,147	42,290	43,464	44,672	45,913
Total Cost	Capital Cost	ODA investment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Variable Cost	ODA repayment of principal and interest	-16,557	-16,525	-16,493	-16,461	-16,429	-16,397	-16,365	-16,333	-16,301	-16,269	-16,237	-16,205	-7,548	-7,533
		Service Fee	-1,497	-1,497	-1,497	0	0	0	0	0	0	0	0	0	0	0
		Pre-opening expenses	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Cost after O&M change of jurisdiction	-8,363	-8,514	-8,668	-8,826	-8,988	-9,154	-9,325	-9,499	-9,678	-9,861	-10,049	-10,242	-10,440	-10,642
		Replacement investment	-12,737	-12,304	-12,372	-12,441	-13,460	-12,585	-12,660	-12,737	-14,385	-14,505	-10,550	-10,574	-10,599	-10,624
Revenue－Total Cost			-6,999	-5,791	-5,063	-2,819	-2,998	-1,261	-450	384	-329	512	5,453	6,443	16,086	17,114
Year			2055	2056	2057	2058	2059	2060	2061	2062	2063	2064				
Revenue		Fare Revenue	47,188	48,499	49,846	51,231	52,654	54,116	55,619	57,164	58,752	60,384				
Total Cost	Capital Cost	ODA investment	0	0	0	0	0	0	0	0	0	0				
	Variable Cost	ODA repayment of principal and interest	-7,518	-7,503	-7,489	-7,474	-7,459	-7,444	-7,430	-7,415	-7,400	-7,385				
		Service Fee	0	0	0	0	0	0	0	0	0	0				
		Pre-opening expenses	0	0	0	0	0	0	0	0	0	0				
		Cost after O&M change of jurisdiction	-10,849	-11,062	-11,280	-11,503	-11,732	-11,967	-12,208	-12,454	-12,707	-12,966				
		Replacement investment	-10,650	-10,676	-10,703	-10,731	-10,760	-12,162	-10,819	-10,849	-10,881	-10,913				
Revenue－Total Cost			18,171	19,257	20,374	21,522	22,703	22,543	25,163	26,446	27,764	29,120				

Source: JICA Study Team

Table 6.2.22 Base case in financial analysis (1/2)

Ph1+Ph2 | Rolling stock and AFC only | Inner-city overhead structures

1US$= 82.4 Yen
Price Escalation: FC: 1.6% LC: ~2030 7.3% | 2031~2040 3.20% | 2041 onward 2.50%

Preoperating cost 1.000

Start-up

PSIF & LEASE

Phase1 — Total 15,388 | JICA-PSIF 10,772 | Equity 4,616

		2013	2014	2015	2016	2017	2018	2019	2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
JICA finance portion									7,540	7,849																												
Equity									4,616																														
Lease payment fee (monthly) rate	1.052%																																					
Lease payment fee	15Years									1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944														
PSIF cost of principal and interest payment										1,041	1,020	998	977	955	934	912	890	869	847	826	804	783	761	740														
Total cash flow		0	0	0	0	0	0	0	-4,616	902	924	945	967	988	1,010	1,032	1,053	1,075	1,096	1,118	1,139	1,161	1,182	1,204	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IRR (Ph 1) (until end of Phase 1 lease contract)	20.0%																																					

Phase1 — PSIF count (Excluding Preoperating cost)

		2013	2014	2015	2016	2017	2018	2019	2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
PSIF(phase1)									10,772																														
Payment principal(phase1)(Grace=0)	15years									718	718	718	718	718	718	718	718	718	718	718	718	718	718	718														
Payment interest rates(phase1)	3%									323	302	280	259	237	215	194	172	151	129	108	86	65	43	22														
Residual principal(phase1)		0	0	0	0	0	0	0	10,772	10,054	9,336	8,617	7,899	7,181	6,463	5,745	5,027	4,309	3,591	2,872	2,154	1,436	718	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0
PSIF Preoperating cost 70%									700																														
Payment principal(Preoperating cost 70%)(Grace=0)										47	47	47	47	47	47	47	47	47	47	47	47	47	47	47														
Payment interest rates(Preoperating cost 70%)										21	20	18	17	15	14	13	11	10	8	7	6	4	3	1														
Residual principal(Preoperating cost 70%)									700	653	607	560	513	467	420	373	327	280	233	187	140	93	47	0														

PSIF & LEASE 27,238

Phase2 — Total 11,850 | JICA-PSIF 8,295 | Equity 3,555

		2013	2014	2015	2016	2017	2018	2019	2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
JICA finance portion																	5,806	6,044																					
Equity																	3,555																						
Lease payment fee (monthly) rate	1.052%																																					
Lease payment fee	15Years																	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497							
PSIF cost of principal and interest payment																		802	785	769	752	735	719	702	686	669	653	636	619	603	586	570							
Total cash flow		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-3,555	695	711	728	745	761	778	794	811	827	844	861	877	894	910	927	0	0	0	0	0	0	0
IRR (Ph 2) (until end of Phase 2 lease contract) 15%	20.00%																																					

Phase2 — PSIF count

		2013	2014	2015	2016	2017	2018	2019	2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
PSIF(phase2)																	8,295																						
Payment principal(phase2)(Grace=0)	15years																	553	553	553	553	553	553	553	553	553	553	553	553	553	553	553							
Payment interest rates(phase2)	3%																	249	232	216	199	182	166	149	133	116	100	83	66	50	33	17							
Residual principal(phase2)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,295	7,742	7,189	6,636	6,083	5,530	4,977	4,424	3,871	3,318	2,765	2,212	1,659	1,106	553	0						

Transferred from 5th year

O&M Fee

		2013	2014	2015	2016	2017	2018	2019	2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
O&M Fee										3,353	3,227	3,068	2,907	2,717																										
O&M Fee Price Escalation										1,182	1,326	1,466	1,606	1,742																										
										4,535																																
O&M cost										2,792	2,687	2,555	2,421	2,262																										
O&M cost Price Escalation										984	1,104	1,220	1,337	1,451																										

Service Fee

		2013	2014	2015	2016	2017	2018	2019	2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
④ Service Fee(phase1+phase2)		0	0	0	0	0	0	0	0	6,479	6,496	6,478	6,457	6,403	1,944	1,944	1,944	3,440	3,440	3,440	3,440	3,440	3,440	3,440	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	0	0	0	0	0	0	0	0	0

Start-up costs fee

		2013	2014	2015	2016	2017	2018	2019	2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
⑤ Start-up costs fee		0	133	179	179	220	494	497	2,302																														
⑥ Start-up costs fee Price Escalation		0	8	24	33	48	162	197	710																														

Start-up costs

		2013	2014	2015	2016	2017	2018	2019	2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Start-up costs		0	111	149	149	183	411	413	1,916																														
Start-up costsPrice Escalation		0	7	20	27	40	135	164	591																														

Depreciation

Phase1

		2013	2014	2015	2016	2017	2018	2019	2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Rolling stock(phase1)	15Years								0	10,300																													
Price Escalation									0	1,350																													
Rolling stock+Price Escalation									0	11,650																													
AFC(phase1)	8Years								0	3,305																													
Price Escalation									0	433																													
AFC+Price Escalation									0	3,738																													
Rolling stock Depreciation										777	777	777	777	777	777	777	777	777	777	777	777	777	777	777	0													
Rolling stock Stock									0	10,874	10,097	9,320	8,543	7,767	6,990	6,213	5,437	4,660	3,883	3,107	2,330	1,553	777	0	0													
AFC Depreciation										467	467	467	467	467	467	467	467																							
AFC Stock									0	3,271	2,803	2,336	1,869	1,402	934	467	0																							
Depreciation Total(phase1)		0	0	0	0	0	0	0	0	1,244	1,244	1,244	1,244	1,244	1,244	1,244	1,244	777	777	777	777	777	777	777	0	0	0	0	0	0	0	0	0	0	0	0	0	0

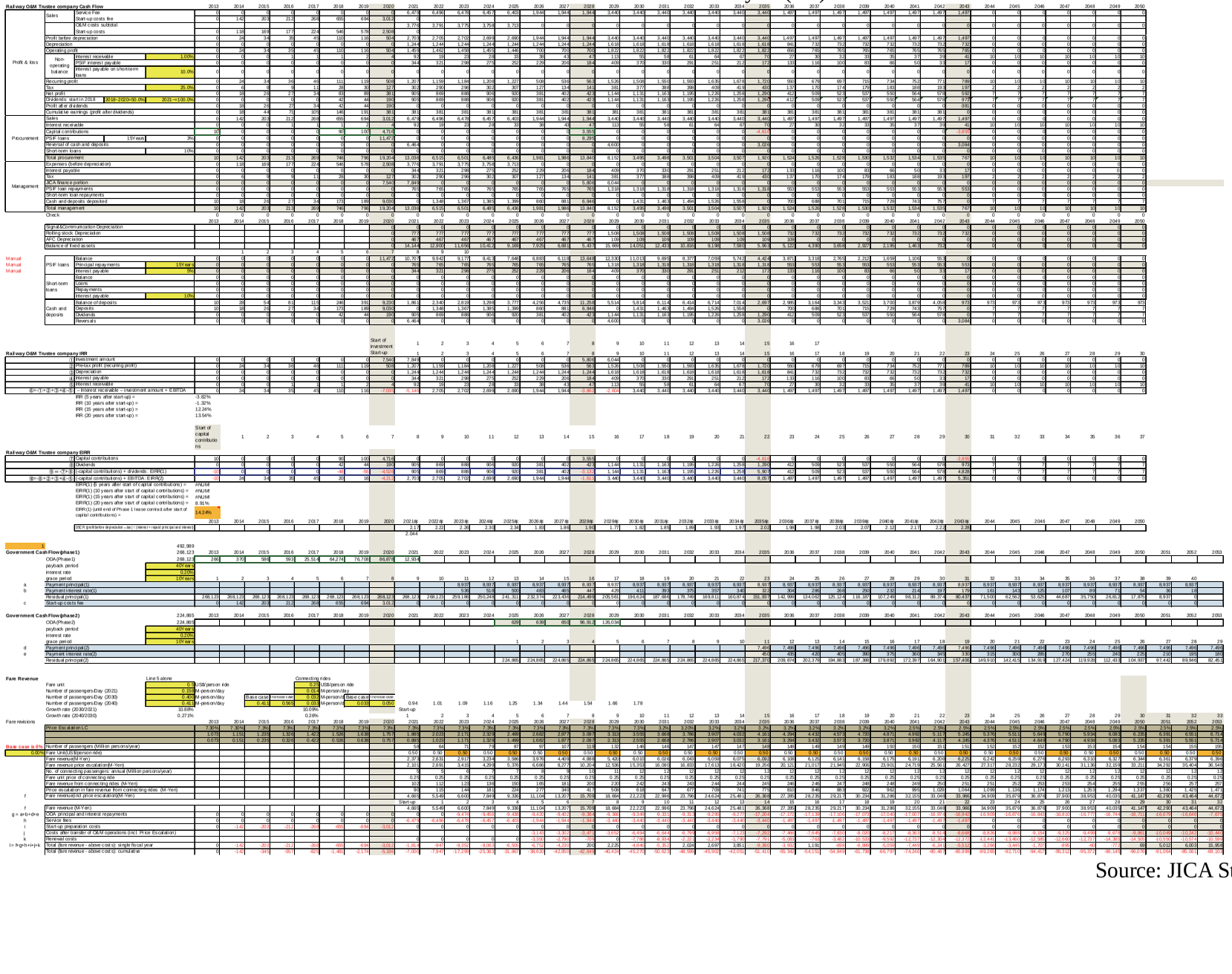
Depreciation

Phase2

		2013	2014	2015	2016	2017	2018	2019	2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Rolling stock(phase2)	15Years																	8,654																				
Price Escalation																		2,321																				
Rolling stock+Price Escalation																		10,975																				
AFC(phase2)	8Years																	689																				
Price Escalation																		185																				
AFC+Price Escalation																		874																				
Rolling stock Depreciation																		732	732	732	732	732	732	732	732	732	732	732	732	732	732	732							
Rolling stock Stock																		10,244	9,512	8,780	8,049	7,317	6,585	5,854	5,122	4,390	3,658	2,927	2,195	1,463	732	0							
AFC Depreciation																		109	109	109	109	109	109	109	109														
AFC Stock																		765	656	546	437	328	219	109	0														
Depreciation Total(phase2)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	841	841	841	841	841	841	841	841	732	732	732	732	732	732	732	0	0	0	0	0	0	0

Source: JICA Study Team

Table 6.2.23 Base case in financial analysis (2/2)



Source: JICA Study Team

6.3 Risk analysis

See the following table for the risks involved in this project.

Risk analysis of the project

Stage	Type of risk		Contents	Railway operator (Vietnam government)	Rail operation contractor (Private SPC)	O&M management subsidiary	Investing company	Financial institutions
Common	Country risk	Risk regarding laws and permission/ approval	Congressional approval is not received or policies change due to a change in political administration. The contents of laws, permission or approval regarding projects are changed or cancelled. Permission/approval cannot be obtained from the government, competent government offices, other ministries/agencies or local governments. Permission/approval necessary for the implementation of the project cannot be obtained, is delayed or requires more time than estimated. Owing to corporate governance and resolution rules based on Vietnam's Enterprise Law and foreign capital regulations, management control by the Japanese side does not extend to the rail operation contractor (Private SPC). Rights under labor laws with rules that are different from the granting of operating rights (business operators have loans managed by the government) expand, while labor disputes become more active due to social anxiety.		○	○	○	○

		Risk of expropriation	Expropriation of private facilities by the government.		○	○	○	○
		Money transfer risk	Suspension of foreign currency exchanges and money transfer or financial rescheduling.		○	○	○	○
		Risk of war	War or domestic conflicts	○	○	○	○	○
		Risk of changes in the taxation system	Introduction of new taxation systems or changes in tax rates.		○	○	○	○
		Contract risk	Failure of contract party to observe a contract.		○	○	○	○
		Price risks	As prices rise and management costs increase, discrepancies in income/ expenditure estimates of railway operator (Vietnam government) occur. Wages of workers employed by the rail operation contractor (Private SPC) rise steeply.	○	○	○	○	○
	Risk in the economic environment	Foreign exchange risk	Large degree of fluctuation in foreign exchange rate causes discrepancies in originally planned income/ expenditure. Japanese enterprises suffer drop in value of earnings when converted to Japanese yen.		○	○	○	○
		Interest rate risk	Rise in interest rates pushes up fund raising costs.	○	○	○	○	○
		Fund raising risk	Necessary funds cannot be raised in planned amount or based on planned conditions.	○	○	○	○	○
		Environmental risk	Academic discoveries or discovery of natural destruction causes projects to be suspended.	○	○	○	○	○

	Risk related to social and natural environments	Risk of opposing movements / general strikes	Project activities are restricted by opposing groups or general strikes.	○	○	○	○	○
		Risk of accident / disaster	Project activities are restricted by accident, fire, natural disaster, bad weather or war during the construction period.	○	○	○	○	○
	Sponsor risk		Inadequate capability of investors to implement the project or insufficient ability to contribute capital.		○	○	○	
Project implementation	Plan-related risk	Measurement and research risk	Inadequacies or mistakes in onsite research of geography or geology.	○				
		Design risk	Changes in the design due to design mistakes	○				
		Risk of plan changes or delays	Change or delay due to environmental assessment and public hearing	○				
		Risk of change in requirements	More advanced management organization required than initially agreed.		○	○	○	○
		Application risk	Loss of application cost when application rejected.		○	○	○	○
	Construction risk	Risk of delay in land acquisition	Restricted project implementation due to delayed land acquisition	○	○	○	○	○
		Completion risk	Construction is not completed by the initial deadline or within the original budget. Alternatively, construction is completed but does not reach the required capability.	○	○	○	○	○
		Technological and quality risk	The project does not advance as initially planned due to inappropriate technologies	○	○	○	○	○

			or improper work.					
		Risk in development of related infrastructure	Delay in construction of access roads around stations and train garages.	○	○	○	○	○
		Contract risk	Contract party does not observe contract. For example, railway operator (Vietnam government) does not pay service fees to the rail operation contractor (Private SPC).		○	○	○	○
Business operation	Market risk	Revenue and sales risk	Number of passengers assumed in demand estimates is not reached.	○				
	Operational risk		Operation become impossible or operating rate declines, as staffs at the rail operation contractor (Private SPC) do not have required capability or experience. Handling confusion occurs at time of interface malfunction or breakdown caused by introduction of new technology. Continued supply of additional investment properties and replacement parts is suspended. Owing to change in infrastructure by railway operator (Vietnam government), operation of upper segment of railway facilities (rolling stock and AFC system) becomes impossible.	○	○	○	○	○
	Supplier risk	Maintenance risk	Failure to comply with maintenance operation manual. Necessary parts and materials cannot be procured.		○	○		

		Power supply risk	Electricity supplied by power company becomes insufficient. When a power outage occurs due to a third party, the location of responsibility is not known. Inspections are not carried out. Charges rise steeply.		○	○		
		Rolling stock risk	Additional investment is required when rolling stock is expanded and end of life is reached.		○	○		
	Personnel related risk	Recruitment risk	Personnel required for railway cannot be hired. Unable to ensure number of interpreters with sufficient ability		○	○		
		Human resources development risk	Personnel required by rail operation contractor (Private SPC) cannot be developed (drivers and engineers).		○	○		
		Labor risk	Labor accident, commuting accidents, or lawsuits related to compensation for damages, etc. arise. Owing to factors such as working environment, attrition rate increases and strikes become frequent. Employees all resign at once. Wages rise substantially.		○	○		
		Risk of human error and improper behavior	Losses occur due to mistakes and improper behavior related to transfer of money.		○	○		
	Accident related risk	Risk of occurrence of accidents	An accident for which the rail operation contractor (Private SPC) is responsible occurs.		○	○		

		(due to company itself)						
		Risk of responding to accidents (due to other parties)	An accident occurs due to action by a third party such as collision of a car with railway facilities.	○		○		
	Facility and equipment management risk	System risk	Costs increase sharply due to system down, software changes, or theft, etc.		○	○		
		Man-made disaster risk	Theft or facility damage occurs.		○	○		
		Risk of natural disasters	Facilities become unusable due to natural disasters such as flooding or thunderstorm damage.		○	○		
		Risk based on depot facilities	Environmental trouble such as noise and vibration affecting residents in vicinity of depots occurs. (same for all railway lines) -Land subsidence at depots (same for all lines)		○	○		
	Risk regarding compliance with laws and regulations and contracts		Operation becomes impossible due to inability to obtain necessary permission or approval.		○	○		
	Risk regarding related infrastructure and utilities		Infrastructure and utilities needed for project cannot be obtained	○	○	○	○	○

6.4. Investigation of risk hedging measures

See the following Table for the hedging measures for each selected risk.

Stage	Type of risk		Hedging measures
Common	Country risk	Risk regarding laws and permission/ approval	There are some countries with many cases of problems regarding the non-enactment of related laws and problems regarding inefficient coordination between administrative and permission / approval organizations. The Study Team will, therefore, determine the responsibility for acquisition of permission/approval required for the project under consideration in advance with the authorities in the host country. In particular, the following permission / approval will significantly affect the realization of the project. • Permission for investment / projects / operation by foreign enterprises • Permission for land acquisition • Permission for ownership of project assets • Permission for obtaining foreign currency loans, repayment/payment of interest and permission related to the environment • Permission related to construction and for contracts with foreign contractors • Permission for the import of machines and materials The Study Team will make provisions to place the above in the scope of the responsibility of the host country government and personnel in charge as far as possible or mandate them to cooperate with project companies so that they can obtain the above permissions smoothly. The project finance provider usually regards the acquisition of the above permissions for financing as the conditions precedent. When international and governmental organizations provide a guarantee or insurance, the Study Team will determine through concrete negotiations whether the risk of changes in laws is covered by the guarantee/insurance. When there are inconsistencies between laws, the project owner will be armed with logic in advance, as interviews with both governments will be conducted. A guarantee will be obtained regarding responses to layoffs, including a long-term suspension of operation. To prepare for the event that it becomes necessary for the rail operation contractor (Private SPC) to unavoidably carry out a long-term suspension of operation, for a reason attributable to the responsibility of the railway operator (Vietnam government), the rail operation contractor (Private

			SPC) will obtain a guarantee regarding responses to layoffs. Owing to the non-performance of contracts (non-payment) or corporate governance and resolution rules based on Vietnam's Enterprise Law as well as foreign capital regulations, ideal management control may not extend to the rail operation contractor (Private SPC). Therefore, a shareholders' agreement, decision by the prime minister of Vietnam, or an agreement between the Japanese and Vietnamese governments will be determined.
		Risk of expropriation	Basically, the project owner shall obtain a guarantee that the government will not expropriate land one-sidedly and determine with the government the method of compensation when expropriation or business suspension occurs for reasons on the host country side and during the contract period. Furthermore, in some cases, it is also necessary to make the government of the host country directly guarantee the revision of applicable legislation (such as foreign investment regulations) and at the same time make this a condition for starting the project. An agreement on the planned amount of expropriation denominated in foreign currency in the event that expropriation occurs shall be concluded. An agreement on the planned amount of expropriation denominated in foreign currency to cover invested capital, expected profits, and debt repayment shall be concluded.
		Money transfer risk	Even when the railway operator (Vietnam government) contractually guarantees the payment of foreign currency or the host country does not restrict foreign currency exchanges at that time, some countries may stop transfers of foreign currency and implement rescheduling in the future. Therefore, the project owner shall obtain a guarantee regarding transfers and foreign currency exchanges directly from the government of the host country.
		Risk of war	As a means of analyzing country risk, the project owner shall not only rely on publicly available and local information but also rely on research by specialist organizations such as UK and US strategic research centers in some cases. As a means of country risk hedging, the project owner shall acquire insurance /guarantees provided by international and governmental organizations.
		Risk of changes in the taxation system	As new taxes may be introduced or tax rates may change, the rail operation contractor (Private SPC) shall obtain a guarantee regarding specially privileged tax measures, including the continuation of the initial tax system.
	Risks regarding the economic environment	Price risk	At the stage of considering the plans concerned, the plans are formulated based on changes in costs and the contract value is decided after taking into account changes in prices. The railway operator (Vietnam government) will address this by revising fares after taking into account the state of prices and management costs. The rail operation contractor (Private SPC) will set the service fee based on the cost-on system,

			which includes a rise in wages.
		Foreign exchange risk	The service fees paid by the railway operator (Vietnam government) to the rail operation contractor (Private SPC) shall be paid in Japanese yen or denominated in Japanese yen and paid in VND. They shall be deposited in an offshore escrow account (an overseas designated account to manage the cash flow of the target project).
		Interest rate risk	The procurement of loans by the rail operation contractor (Private SPC) shall involve only JICA overseas investment finance (PSIF).
		Fund raising risk	For loans, the aim is to use JICA-PSIF loans for the full amount on a non-recourse basis. The remaining amount will be procured through capital contributions by participating enterprises.
	Risks regarding social and natural environments	Environment related risks	The railway operator (Vietnam government) will hire specialist consultants and allow the involvement of international organizations. The railway operator (Vietnam government) will obtain permission for the implementation of an environmental impact assessment and for the local environment. In cooperation with the host country government and project companies, the railway operator (Vietnam government) shall conduct advance negotiations and adjustments with local residents and NGOs, etc. In regard to problems involving residents beside the railway line, such as noise and vibrations, the railway operator (Vietnam government) will basically address these from the viewpoint of public transport and add them to contract provisions. In preparation for the event that the project is suspended as a result of environment-related changes, the rail operation contractor (Private SPC) will obtain a guarantee regarding responses to layoffs.
		Risk of opposing movements/general strikes	The railway operator (Vietnam government) will basically address this risk from the viewpoint of public transport and add it to contract provisions.
		Risk of accidents and natural disasters	Purchase at an appropriate price in the case of termination for reasons on the host country side shall be guaranteed. An upper limit shall be set on compensation for damages based on reasons attributable to the responsibility of the rail operation contractor (Private SPC). In the event of accidents or disasters that are caused by the railway operator (Vietnam government), the host country government shall be made to promise to cover the repair costs. Indemnity for reasons that are not attributable to the responsibility of the rail operation contractor (Private SPC) shall be as follows. - Defects in infrastructure portion constructed with the responsibility of the government

			- Damage such as the suspension of operation caused by aging of equipment - Reparation and compensation associated with suspension of operation at time of power outages caused by power suppliers - Suspension of operation caused by natural disasters, acts of providence, or the actions of third parties, and other such events The project finance lender shall require that nonlife insurance be paid according to the advice of the insurance adviser.
	Sponsor risk		The sponsor shall offer funds on an equity-first basis and prepare a bank certificate for the amount equivalent to the invested funds to complete credit enhancement by a third party. If additional capital contributions are made, the Vietnamese government shall bear responsibility for the amount of capital contributions on the Vietnamese side, and an agreement between the Japanese and Vietnamese governments shall be concluded. The companies that contribute capital shall have limited liability within the range of the amount of capital contributions.
Project implementation	Plan-related risks	Measurement and research risks	The establishment of an organization that is able to precisely control the progress of the project shall be considered. It shall be clarified that the responsibility for the planning, design and construction of the infrastructure portion lies with the Vietnamese government.
		Design risk	
		Risk of plan changes or delays	
		Risk of change in requirements	The rail operation contractor (Private SPC) shall address this risk within the possible scope and shall invoice the railway operator (Vietnam government) through service fees based on the cost-on system.
		Application risk	Efforts shall be made to avoid open tendering, such as preparing for projects where the company's own strengths can be utilized.
	Construction risk	Risk of delay in land acquisition	In the contract with the railway operator (Vietnam government), the response in the case of construction delays shall be clarified (railway facilities and staff that have already been procured shall be regarded as costs and shall be guaranteed by the railway operator (Vietnam government). As ensuring safety after the sharing of possessed infrastructure is important, the railway operator (Vietnam government) shall cooperate with the rail operation contractor (Private SPC) in checking construction management. The form of contract relating to the construction of facilities procured by the private sector shall be an EPC agreement, and the manufacturers, which are the suppliers, shall bear responsibility for technology, quality, and the period of construction.
		Completion risk	
		Technological and quality risks	

		Risk in development of related infrastructure	In large-scale projects, it is important to construct roads, ports, housing, hospitals and other necessary infrastructure. When the development of this infrastructure is required, the Vietnamese government and various developers shall carry out development and also bear the cost. When land acquisition is necessary, the Vietnamese government shall acquire the land, and it will be necessary to clarify in advance the associated responsibility and guarantees, including time limits.
		Contract risk	As there are problems regarding the establishment of legislation in emerging countries, the fundamental laws shall be UK, US, and Japanese laws as far as possible, and the court with jurisdiction and place of mediation shall be Japan.
Business operation	Market risk	Revenue and sales risk	The railway operator (Vietnam government) shall bear the demand risk, and the rail operation contractor (Private SPC) shall receive service fees based on the cost-on system. The railway operator (Vietnam government) shall guarantee the service fees paid to the rail operation contractor (Private SPC), and the Vietnamese government shall guarantee their financial sources. To promote demand, the railway operator (Vietnam government) shall review transport policies.
	Operational risk		Insurance required for operations shall be taken out. The rail operation contractor (Private SPC) shall check the equipment specifications and order conditions when preparing tender documents. In regard to equipment that is directly linked to safety, equipment that has operated in Japan shall be procured with a STEP loan. A follow-up system based on manufacturer support shall be established, and equipment shall be renewed within the manufacturer supply guarantee period. The period of the lease agreement with the railway operator (Vietnam government) shall be within the range in which manufacturers' parts can be supplied. Design will be carried out on the basis of introducing parts for which several suppliers exist. As there is a close relationship between the infrastructure that is owned by the railway operator (Vietnam government) and the railway facilities (rolling stock and AFC system) that are owned by the rail operation contractor (Private SPC) from the perspective of safe operation, cooperation will be sought when making adjustments or checks, etc. if changes to specifications occur.
	Suppliers	Maintenance risk	Contracts shall be concluded based on maintenance agreements that determine the contents of everyday regular inspections, inspection cycles, and repair work. It shall be clearly specified that repair, improvement and renewal work that goes beyond the scope of functional maintenance will not be included. Damage including the suspension of operation caused by the aging of equipment shall be exempted.

			The signal system is inseparable from driving safety. The rail operation contractor (Private SPC) will inspect the system and the railway operator (Vietnam government) will maintain it. Attempts shall be made to simplify and expedite import procedures regarding products procured from Japan as well as materials and engineers associated with recovery from malfunctions. Spare parts shall be held (about two years). A limit on liability for damages shall be set in business outsourcing agreements.
		Power supply risk	Power supply shall be ensured not only for railway operation but also in regard to maintenance, and a priority supply guarantee over the long term shall be obtained. Reparation and compensation associated with the suspension of operation at the time of power outages caused by the supply side shall be exempted. It shall be specified that agreements will change when electricity unit prices change (cost-on system).
		Rolling stock risk	To avoid the occurrence of a serious accident, all rolling stock and equipment and materials shall be made in Japan. The railway operator (Vietnam government) shall prepare long-term plans from the start and provide for large-scale renewal.
	Personnel related risk	Recruitment risk	Before the start of operation and during the initial stage of operation staff shall be dispatched from Japan. Requests for support for Line 2 and Line 3, which take precedence in Vietnam, shall be implemented. Vietnamese personnel with experience at Japanese companies shall be hired. Management candidates shall be requested from personnel agencies with a good track record.
		Human resources development risk	A human resource development plan with a long-term view shall be prepared. Training organizations and curricula in Japan shall be used.
		Labor risk	All-risk security insurance and liability insurance shall be taken out. A comfortable working environment and salary system compared to other companies shall be prepared. In addition, sufficient personnel shall be secured. The agreement between the railway operator (Vietnam government) and the rail operation contractor (Private SPC) shall contain provisions that consider an agreement between labor and

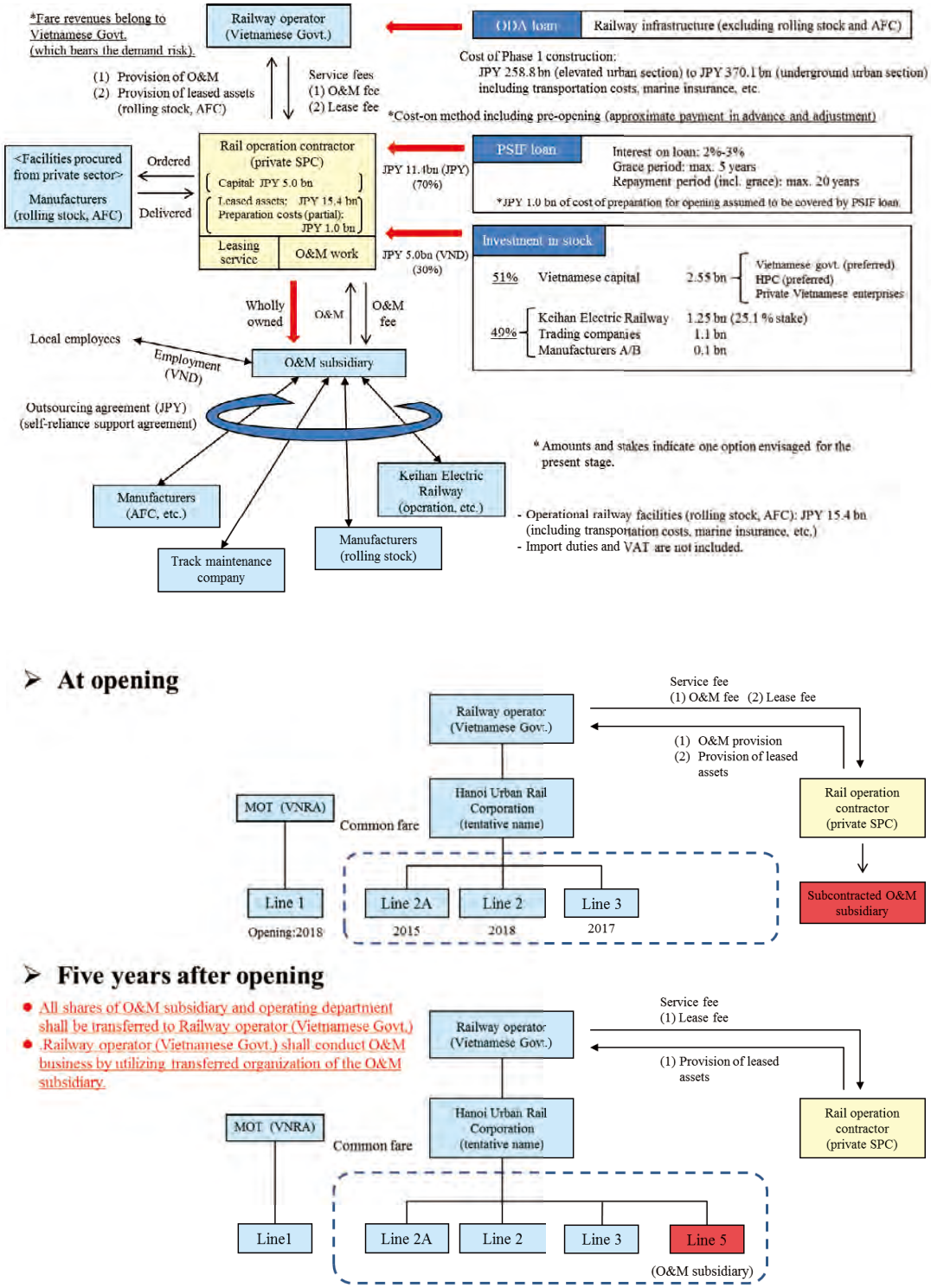
			management at the O&M management subsidiary. The talents of employees shall be managed. In regard to various expenses at the time of dismissing employees, provisions shall be made for the settlement of actual payments such as retirement allowances.
		Risk of human error and improper behavior	Opportunities for officers to transfer money shall be reduced as far as possible by promoting the diffusion of charge-type IC cards (SVC). An inspection and examination system shall be developed (regulations, standards, manuals, and inspection reports, etc.)
	Accident related risk	Risk of occurrence of accidents (due to company itself)	Railway operation liability insurance and fire insurance shall be taken out at the cost of the railway operator (Vietnam government). All business operation insurance and a rider for business interruption shall be taken out. Highly competent educational staff shall be selected, and they will provide reliable employee education including the enhancement of safety awareness. Japanese-style health and safety management shall be introduced. Manuals shall be prepared to reliably hand down knowledge regarding business operations. A driver training organization shall be established as a governmental organization, a training system will be established, and drivers with a certain level of competency will be hired. The verification system shall be strengthened in regards to operation commands based on a multiple-personnel system. Platform doors shall be installed to ensure security within stations.
		Risk of responding to accidents (due to other parties)	If damage to facilities occurs, it shall be dealt with swiftly.
		Risk of responding to accidents	Responsibility that the railway operator (Vietnam government) or the rail operation contractor (Private SPC) should bear will be prescribed in advance. In regard to accidents caused by third parties, basically neither the railway operator (Vietnam government) nor the rail operation contractor (Private SPC) shall take responsibility. Employee education shall be thoroughly provided and efforts made to prevent accidents for which employees are liable.
	Facility and equipment	System risk	Based on consultation with Clearing House, the boundary points of responsibility shall be clarified.
		Man-made	Crime prevention equipment such as surveillance cameras shall be enhanced.

	management risk	disaster risk	
		Risk of natural disasters	The railway operator (Vietnam government) shall implement designs that assume flooding. Water discharge equipment shall be installed, and uninterruptible power supply systems shall be established. Suspension of operation due to natural disasters and acts of providence shall be exempted, and the rail operation contractor (Private SPC) shall handle recovery repair costs through a separate contract.
		Risk based on depot facilities	Green buffer zones shall be developed around depots. In regard to problems involving residents beside the railway line, such as noise and vibrations, the railway operator (Vietnam government) will basically address these from the viewpoint of public transport and add them to contract provisions.
	Risk regarding compliance with laws and regulations and contracts		As there is a possibility that the non-performance of contracts will occur, a decision by the prime minister of Vietnam or an agreement between the Japanese and Vietnamese governments will be determined.
	Risk regarding related infrastructure and utilities		The prior commitment of the local government shall be obtained.

Chapter 7 Security Package

7.1 Project scheme framework

A framework was designed for the proposed project scheme to assist development of a security package and creation of a term sheet. The project scheme is outlined below.



Source: JICA Study Team

Figure 7.1.1 Outline of project scheme

The main features of the project scheme are as follows.

(1) Roles of each entity

1) Railway operator (Vietnam Government)

Vietnamese Government will function as the Railway operator, which will develop the railway infrastructure (facilities other than rolling stock and AFC) and manage the railway business as the party to which railway business expenditures and revenues are imputed.

Additionally, Hanoi City will prepare to establish a tentatively named Hanoi Urban Rail Corporation, to which operation will be transferred five years after opening.

2) Rail operation contractor (private SPC)

The Rail operation contractor (private SPC) will be contracted by the Railway operator (Vietnam Government) to procure and lease to the Railway operator (Vietnam Government) the rolling stock and AFC, and to perform O&M work under a cost-on arrangement.[2]

3) O&M subsidiary (private sector)

The O&M subsidiary will be created as a wholly owned subsidiary of the Rail operation contractor (private SPC), and will be sub-contracted by the Rail operation contractor (private SPC) to perform actual O&M activities with the assistance of Japanese Railway operators and manufacturers with extensive experience and know-how of urban rail operations.

It will be a corporation whose contractual status in relation to management rights and performance of actual O&M activities will be transferred from the Rail operation contractor (private SPC) to the railway operator (Vietnamese government) by means of a share transfer five years after opening.

(2) Financing of Rail operation contractor (private SPC) and projected investors

1) Financing

The Rail operation contractor (private SPC) will require funds to procure the privately procured facilities (rolling stock and AFC) and a portion of the cost of preparation for opening. It is assumed that 70% of this amount will be funded by JICA's Private Sector Investment Finance (PSIF) program, and 30% by obtaining investment in equity. In keeping with restrictions on foreign investment, it is envisaged that 51% of the investment in equity will come from Vietnam and 49% from Japan.

2) Projected investors

The investors in the Rail operation contractor (private SPC) are envisaged to be: on the Vietnamese side, the Vietnamese government (including local government), government-affiliated enterprises, and other private enterprises; and, on the Japanese side, Japanese railway companies with expertise in railway operation, trading companies, manufacturers, and other enterprises.

(3) Service fee paid to Rail operation contractor (private SPC)

The sum of the O&M fee and the lease fee shown below shall be paid by the Railway operator (Vietnam Government) to the Rail operation contractor (private SPC) as a service fee.

1) O&M fee

(i) Use of cost-on method

The Railway operator (Vietnam Government) shall pay the Rail operation contractor (private SPC) an O&M fee. This fee shall be calculated by the cost-on method by adding together the total cost of performance of O&M by the Rail operation contractor (private SPC) and a return determined by multiplying this cost by a certain percentage. The Railway operator shall pay the amount calculated by the above method to the Rail operation contractor (private SPC) as O&M fee. The above cost includes the following:

- ○ Labor costs
- ○ Management costs
- ○ Electricity charges
- ○ Cost of spare parts
- ○ Outsourcing and maintenance contract costs
- ○ General expenses and railway service liability insurance

As O&M fees include costs such as electricity charges and foreign exchange, they typically vary during the period concerned.

(ii) Approximate payment in advance and adjustment

To ensure that no discrepancy arises between actual operation and the costs paid by the Railway operator (Vietnam Government) to the Rail operation contractor (private SPC), the approximate amount incurred over a predetermined fixed period shall be paid in advance, and the difference from this amount in light of actual performance shall then be settled within a predetermined period after the elapse of this fixed period.

2) Lease fee

The fee for lease of rolling stock and AFC railway facilities shall be calculated by multiplying the cost of these facilities and other related costs by a lease charge rate fixed according to the depreciable life.

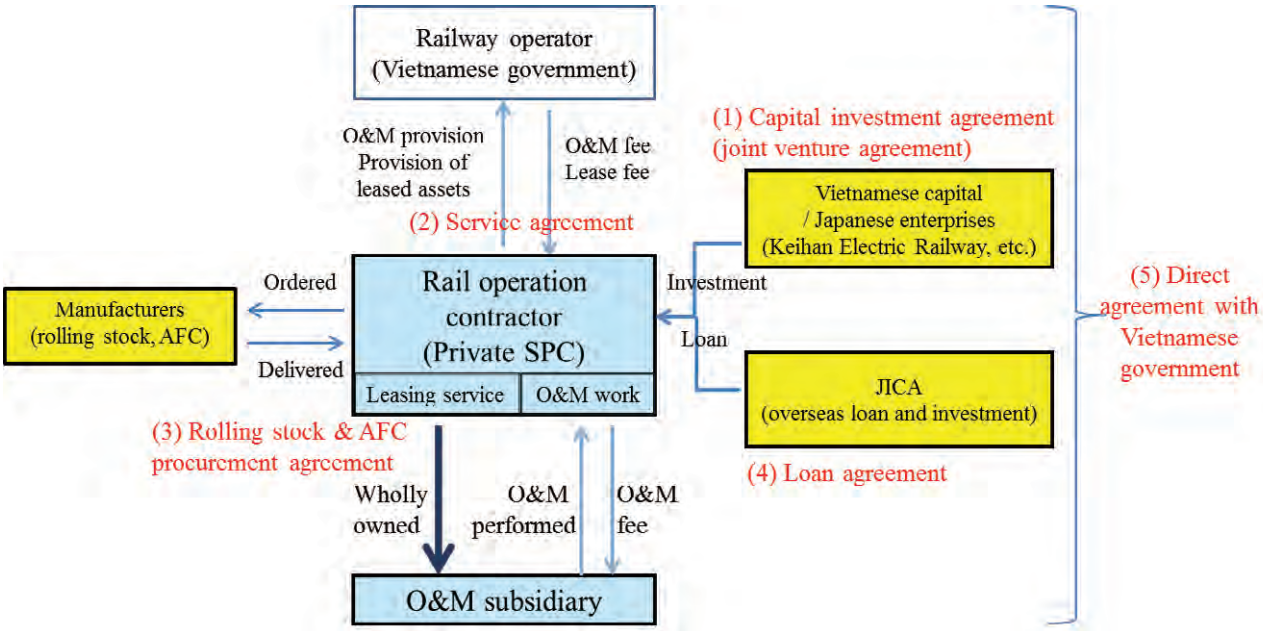
(4) O&M structure

The O&M functions and contractual status of the O&M subsidiary shall be transferred five years after opening from the Rail operation contractor (private SPC) to the tentatively named Hanoi Urban Rail Corporation by means of the transfer of all shares at the market value (provided that this is not less than the amount of investment).

7.2 Security package

Based on a review of the findings of economic, financial, and risk analyses, a “security package” system of contracts will be developed focusing mainly on the Rail operation contractor (private SPC) and O&M subsidiary to ensure the stable performance of railway business. The agreements which are supposed to be developed will consist of the following.

(1) Capital investment agreement with rail operation contractor (joint venture agreement)
(2) Service agreement with the railway operator (Vietnam government) and rail operation contractor (Private SPC)
(3) Rolling stock and AFC procurement agreement
(4) Loan agreement with the rail operation contractor (Private SPC)
(5) Direct agreement with government



Source: JICA Study Team

Figure 7.2.1 Overview of security package

7.3 Creation of term sheet (draft)

Based on a review of the findings of economic, financial, and risk analyses, the main elements of the agreements included in the supposed security package are shown below in the form of a draft term sheet.

Many past urban railway PPP projects have failed due to overestimation of demand. To avoid such an occurrence, therefore, the agreements are designed based on use of the cost-on method, which is unaffected by demand risk.

With the exception of agreements (1) to (5), the Rail operation contractor (private SPC) will additionally need to obtain political risk insurance to cover it against hazards such as seizure, expropriation, requisitioning, nationalization, suspension of currency conversions, suspension of remittances, failure to honor government guarantees, conflict, riot, and political violence.

(1) Capital investment agreement with rail operation contractor (joint venture agreement)

JPY 5.0 billion (30%) of the approximately JPY 16.4 billion in funding required by the Rail operation contractor (private SPC) (i.e., the sum of approximately JPY 15.4 billion for leased rolling stock and AFC assets and approximately JPY 1.0 billion of the cost of preparation for opening) will be raised as capital by obtained investment in equity. Investors are envisaged to consist of, on the Vietnamese side, the government (including Hanoi City), government-affiliated enterprises, and private enterprises. If allowed under regulations on foreign investment, however, the Japanese participants may take a majority stake. To enable O&M work to be developed smoothly, authority will be granted to the Japanese participants from preparation for opening to five years after opening to determine matters including rules on railway operation, facility maintenance and inspection standards, assets procured by lease (rolling stock and AFC), and maintenance methods for them.

<Investment framework>

- The total amount of capital investment of approximately JPY 5.0 billion is envisaged to break down as follows: 51% Vietnamese capital (JPY 2.55 billion) and 49% Japanese capital (JPY 12.5 billion from Keihan Electric Railway and JPY 1.2 billion from other enterprises). The Vietnamese investors are envisaged to consist of the government (including Hanoi City), government-affiliated enterprises, and private enterprises.
- Investment shall be received in Vietnamese dong and dividends shall also be paid in Vietnamese dong.
- Policy on distribution of profits and duration shall be determined in advance.
- Investing enterprises shall contribute the entire sum of their investments before the PSIF loan is made in accordance with the terms of the loan, and shall prepare written bank guarantees for the amounts to be invested. Credit enhancement shall be entrusted to a third party.
- The liability of investing companies shall be limited to the amounts of their investments.
- Share transfers shall be limited. One possible option is to establish a form of limited company in which assignment of equity interests is limited by law. (In this case, the maximum number of employees would be limited to 50.)
- The representative and a majority of the directors shall be provided by the Japanese participants.
- If any of the parties judges that the initially intended purpose of the project cannot be achieved due, for example, to delays in the development of railway infrastructure, before the joint venture has been established, the joint venture agreement may be cancelled.

<Objectives of project>

- The objectives of the project shall be limited to those necessary to fulfill the terms of the service agreement.

<Other matters>

- Decisions on the suppliers of rolling stock and AFC shall be made by the authority granted to the Japanese participants.
- During the period from preparation for opening to five years after opening, the O&M subsidiary shall, by the authority granted to the Japanese participants, decide the railway companies, manufacturers, track maintenance contractors, and other suppliers with

which it enters outsourcing agreements and technical support agreements concerning the preparation of manuals, training of employees, outsourced maintenance, etc.

<Governing law>

- The governing law shall, as far as possible, be Anglo-American law and Japanese law, and the competent court and arbitration shall be located in Japan.

(2) Service agreement with the railway operator (Vietnam government) and rail operation contractor (Private SPC)

The Rail operation contractor (private SPC) shall lease the privately procured facilities (rolling stock and AFC) subject to a repayment period of 15 years from opening, and shall be contracted to perform O&M work for five years from opening.

The O&M work *performed* by the Rail operation contractor (private SPC) shall consist of railway operation and maintenance, and restoration and repair work beyond the scope of the outsourced services shall be performed by the conclusion of a separate agreement. The Rail operation contractor (private SPC) shall be exempt from liability for matters beyond its control, including superannuation of railway infrastructure and facilities, power failures, and natural disasters.

As a fee for O&M work, the Rail operation contractor shall receive consideration for services calculated by adding on actual costs by a pre-agreed method of adjustment.

<Fee structure>

- O&M fees shall be determined using the cost-on method (approximate payment in advance and subsequent reimbursement for actual costs).
- The sum of the O&M fee and lease fee shall be received as a service fee.
- Amounts calculated by the cost-on method shall be received in Japanese yen and Vietnamese dong.
- To prevent possible inflation of costs using the cost-on method, an incentive scheme shall be adopted to determine the return portion of the service fee in order to encourage the Rail operation contractor (private SPC) to keep down costs. More specifically, it is envisaged that the rate of return will be raised where costs are a certain percentage less than initially planned, and lowered where costs are a certain proportion more than initially planned.
- An offshore escrow account shall be used.
- Performance of O&M work shall be suspended if the Railway operator (Vietnam Government) fails to pay the service fee. If failure to pay continues and if the Rail operation contractor (private SPC) so chooses, Hanoi City must buy the Japanese participants' shareholdings in the Rail operation contractor (private SPC). In such case, the Rail operation contractor's financial obligations under the PSIF loan from JICA shall be assumed by the Railway operator (Vietnam Government).

<Currencies of payments>

- The currencies of payment shall be Japanese yen and Vietnamese dong, with the specific currency used being determined according to the recipient of payment by the O&M subsidiary. (For example, consideration for technical support payable to Japanese enterprises would be paid in yen, and the currency for payment of salaries to Vietnamese employees would be dong. Thus the necessary amounts will be paid respectively in yen and dong at the time of settlement in each fiscal term.) Regarding lease fees, those fixed in Japanese yen when the agreement was concluded shall be paid in Japanese yen.
  Where payment in Japanese yen would be difficult, however, the corresponding amount calculated on a Japanese yen base shall be paid in Vietnamese dong, allowing for foreign exchange risk, at the official rate of the State Bank of Vietnam.

<Changes in content of service agreement>

- Period of preparation for opening + five-year period from opening: O&M work, leasing service
- For 15 years from sixth year after opening: leasing service
  The O&M component of work contracted out to the Rail operation contractor (private

SPC) shall terminate when work is transferred, and the lease agreement alone shall survive and continue for 10 years.

<Transfer of O&M work after five years>

- After the elapse of five years from opening, the Rail operation contractor's position as O&M contractor to the Railway operator (Vietnam Government) shall be transferred to the O&M subsidiary, and the Rail operation contractor's operating division and all shares and management rights in the O&M subsidiary shall be transferred to the Railway operator (Vietnam Government).
- The transfer price of shares in the O&M subsidiary shall equal the value of its net assets at the time of the transfer (or the value of investment if the net value of assets is less than the value of investment, i.e., the cost of acquisition).
- The outsourcing agreement between the O&M subsidiary and each of the Japanese participants, shall, in principle, terminate at the time of transfer of O&M work. If necessary, however, continuing support agreements may optionally be entered separately.
- As the Railway operator(Vietnam Government) will contract out O&M work hitherto performed under contract by the Rail operation contractor (private SPC) to the O&M subsidiary, which becomes a subsidiary of the Railway operator(Vietnam Government) when O&M work is transferred, an outsourcing agreement shall be entered with the O&M subsidiary (or the O&M subsidiary may, as one option, be merged with the tentatively named Hanoi Urban Rail Corporation). In order to allow excellent workers employed for a considerable period at the O&M subsidiary to be hired, it is assumed that employment conditions for employees will be maintained for a certain period following the transfer of O&M work.

<Scope of services>

- A maintenance agreement shall be entered setting forth the details of daily regular inspections, inspection cycles, work to replace consumable parts, and scope of repair work. This agreement shall specify that repair, improvement, and upgrade work beyond the scope of maintenance of functions shall not be included.
- Restoration and repair work beyond the scope of contracted work shall be performed further to conclusion of a separate agreement.

<Facility and equipment>

- The Rail operation contractor (private SPC) shall confirm the equipment specifications and order placement requirements as the provider contracted to provide O&M when the tender documents are prepared by the general consultant, and also cooperate in management of construction. Facilities directly related to safety shall be procured under STEP.
- Rolling stock and AFC specifications shall be determined by the Rail operation contractor (private SPC).
- Arrangements for provision of follow-up support by manufacturers shall be established.
- Replacement parts shall be kept (around two years' worth).
- Assets procured by the Rail operation contractor (private SPC) shall be transferred to the Railway operator (Vietnam Government) at the remaining book value after conclusion of the lease period.
- Leases shall consist of the finance lease of initially procured assets, and augmentations of capacity, upgrades, loss, damage, etc. shall be handled by the Railway operator (Vietnam Government).
- Procurements to augment or upgrade rolling stock and AFC equipment after the opening of Phase 1 and procurements of rolling stock and AFC that have to be made during Phase 2 shall be made by the Railway operator (Vietnam Government).
- Long-term continuous supply of electricity shall be guaranteed.

<Liability>

- Compensation for damage caused by reasons attributable to the Rail operation contractor (private SPC) shall be limited to the maximum amount agreed upon with the Railway operator (Vietnam Government).

<Guarantees>

- A take-or-pay contract shall be used under which service fees shall be paid by the Railway operator(Vietnam Government) to the Rail operation contractor (private SPC) even in the event of non-provision of service (inoperability of service, inoperability of stations, train delays, or damage to leased assets), operation suspension for safety checks, etc. due to reasons not attributable to the Rail operation contractor (private SPC) (including defects to components of infrastructure for whose construction the government was responsible, power failures arising from causes on the supply side, natural disasters, strikes, riots, terrorist, and acts of third parties).
- In the event that opening is delayed for reasons not attributable to the Rail operation contractor (private SPC), including delays in expropriation of land, railway construction, and development of related infrastructure, the Railway operator(Vietnam Government) shall be obliged to pay a service fee for costs already incurred (including cost of procurement of rolling stock and AFC, maintenance costs, and labor costs) to the Rail operation contractor (private SPC).
- To provide against the eventuality that the Rail operation contractor (private SPC) has to unavoidably suspend services for a prolonged period or take similar steps for reasons attributable to the Railway operator(Vietnam Government), the Rail operation contractor (private SPC) shall be authorized to enter employment contracts allowing employment adjustments to be made to the necessary extent.
- The Vietnamese government shall be jointly and severally liable for payment of service fees (for O&M work and leasing service) and payment of consideration in the event that the Railway operator (Vietnam Government) and the Rail operation contractor (private SPC) enter a separate agreement on restoration and repair work beyond the scope of the outsourced services.
- The Railway operator (Vietnam Government) shall cooperate fully in work reasonably requested by the Rail operation contractor (private SPC), including the acquisition of all permits and licenses, provision of necessary land, and coordination with the government authorities.
- The Rail operation contractor (private SPC) shall be granted exclusive operation and management rights to Line 5.
- Entry of an exclusive lease agreement with the Rail operation contractor (private SPC) concerning the lease of rolling stock and AFC facilities for Line 5 shall be guaranteed.
- To ensure the Rail operation contractor's business viability, preferential measures including exemptions from corporation tax, fixed asset tax, and import duties shall be guaranteed.
- An agreement shall be entered specifying that any property on railway operation may not be unilaterally expropriated and specifying the estimated amounts of expropriation, denominated in a foreign currency, in the event that expropriation should occur.

<Insurance>

- Railway service liability insurance and fire insurance shall be entered into at the expense of the Railway operator (Vietnam Government).
- Full operational insurance and an insurance rider for interruption of business shall also be entered into.

(For reference) Railway insurance in Japan

	Policyholder	Payer	Recipient
Railway service liability insurance	Railway operator (Vietnam Government)		
Operational insurance	Rail operation contractor (private SPC)		
Fire insurance	Asset owners		

<Governing law>

- The governing law shall, as far as possible, be Anglo-American law and Japanese law, and the competent court and arbitration shall be located in Japan.

(3) Rolling stock and AFC procurement agreement

The Rail operation contractor (private SPC) shall procure the following facilities from manufacturers determined by the Japanese participants in order to lease the privately procured facilities (rolling stock and AFC).

<Delivery and handover>

- Delivery shall include onsite setup and facilities shall be handed over at the site in an immediately usable state.

<Warranty against defects>

- Manufacturers shall be responsible for providing warranty against defects for facilities delivered. Manufacturers shall also be liable in the case that the Rail operation contractor (private SPC) is held liable for compensation of the Railway operator (Vietnam Government) or other third parties due to defects to the facilities.

<Cost overruns and delivery delays>

- Manufacturers shall deliver facilities at the contract price. Additional expenses may not, in principle, be incurred. Furthermore, if the Rail operation contractor (private SPC) is held liable for damages by the Railway operator (Vietnam Government) or other third parties due to late delivery of facilities, manufacturers shall compensate for such damages.

<Support>

- From at least opening to the transfer of O&M work to the tentatively named Hanoi Urban Rail Corporation after five years, it shall be made a condition of delivery that maintenance follow-up shall be provided by manufacturers to the O&M subsidiary. (Separate support agreements shall be concluded between manufacturers and the O&M subsidiary. Continued support agreements may also be concluded after the elapse of five years where necessary.)

<Investment in the Rail operation contractor (private SPC)>

- Manufacturers delivering facilities shall invest certain amounts in the Rail operation contractor (private SPC). The purpose of this is to involve Japanese enterprises involved in performance of O&M work together in the management of the Rail operation contractor (private SPC) and facilitate and ensure the sound performance of O&M work and leasing service.

(4) Loan agreement with the rail operation contractor (Private SPC)

It is assumed that approximately JPY 11.4 billion (70%) of the approximately JPY 16.4 billion in funds required by the Rail operation contractor (private SPC) (consisting of the sum of approximately JPY 15.4 billion for rolling stock and AFC leased assets and approximately JPY 1.0 billion of the cost of preparation for opening) shall be raised under JICA's PSIF program.

<Loan framework>

- It is presupposed that the loan provided under JICA's PSIF program will be a non-recourse loan covering spending on rolling stock and AFC leased assets and the cost of preparation for opening.
- The loan shall be provided in Japanese yen and shall be repaid in Japanese yen by equal redemption of principal.
- A grace period (for a maximum of five years) shall be provided from the commencement of procurement of leased assets by the Rail operation contractor (private SPC) to opening, and the repayment period shall be 15 years from opening.
- An offshore escrow account shall be used.

<Loan conditions>

- Conditions shall be as per JICA loans, with a security interest being created on leased assets.

(5) Direct agreement with government

To ensure that the railway project is smoothly established and operated in accordance with the present scheme (including the provisions described in 1) through 4)), an agreement shall be

entered with the Vietnamese government concerning the provision of necessary support relating to legislation and guarantees.

<Contracting parties>

- The contracting parties shall be the Vietnamese government, JICA, and planned investors in the Rail operation contractor (private SPC) on the Japanese side.

<Licenses and permits>

- The licenses and permits required for the present project shall be promptly obtained before commencement of the work requiring such licenses and permits.

<Government guarantees>

- The government shall guarantee payment of service fees by the Railway operator (Vietnam Government).
- The government shall guarantee payment of consideration in the event that the Railway operator (Vietnam Government) and the Rail operation contractor (private SPC) enter a separate agreement on restoration and repair work beyond the scope of the outsourced services.
- Long-term continuous supply of electricity shall be guaranteed.
- To provide against the eventuality that the Rail operation contractor (private SPC) has to unavoidably suspend services for a prolonged period or take similar steps for reasons attributable to the Railway operator(Vietnam Government), the Rail operation contractor (private SPC) shall be authorized to enter employment contracts allowing employment adjustments to be made to the necessary extent.
- An agreement shall be entered specifying that any property on railway operation may not be unilaterally expropriated and specifying the estimated amounts of expropriation, denominated in a foreign currency, in the event that expropriation should occur.
- Provision for exchange and remittance of foreign currency (Japanese yen) shall be guaranteed.
- The validity under domestic Vietnamese law of each clause of each agreement shall be guaranteed.
- It shall be guaranteed that the necessary arrangements agreed upon in advance regarding the project will not be affected by future changes in Vietnam’s legal system or government.
- An agreement shall also be entered into with the Vietnamese government regarding options to (1) transfer the position of O&M contractor to the Railway operator(Vietnam Government) to the O&M subsidiary and (2) transfer shares and management rights in the O&M subsidiary to the Railway operator(Vietnam Government) after the elapse of five years from opening.
- Land acquisition shall be conducted by the Vietnamese government.

<Legislation>

- Legislation needed to operate a safe urban railway system will be developed, including:
  - Legislation to ensure safety of rail services (providing for the obligations of passengers, etc.)

Chapter 8 Assessment of viability

8.1 Suitability of railway plan

8.1.1 Planned route

(1) Route outline

The planned route runs alongside a wide highway, providing a good line that does not require services to be subject to speed restrictions. The impact on the environment and extent of land that has to be purchased can also be kept to a minimum. Particular considerations at the planning stage were as follows.

(2) Development of urban structure

Elevated and underground systems were compared, and it was determined as a result to recommend an elevated system for the central urban area. This is because this approach reduces construction costs and allows greater ease of flood control and line maintenance.

However, many officials of the Vietnamese government and Hanoi City were found to favor an underground system on the grounds that this would better preserve the appearance and environment of the city. As other countries' experiences clearly illustrate the difficulty of making alterations in the future once railway structures have been built, caution should be exercised over the choice of form of structure.

Every effort is therefore made in this report to provide a fair comparison of the two approaches. However, the Vietnamese government should judge finally comparing the merit and the demerit of both plans.

(3) Locations of stations in suburban areas

Stations in the central urban area will be positioned at intervals of 1-1.5 km to allow for ease of connection with other means of transportation and the distance that can be walked by passengers. This interval is similar to that observed in other countries.

In suburban areas, the thinking on spacing between stations differs. To shorten travel time between hubs, there should preferably be fewer stations. This is because stoppage times at stations and the consequent time required to accelerate and decelerate mean that stopping at a single station adds several minutes to travel time. If the number of stations is to be increased, provision should be made to keep down travel time between hubs by providing overtaking track for express trains. Those studies are described at 3.4.8 of this report.

As the presence of a station affects the development of the surrounding area, stations are as a rule not built in areas that are subject to development restrictions, such as greenbelt land. Instead, stations are located in areas targeted for strategic development to serve as nodes for feeder transport. Railway stations are in other words used as a means of maintaining a balance between development and control when implementing urban plans.

In the course of the present study, it was found that although Hanoi City's Master Plan provides for land zoning, no consideration is given to how this should apply to railway stations.

As the line will not be extended into suburban areas until Phase 2, stations will not be built in these areas for some time. It is hoped that station locations consistent with urban planning requirements will by then have been identified.

(4) Depot

From a railway perspective, depots should preferably be located near main lines, as this allows railways to be arranged more conveniently for yard work and also reduces the distance that has to be travelled by out-of-service trains. The location of the Line 5 depot is indicated on the Hanoi City Master Plan, and the proposals in this report were made on this basis. The depot should be located on a longer, narrower site nearer the main line.

8.1.2 Rolling stock and operating plans

(1) Rolling stock plans

Rolling stock specifications are based on the Standard Urban Railway System for Asia (STRASYA), which is a set of Japanese railway system specifications published for use in Asia, and conform to Vietnamese urban railway standards.

Rolling stock will consist of heavy (i.e., non-LRT) rolling stock, and will be selected depending on the demand to be able to allow future operation of eight-car services providing rapid, high-volume transport.

(2) Operating plans

Services will operate at a maximum speed of 120 km/h. Although the line configuration will allow a maximum speed of 160 km/h from the view point of the ability of current rolling stocks, the emphasis should be placed on acceleration and deceleration performance rather than maximum speed given the distances between stations in the central urban area.

Services will operate at six-minute intervals at peak times, although facilities will be technically capable of running services every three minutes.

It was decided that a Communication Based Train Control System (CBTC) should be used for the train control system, as used on other lines planned in Hanoi, with proper consideration being given to safety by also deploying a track circuit backup system.

8.2 Suitability of operating plan

8.2.1 Operation and maintenance structure

(1) Outline of operation and maintenance structure

Routine operation of rail services and maintenance of facilities will be contracted out by Hanoi City. The rail operation contractor will be organized into three divisions: a head office, a transportation division, and a maintenance division. The transportation division will be responsible for routine operation and management of services and station operations, and the maintenance division for daily maintenance of facilities, electricity, and rolling stock.

The proposed content of work and frequency of maintenance are designed to provide a high level of reliability taking into consideration the expertise of Japanese railway operators with many years of experience.

(2) Technology transfers

Expertise in operation and maintenance will be quickly passed on to Vietnamese staff through education and training delivered mainly through on-the-job training (OJT). Training will commence prior to opening by such means as inviting executive personnel to Japan. After opening, Japanese instructors will be sent to Vietnam to provide systematic education and training, while at the same time gradually expanding the scope of responsibilities of Vietnamese staff. Five years after opening, it is considered that the operations will be performed entirely independently by Vietnamese staff.

8.2.2 Japanese technologies

(1) Features of technologies

Japan’s urban railway services are the fastest, densest, and safest in the world. This is due in large part to the depth of experience accumulated in ensuring safety and punctuality founded on strong employee awareness of safety and operation and maintenance methods that take into account lifecycle costs. Employee awareness has been raised through the unremitting efforts of Japanese enterprises. Toyota’s well-known Kaizen philosophy of continuous improvement is in fact practiced at many companies in Japan, albeit under different names. When those enterprises develop operations overseas, they succeed in producing products of the same quality as in Japan. Raising employee awareness is one of the distinguishing features of Japan’s corporate culture. None of Japan’s railway operators has so far expanded overseas. Considering the quality of corporate culture that they embody, however, it is hoped that they will foster world-beating employee awareness and lay the foundations of Vietnam’s railway system.

8.3 Suitability of economic and financial analysis

8.3.1 Assessment from perspective of the private sector (rail operation contractor)

The purpose of private-sector involvement in public projects is generally to enable efficient operation utilizing its accumulated experience and know-how and to generate greater benefit from them. Private enterprises are in turn compensated for their participation, recover their investment, and earn a profit.

The main purpose of the present proposals is to alleviate the risk borne by the private sector (rail operation contractor) by using the “cost-on method” and ensure sound operation of the project.

8.3.2 Assessment from perspective of public entity (railway operator)

From the point of view of Hanoi City, as the public entity behind the project, the huge cost of development of railway infrastructure means that investment in the project cannot be recouped from fare revenues. The same applies in other countries too, and is a typical occurrence in the railway business. Owing to the gap in interest rates on financing between the public and private sectors, PPP schemes impose a greater burden over the entire term of a project than a pure ODA scheme, but the initial burden on the government is alleviated slightly. The involvement in the project of Japanese railway operators and other private enterprises will additionally enable Vietnam to quickly acquire expertise in operating railways in an extremely safe, punctual and efficient manner. This study puts forward highly feasible proposals that take into consideration the balance of burdens on the public and private sectors and their effects.

Regarding fares, these should be set taking into consideration Hanoi City’s urban and public transport policies. It is therefore proposed that fare levels be set by the rail operator (HPC (MRB)), as the public entity, which will then receive the full amount of fare revenues thus generated. In other words, demand risk (ridership risk) should be borne by the public entity rather than the private sector. This makes it possible to flexibly accommodate transport policy planned by Hanoi City, and facilitates formation of the transport system planned by the city.

8.3.3 Issues requiring continued consideration following the present study

The present study proposes a feasible PPP project for an emerging country with no experience of operating an urban railway. Injecting private finance lowers the initial burden on the government, but at the same time adds the burden of paying a fair return and interest to the private sector for the portion for which the private sector is responsible. It must therefore be remembered that the total cost of repayment for the project as a whole is greater than it would be if financed entirely by government.

Vietnam therefore needs to make an appropriate policy-informed decision weighing up the advantages and disadvantages of each approach.

It is also necessary to consider adopting a financing method that incorporates means of getting beneficiaries to bear some of the cost and channeling gains from betterment back into the project, as described in 8.5, in order to ease government debt. The development and expansion of legal institutions required to allow this therefore similarly needs to be considered.

8.4 Assessment of project scheme

8.4.1 Basic structure of project scheme

(1) Vertical separation of infrastructure and operation

Fresh development of urban railway projects is enormously expensive and payback periods are long. Railway projects are also to large extent public undertakings. In the global marketplace, therefore, vertical separation of infrastructure and rail services is typically employed. Development of Hanoi Railway Line 5 is also premised on the infrastructure portion being developed by a public entity and operation of services being contracted out to the private sector.

(2) Proposals on financial soundness of the public entity

The proposals on Hanoi Railway Line 5 are made paying certain consideration to the financial soundness of the public entity that develops and owns the line. They are also characterized by their consideration of means of reducing the public entity's foreign debt and spending from general revenue resources.

8.4.2 Sharing of roles and risks between each entity involved

(1) Private sector

Hanoi Railway Line 5 will be operated by the private sector under contract.

The private sector will form a business entity to act as a "rail operation contractor" that operates the railway under contract, and Japanese railway operators, trading companies, manufacturers, and other enterprises will invest in this entity. By having a certain stake in it, they will be actively involved in decision-making on the work contracted out and procurement of funds required for and content of such work. More specifically, they will provide the necessary scale of investment to procure the AFC and rolling stock that will be the principal assets.

Regarding the work performed under contract, provision of service-related functions will be led by Japanese railway operators and other private enterprises.

For the agreement with the railway operator (HPC (MRB)), it is proposed that the cost-on method be used. This involves adding together the total cost of performance of O&M and lease of railway facilities by the rail operation contractor and a return determined by multiplying this cost by a certain percentage. This will simultaneously enhance project stability and facilitate sharing of Japanese technical and operational expertise in railway operation with Vietnam.

(2) Public entity

The function of the public utility acting as the railway operator for Hanoi Railway Line 5 will be to develop and own the rail infrastructure. To maintain the overall running of the urban transport system as a public service, it will need to determine the appropriate service level to be provided by Line 5, contract out operation to the rail operation contractor, and appropriately supervise the state of railway management and operation.

As ridership risk on Line 5 will not be borne by the rail operation contractor, it is assumed that risk concerning fare revenues will be borne by the public entity. However, rail demand, which affects fare revenues, depends heavily upon Hanoi's development as a city. When urban population and employment opportunities are attracted and allocated in an appropriate manner over the medium to longer term, the resulting increase in revenue will belong to the public entity.

Growth in demand will bring with it the various benefits described below. It is consequently possible that the growth in line-side value resulting from demand growth could also help improve the financial soundness of the public entity by, among other things, increasing revenues from land price and fixed asset taxes, etc. scheduled to be introduced in the future, and the rise in value of publicly-owned land owned by the public entity.

8.4.3 Relationship with other lines

The present proposals regarding Hanoi Railway Line 5 also give consideration to the possibility of contracting out of operation of other lines scheduled to be developed and operated in the future. As it is envisaged that a provisionally named "Hanoi Urban Rail Corporation" will be established to centrally manage multiple lines, it is proposed that a project scheme be employed that assumes transfer of Line 5 O&M work to management and operation under the same organization where necessary.

From the point of view of the citizens who use urban railways operated as a public undertaking, user convenience should be ensured by such means as providing connecting services between different lines, adopting a common fare structure, and introducing AFC. From the perspective of the rail operation contractor, meanwhile, consideration should be given to matters such as the adoption of specifications allowing the operation of inter-connecting through services and the shared use of rail yards and service control centers so that benefits of scale can be enjoyed.

One way of achieving the above is to unify operation of Hanoi Railway Line 5 under the same form of organization as other lines. However, consolidation of the operating entities is not necessarily a requisite for obtaining the above benefits, which should be achievable through the use of certain contracts and other arrangements.

Hanoi should therefore continue to study ways of operating Line 5 (premised on sustainable management) so as to achieve the above benefits, with appropriate consideration being given to the unification of projects as one alternative proposal for doing so.

8.5 Effects of opening railway

(1) Hanoi City development plan

The Vietnamese government plans to preferentially and strategically develop Hanoi into a large international city to make it a major political, cultural, scientific, educational, economic, and international trade hub.

Hanoi City's master plan calls for the development of five satellite urban areas in the suburbs to provide some of Hanoi's functions, such as housing, education and training, industry, and services. It also calls for the development of the city center and satellite center, and greenbelts in between them.

Hanoi Railway Line 5 will connect the center of Hanoi with one of these satellite cities, Hoa Lac, and will serve as an important element of metropolitan Hanoi's social infrastructure.

(2) Transport demand

Transport demand in Hanoi is growing rapidly. Motorcycles are presently the main means of movement within the city, and the public transport system is limited to buses. Rail makes no contribution to urban transportation.

Our demand forecasts indicate that when Phase 1 of Line 5 opens, demand will be 158,000 passengers per day. Combined with connecting passenger services on Lines 2 and 3, which will open by that time, demand will come to 171,000 passengers per day.

When Phase 2 opens and population growth resulting from development of Hoa Lac is taken into consideration, demand is projected to reach 400,000 passengers per day, and 432,000 passengers per day when connecting passenger services on other lines are included.

(3) Technology corridor to Hoa Lac

Hoa Lac is to function as a science, technology, and training zone. Alongside key facilities such as Hanoi University and Hoa Lac Hi-tech Park, two health and culture centers are to be built: Dong Mo Health Resort and the Vietnam Ethnic Tourism Culture Village. These projects are projected to bring the population to 600,000 in 2030, and reach an ultimate target of 750,000.

Serving as the transport infrastructure for this will be the already completed Lang-Hoa Lac Road and the anticipated Hanoi Railway Line 5.

This railway will shorten travel time between the center of Hanoi and Hoa Lac, and provide comfortable commuter transport for people working in industrial districts and for tourists.

Plans to develop an eco-town and housing along the main line are also progressing, and such development will be promoted

(4) Effect of promoting the development

At the around area along the Hanoi city railroad No. 5 line, there are various concepts, such as an eco-town plan and housing development plan at Hanoi University and a Hoa Lac high-tech park, the Quoc Oai prefecture surrounding area.

These projects are highly expecting the demand needs of the Hanoi city railroad No.5 line.

Moreover, since accessibility of the center of Hanoi-city and a suburban part becomes easy by the construction of this route, it can be expected the effect of promoting the development.

Thus, it is thought that construction of a railroad infrastructure and development of the surrounding area should be done with as one policy.

8.6 Measures of effect of operation

It is set up the Measures of effect of operation index and desired value as follows.

Passenger traffic shows how much people are used. A desired value is based on the demand-forecasting value assumed by this study.

The number of operations showed the train operation number per day, and defined the desired value based on the transportation programming corresponding to assumption transportation demand. The desired value of the operating ratio defined the similar project as reference. The specific section time required took into consideration vehicle performance, track alignment, and station stoppage time, and set up the desired value.

Table 8.6.1 Measures of effect of operation and targets

Measure		2023 target (2 years after Phase 1 completion)	2032 target (2 years after Phase 2 completion)
Passengers carried (1,000 passenger-km/day)		495	2,536
Services (trains/day)	Ho Tay - An Khanh	218	234
	An Khan - Ba Vi	—	180
Working efficiency (%)		90	90
Car-km (1,000 km/day)		11.9	45.8
Time required on specified sections (min.)	Ho Tay - An Khanh	20 min.	20 min.
	Ho Tay - Hoa Lac	—	35 min.

*Operating ratio =(Schedule train number-suspension train number)／(schedule train number)

Source: Produced by the Study Team

8.7 Conclusion

As demonstrated in the preceding sections, the proposals presented in this report are reasonable and realistic from the point of view of railway planning, operational planning, economy and finance, project scheme, and effect of opening.

PPP method is very advantageous for reducing the financial burden of the government and early and smooth transfer of advanced technologies and expertise of the private sector by asking the private sector to participate in projects and making them implement projects including fundraising. Countries around the world are promoting the use of PPP for these reasons. However, the proper risk allocation between the government and the private sector as well as securing profitability of the private sector and reduction of the financial burden of the government based on the proper allocation need to be carefully examined when exploring the possibility and methods of the participation of the private sector in infrastructure projects in development countries (Especially in countries such as Vietnam and Indonesia which are regarded as the countries with high country risk by private companies.)

Considering the demand risks, which are the most important factor when considering risk allocation between the government and the private sector, the key in this project is how the project will respond to demand from suburbs, such as Hoa Lac in which major development is to be implemented, in addition to urban areas where demand is already apparent.

Also, urban railway is not established as a common means of transportation in Vietnam at this point, and it is not reasonable to assume that the modal shift from automobiles and motorcycles to urban railway is sure to occur. The shift of users to public transportation will become possible if the Vietnamese government will effectively control traffic and promote the use of public transportation.

Based on the above observations, the demand risks of this project are not to be controlled by private railway companies; rather, it is more appropriate for the Vietnamese government, which has the means, capability, and authority to alter demand, to become responsible for the proper amount of risks. (It is general that the private sector is not responsible for risks in PPP projects involving water supply and power supply.) Also, in the environment of this project, if private railway companies are to be responsible for demand risks, they will be forced to use conservative demand forecasts and start seeking high returns for high risks. As a result, there will be a high possibility that the Vietnamese government will face larger financial burden, and the railway

companies will end up increasing railway fares.

In addition, Vietnam does not have the experience of operating urban railways. Therefore, an important point in the allocation of roles between the government and the private sector is to carefully plan the allocation so that responsibilities in case of an accident in the operation phase will be clear. This means that if the cause of a railway accident is in the railroad facilities rather than human error, both the government and the private sector will be responsible for unexpected risks when the faults of specific facilities cannot be identified. If faults cannot be identified, the private sector will seek high returns for high risks as in the case of demand risks. Thus, such a system will likely degrade profitability.

Based on the above observations, this investigation finds that the government should develop signal and communication systems and operation management systems that are inseparable parts of railroad tracks as basic (lower) infrastructures as integrated development with civil engineering and track installations. Meanwhile, the private sector should develop rolling stocks and AFC devices as additional (upper) infrastructures. This investigation proposes this method as the method to separate basic and additional infrastructures.

Moreover, although it is assumed that O&M work will be transferred to the tentatively named Hanoi Urban Rail Corporation five years after opening, expertise in operation and maintenance incorporating the knowledge and experience of Japanese railway companies will be passed on to local staff, thereby contributing to improved management stability and increased efficiency of railway management, construction of new lines, upgrading of facilities, and operation and management in the future by the rail operator (Hanoi City).

The study team is aware of the comments by the Vietnamese government that the ratio of fund allocation between the government and the private sector proposed in this investigation does not satisfy the ratio of fund allocation to the private sector as stipulated in Decision No. 71/2010/QD-TTg. Moreover, what the study team proposes is finalized after maximizing the fund from the private sector as well as minimalizing burden of the government as far as possible. Treatment of Decision No. 71/2010/QD-TTg will remain a point to examine when aiming to implement projects based on the PPP method.

Chapter 9 Environmental and Social Considerations

In Vietnam, Article 3 of Environmental Protection Law (52/2005-/QH11) stipulates that an environmental impact evaluation by Strategic Environmental Assessment (SEA) shall be made prior to the execution of Environmental Impact Assessment (EIA) in accordance with the nature of the project. However, according to the decree (29/2011-/ND-CD) providing detailed regulations on SEA, SEA shall not be applied to this project. (This project is not categorized as a strategic large-scale national project.)

On the other hand, according to detailed execution regulations of the Law on Environmental Protection (21/08/ND-CP), the procedure of EIA is indispensable for the construction of subways longer than 500m and elevated railways (without extension provisions). At the next stage of investigation, preparation of EIA report and RAP shall be included in the scope. In preparation of EIA report and RAP, reference shall be made to the investigation result (Initial Environmental Assessment -IEE-) and Resettlement Policy Framework (RPF) of this report.

In this report, IEE has been made in accordance with the Japan International Cooperative Agency (JICA) Environmental and Social Considerations Guidelines (April, 2010) for examination of various aspects of environmental and social impacts of the project. At the same time, RPF plan has been drafted based on the project plan so far studied.

9.1 Making of Draft IEE Report

9.1.1. Confirmation of the Status of the Environmental Society as the Basis of Examination

The status of the environmental society was confirmed in accordance with JICA Environmental and Social Considerations on those aspects, such as land utilization, natural environment and etc. by referring to the existing data, executing the field survey and other means.

As to several items, the descriptions are made separately for the following 2 routes with different features which are divided at the crossing point with Ring Road No.3.

- Urban Route : From St.1 to the crossing point with Ring Road 3 (from Van Cao Street to Tran Duy Hung Street)
- Suburban Route: From the crossing point with Ring Road 3 to St.12 (Thang Long Highway)

(1) Air Pollution

- Urban Route

Existing data for urban route are provided in EIA report of Line-2 and Line-3. The corresponding results at the crossing points with the project are provided in Table 9.1.1.

Table 9.1.1 Air Pollution Investigation Results

Measuring Point	TSP ($\mu g/m^3$)	CO ($\mu g/m^3$)	SO2 ($\mu g/m^3$)	NO2 ($\mu g/m^3$)	HC ($\mu g/m^3$)
Ba Dinh	65	580	173	98	205
Daewoo Hotel	68	910	270	290	140
TCVN5937-2005	300	30,000	350	200	-
TCVN5938-2005	-	-	-	-	5,000

Source: excerpted from “Line-2 EIA Report 2007” for Ba Dinh and “Line-3 EIA Report 2010” for Daewoo Hotel

The levels of air pollution at Ba Dihn (close to St.1 of the project) and at Daewoo Hotel (close to St.2 of the project) are lower than the old standards of Vietnam TCVN.

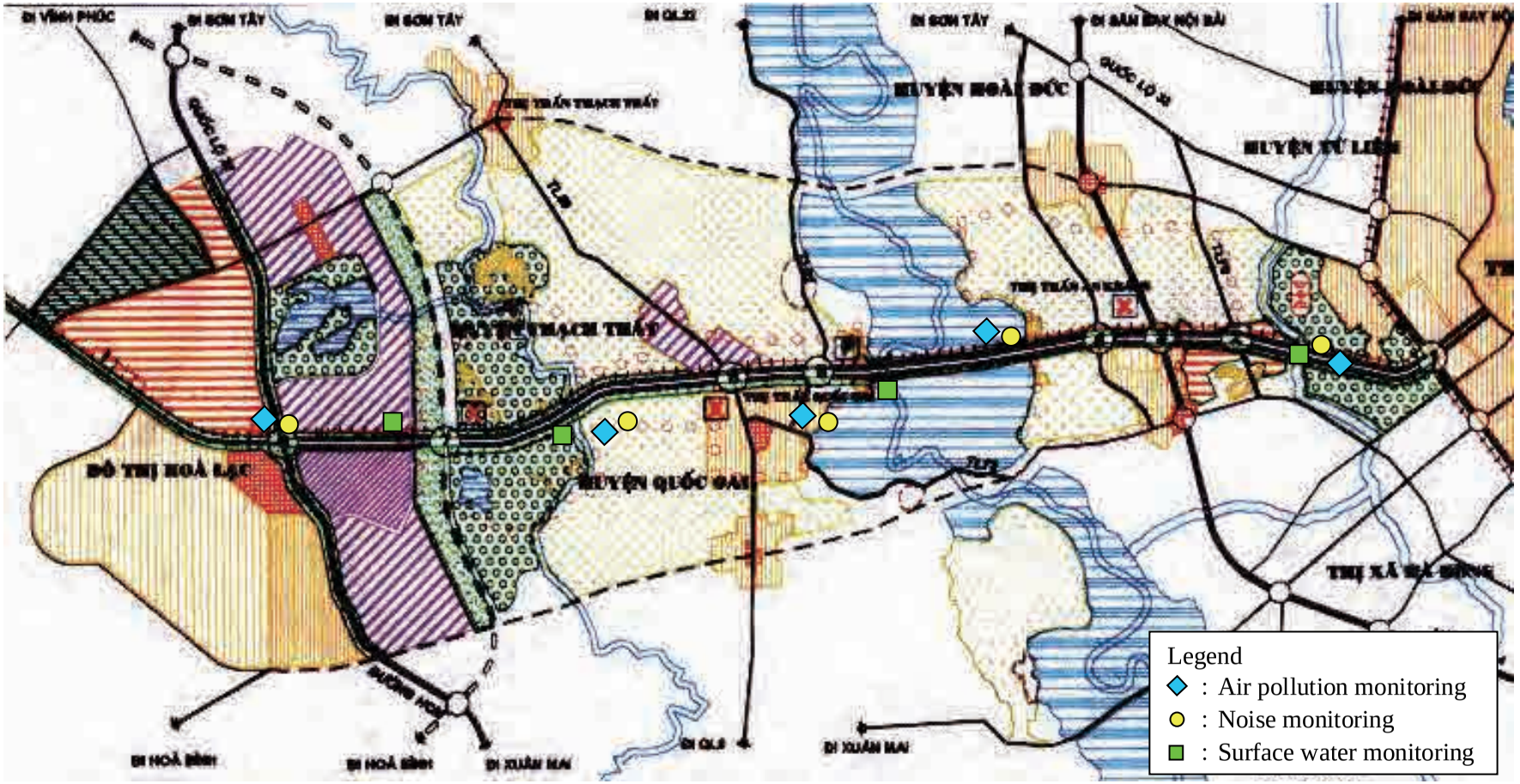
・Suburban Route

The existing data for the suburban route are provided as monitoring results at several points in Than Long Highway, which are mentioned below.

Point 1: at spot of 7km350m from the project (4,200m from the entrance gate of Mi Dihn National Stadium.
Point 2: at spot of 14km850m from the project (tại đê tả sông Đáy 11k580m)
Point 3: at spot of 18km850m from the project (tại đê hữu sông Đáy 15k700m)
Point 4: at spot of 25.850 from the project (22km200m)
Point 5: at spot of 32km from the project (crossing with QL21A)

Km in parenthesis shows the kilo post figures in Than Long Highway.

Monitoring points are shown in Fig. 9.1.1. All the sources of the monitoring data are in “Thang Long Highway Monitoring Results 2011”.

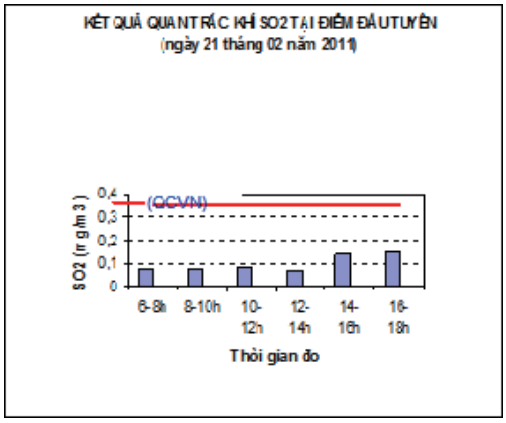


Source: Thang Long Highway Monitoring Results 2011

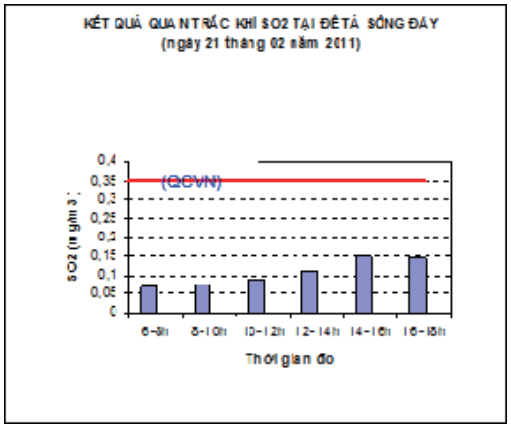
Figure 9.1.1 Thang Long Highway Monitoring Points

・Sulfur Di-oxide (SO2)

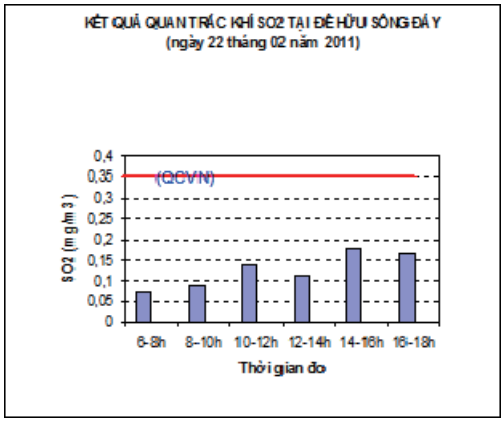
Investigation results of Sulfur Di-oxide are shown in Figure 9.1.2. At any of the investigation points, the levels of SO2 are far below the Environmental Standards of Vietnam (QCVN).



Point 1



Point 2



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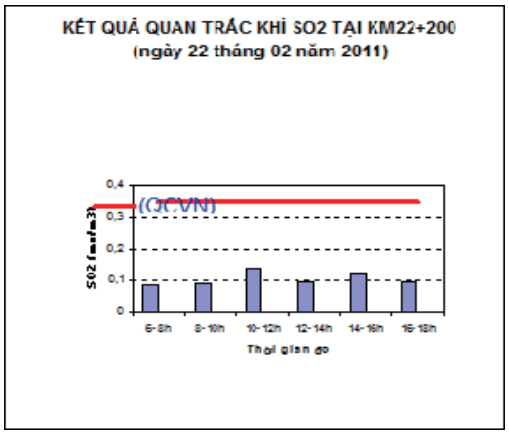
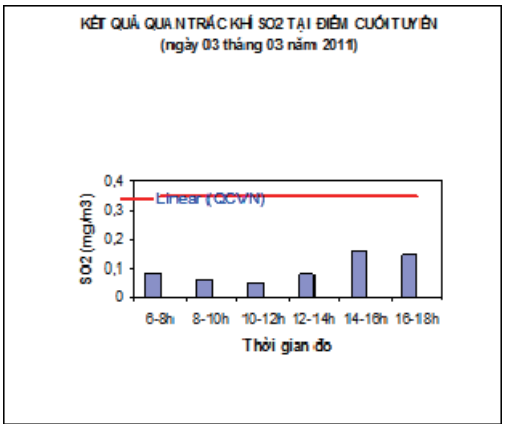


Point 4



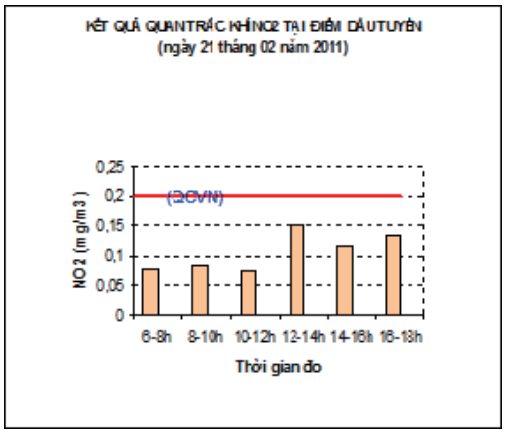
Point 5

Source： Thang Long Highway Monitoring Results 2011

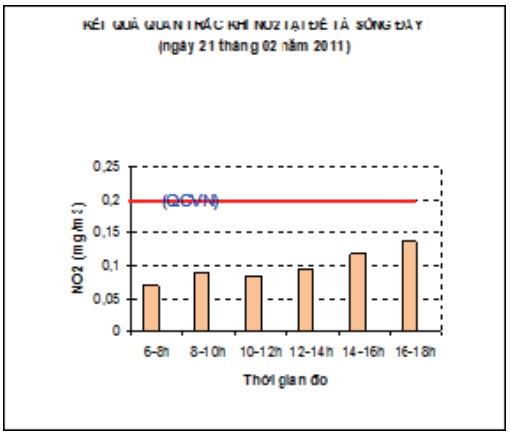
Figure 9.1.2 Sulfur Di-oxide Investigation Results

・Nitrogen Di-oxide(NO2)

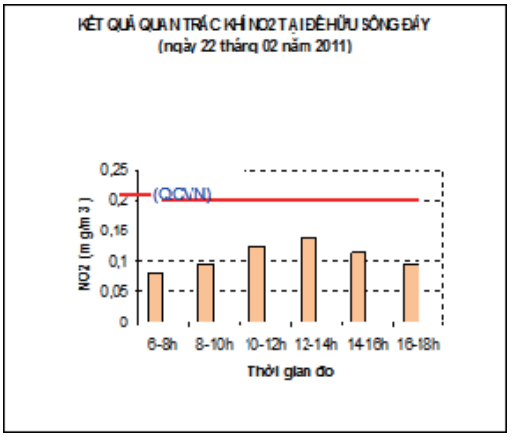
Investigation results are shown in Figure 9.1.3. At any of the investigation points, the levels of nitrogen di-oxide are below the Environmental Standards of Vietnam (QCVN).



Point 1



Point 2



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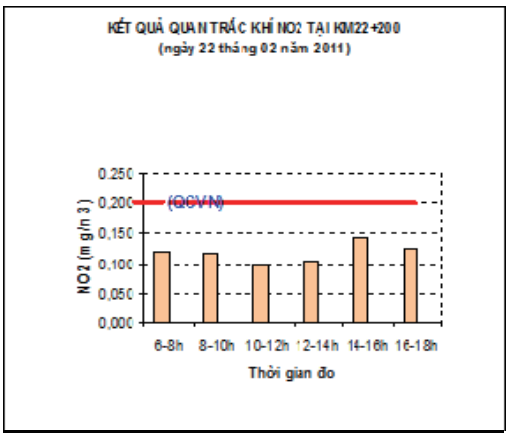
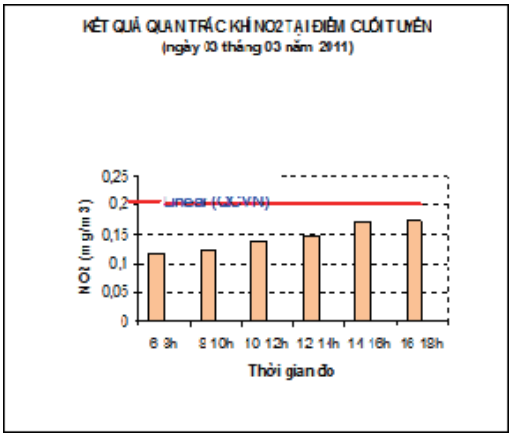


Point 4



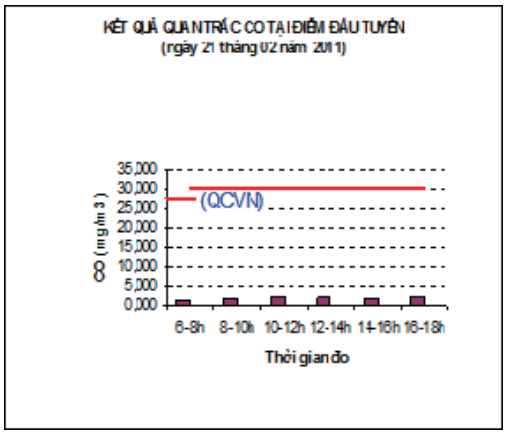
Point 5

Source：Thang Lon Highway Monitoring Results 2011

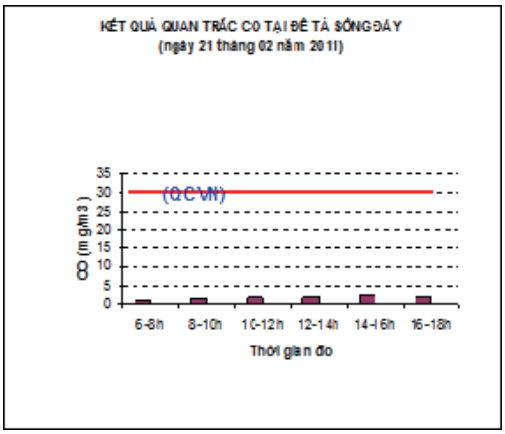
Figure 9.1.3 Nitrogen Di-oxide Investigation Results

・Carbon Mono-oxide (CO)

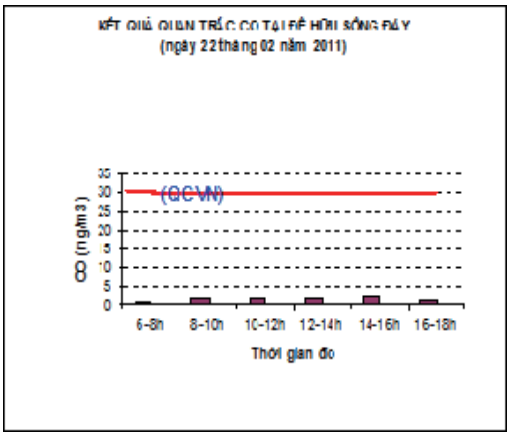
Investigation results of carbon mono-oxide are shown in Figure 9.1.4. At any of investigation points, the levels of carbon mono-oxide are far below the Environmental Standards of Vietnam (QCVN).



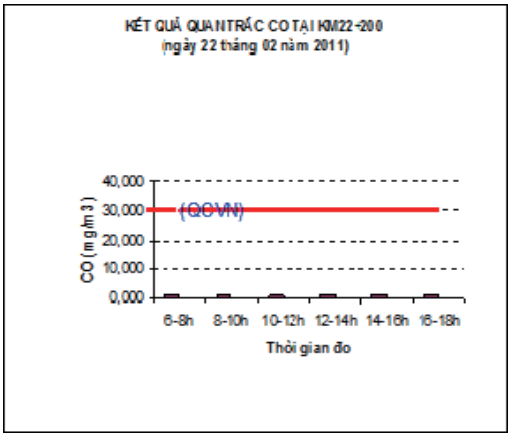
Point 1



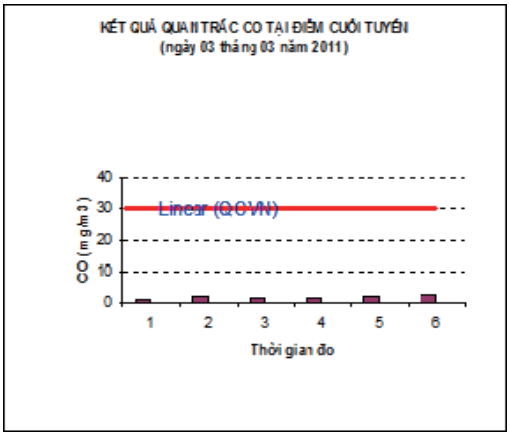
Point 2



Point 3



Point 4



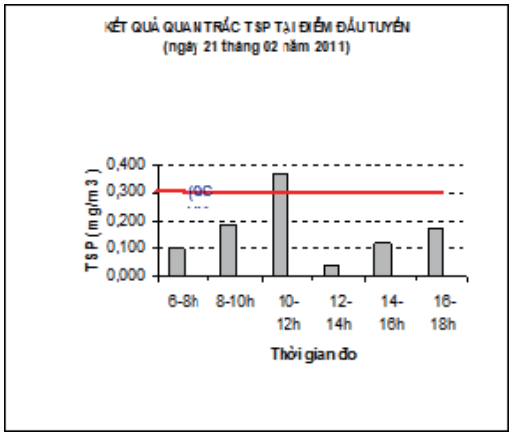
Point 5

Source： Than Long Highway Monitoring Results 2011

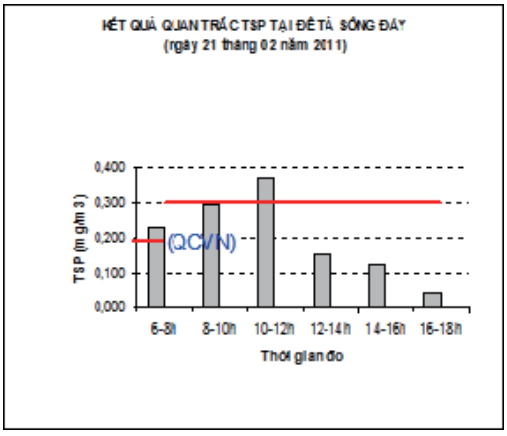
Figure 9.1.4 Carbon Mono-oxide Investigation Results

・Total Suspended Particles (TSP)

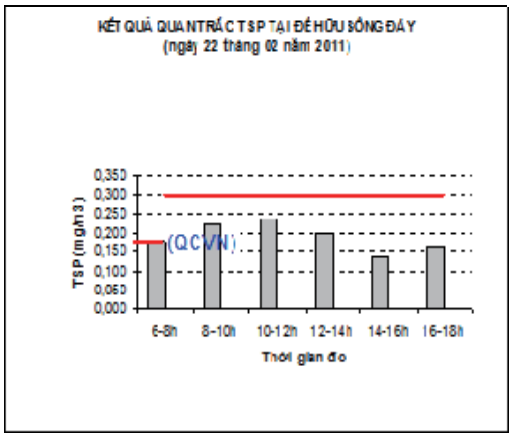
Investigation results of total suspended particles are shown in Figure 9.1.5. At 3 points out of 5, the levels of total suspended particles are above the Environmental Standards of Vietnam (QCVN). At point 5, its level is far above the standard due to the construction work of Thang Long Highway extension.



Point 1



Point 2



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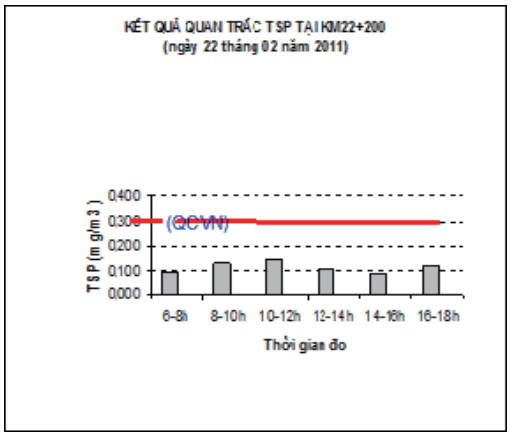

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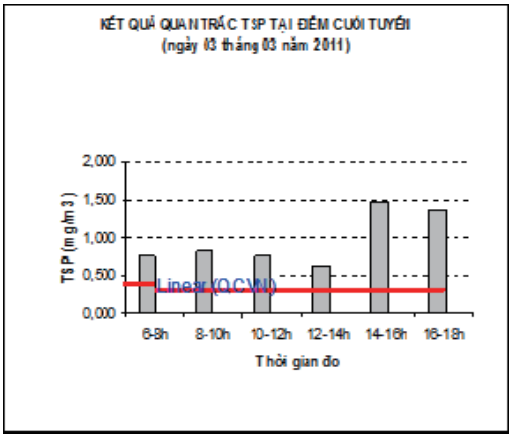


Point 5

Source： Than Long Highway Monitoring Results 2011

Figure 9.1.5 Total Suspended Particles Investigation Results

(2) Water Pollution

Existing data of water pollution along the railway are provided in the Thang Long Highway Monitoring Results 2011 and summarized in Table 9.1.2. Monitoring points are shown in Fig. 9.1.1.

Table 9.1.2 Monitoring Results of the rivers

No.	River	Monitoring Point	pH	DO (mg/l)	SS (mg/l)	BOD5 (mg/l)	OIL (mg/l)	Coliform
1	Sông Nhuệ	AM Upstream - AM	6.67	2.45	55	21.8	0.11	4600
		Spot on the route - AM	6.81	2.26	69	22.5	0.12	4900
		Downstream -AM	6.48	2.07	49	23.4	0.12	4900
		PM Upstream - PM	6.68	2.15	53	19.8	0.11	4500
		Spot on the route– PM	6.80	2.08	65	21.3	0.11	4700
		Downstream - PM	6.51	2.12	50	22.0	0.10	4900
2	Sông Đáy	Upstream - AM	7.02	1.7	53	91.5	0.16	220,000
		Spot on the route - AM	6.97	2.1	58	106.8	0.16	240,000
		Downstream -AM	6.89	1.9	55	112.5	0.16	240,000
		Upstream - PM	6.98	1.8	49	94.3	0.16	190,000
		Spot on the route - PM	7.01	2.0	52	102.4	0.16	200,000
		Downstream - PM	6.97	1.8	51	109.7	0.16	190,000
3	Sông Tích	Upstream - AM	7.20	2.7	26	10.7	0.12	780
		Spot on the route - AM	6.75	2.43	27	11.2	0.12	780
		Downstream - AM	6.83	2.51	27	11.5	0.12	780
		Upstream -PM	6.98	2.71	25	10.8	0.12	780
		Spot on the route -PM	6.84	2.56	26	10.2	0.12	780
		Downstream - PM	6.75	2.53	25	11.1	0.12	790
4	Sông Vực Giang 1	Upstream -AM	6.81	2.81	22	9.9	0.13	110
		Spot on the route - AM	6.78	2.27	36	10.5	0.14	78
		Downstream- AM	6.70	2.36	33	11.4	0.14	78
		Upstream - PM	6.79	2.79	20	9.7	0.13	90
		Spot on the route -PM	6.76	2.18	34	10.2	0.13	85
		Downstream - PM	6.70	2.22	34	11.7	0.14	80
QCVN 08:2008/BTNMT (A2)			6～8.5	≥ 5	30	6	0.02	5,000
QCVN 08:2008/BTNMT (B1)			5.5～9	≥ 4	50	15	0.1	7,500

Source: Thang Long Highway Monitoring Results 2011

QCVNs in the table are classified as follows.

A2: qualified (1) for daily life water after proper treatment, (2) for protection of water creatures, and (3) for B1, B2 and other purposes.

B1: to be used for irrigation and other purposes requiring same level of quality, and for other purposes of B2.

At any of the monitoring points, pH and DO satisfy the Environmental Standards of Vietnam (QCVN), but as to SS, BOD and OIL, the monitored levels tend to be above the standards, showing the water pollution caused by the human sewage and wastes etc.

In the meantime, excessively high coliform level at point 2 is due to direct influence of the private residences nearby.

(3) Waste

Along both urban and suburban routes, discarded waste can be seen in a great number. In Vietnam, waste disposal is an issue. Along the urban route, street cleaning is done at night, but along the suburban route, illegally dumped waste remains on the street.

(4) Soil Pollution

The median strips above which the project is planned have been already transformed. However, excessive spray of pesticides often causes soil pollution in Vietnam.

(5) Noise and Vibration

・Urban Route

Existing data of noise provided by Line-2 and Line-3 EIA Reports are shown in Table 9.1.3

Table 9.1.3 Noise on the Urban Route

Measuring Point	Time	Leq dB(A)	LAmax dB(A)	L50 dB(A)	TCVN 5949-1998
Ba Dinh	Daytime (6h-18h)	70.3	80.4	66.0	60
	Night (18h-22h)	60.6	68.8	55.9	55
Daewoo Hotel	Daytime (6h-18h)	73.8	85.3	70.6	60
	Night (18h-22h)	69.3	81.3	65.8	55

Source: excerpted from Ba Dinh “Line-2 EIA Report 2007”
and Daewoo Hotel “Line-3 EIA Report 2010”

Index values Leq at Ba Dihn (close to St.1 of the project) and Daewoo Hotel (close to St.2 of the project) are far above the standards of Vietnam TCVN in both day and night time zones.

In the urban route, the results of the site survey confirm chronically noisy environment due to heavy traffic volume and frequent use of horns.

Investigation results of vibrations for Line-2 and Line-3 are shown in Table 9.1.4.

Table 9.1.4 Investigation of vibration in urban route

Measuring Point	Leq Daytime	TCVN 7210-2002
Ba Dinh	0.0057 m/s2	0.030m/s^2
Daewoo Hotel	48.8 dB	60 dB

Source: excerpted from Ba Dinh “Line-2 EIA Report 2007”
and Daewoo Hotel “Line-3 EIA Report 2010”

It is confirmed that vibrations measured are well below the Standards of Vietnam (TCVN) and that no problem exists on vibrations.

・ Suburban Route

Existing data as to vibrations are provided in the monitoring results of Thang Long Highway 2011 (equivalent noise level during 8h – 18h) and are shown in Table 9.1.5. (Refer to the monitoring points shown in Fig. 9.1.1.)

Table 9.1.5 Noise Monitoring Results

Measuring Point	LAeq (dBA)	TCVN 5949-1998
Point 1: at 7km350m (4km200m on Thang Long Highway)	73.5	75
Point 2: at 14km730m (11km580m on Thang Long Highway)	73.0	75
Point 3: at 18km850m (15km700m on Thang Long Highway)	74.3	75
Point 4: at 25km350m (11km200m on Thang Long Highway)	72.7	75
Point 5: at 32km (QL21A crossing)	74.4	75

Source: Thang Long Highway Monitoring Results 2011

At any point of measuring, the levels are below the Environmental Standards of Vietnam, but very close to the standards due to the large number of lanes, high speed and low speed, and fast speed driving of motor cars.

(6) Ground Subsidence

The median strips of the highway above which the project is planned have been already transformed. However, as the city of Hanoi is built on alluvial formation or diluvial formation geologically made of deposition brought by the Red River and featured with high underground water level, examination on the land subsidence risk shall be made by detailed boring survey if the alternative plan of the underground railway of the urban route be chosen.

(7) Offensive Odors

Along the urban route, offensive odors associated with living, partly by discarded waste and drainage channels can be smelled, which, however, do not entail any environmental concern.

(8) Bottom Sediment

From the results as derived in (2) water pollution investigation, various hazardous materials coming from factory effluent and dumped wastes are supposed to be contained in the bottom sediment of the rivers. In case of future river work being done in the project, prior investigation on the bottom sediment shall be carried out.

(9) Sanctuary

The median strips above which the project is planned have been already transformed. In addition, the planned train depot including its connecting line section does not involve any sanctuary designated by Vietnamese Laws or International Treaties.

(10) Ecosystem

Urban route: In the median strips above which the project is planned, only artificial vegetation is observed. Also, the strips are located in between the highways. Therefore, almost no impact on the ecosystem is expected.

Suburban route: In the median strips above which the project is planned, only bare ground or artificial vegetation is observed. Also, the strips are located in between the highways. Therefore, almost no impact on ecosystem is expected. In addition, the area of the planned train depot and the connecting line section to the train depot is now utilized artificially as rice fields and farm lands, and therefore no impact on ecosystem is expected.

(11) Hydrological Phenomena

Urban route: The median strips above which the project is planned have been already transformed, but in the urban area, because many floods take place in the rainy season and the underground water level is high in the area as described in the preceding section of

ground subsidence, thorough study shall be carried out on the underground water level by detail boring investigation in case the alternative underground plan is adopted for the project.

Suburban route: There are number of irrigation ponds alongside of the planned route, but none is located either on the median strips to be transformed or on the planned train depot.

(12) Topography and Geographic Features

Urban route: Made of alluvial and diluvial layers with rather flat topography. Geographic features consist of rather loose sand layer and clay layer.

Suburban route: Similar to that of the urban route, but geological features consist mainly of clay layer. The existence of karst formation was found partly in the construction of Thang Long Highway. The area of the planned train depot is flat and now used as rice fields and farm lands.

(13) Involuntary Resettlement

Urban route: No involuntary resettlement is foreseen due to non-existence of dwelling on the median strips above which the project is planned.

Suburban route: No involuntary resettlement is foreseen due to non-existence of dwelling on the road median strips above which the project is planned. However, the connecting line section to the planned train depot passes partly through lands of several factories and may possibly incur relocation of several factory buildings and compensation thereof.

(14) Life and Living

Urban route: Although there are many commercial facilities surrounding the route, no life and living facilities are on the median strips above which the project is planned.

Suburban route: No life and living facilities are on the median strips above which the project is planned. The area of the planned train depot is used as rice fields and farm lands and several factories exist on its connecting line section.

(15) Cultural Heritage

In both urban and suburban routes, the median strips have been already transformed and do not involve any cultural heritage designated in Vietnamese Laws or International Treaties.
No cultural heritage exists in the area of the planned train depot.

(16) Landscape

Urban route: Urban landscapes with clusters of buildings are formed.

Suburban route: Many undeveloped areas remain in the surroundings of Thang Long Highway that give wide view alongside of the highway.

(17) Ethnic Minority and Indigenous People

In the process of our site survey, neither ethnic minorities nor indigenous people are confirmed to inhabit alongside of either the urban or suburban route.

(18) Work Environment

Urban route: The road median strips are not utilized, but the lands surrounding the highway are utilized as mainly commercial activity zones.

Suburban route: the median strips above which the project is planned are not utilized, but factories are scattered and a number of street vendors are seen alongside of the highway.

The photos taken at the site survey are shown in Table 9.1.6 and those of planned train depot area in Table 9.1.7.

Table 9.1.6 Photos along the Planned Railway

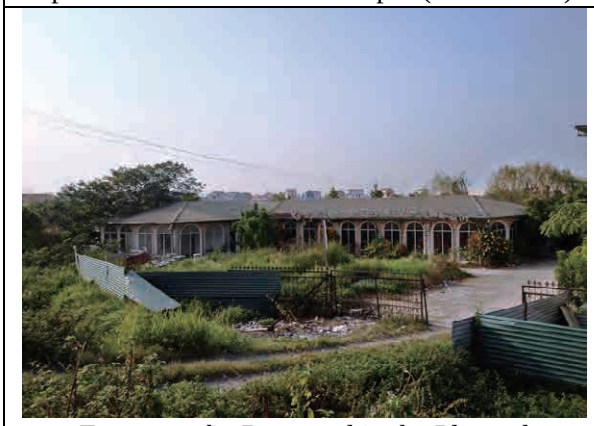
 Spot of St.2 (Urban Route)	 Spot of St.8 (Residence Under Construction)
 Spot of St.3 (Urban Route)	 Spot of St.8 (Suburban Route)
 Spot of St.4 (Urban Route)	 Spot of St.9 (River Crossing)
 Spot of St.5 (Commercial Zone)	 Spot St.10 (Street Vendors)

Source: JICA Study Team

Table 9.1.7 Photos of the Area of the Planned Train Depot

Spot of the Planned Train Depot (Rice Fields)

Spot of the Planned Train Depot (Farm Land)



Factory to be Removed in the Planned Connecting Line Section

Factory Adjacent to the Planned Connecting Line Section

Source: JICA Study Team

9.1.2 Confirmation of the System and Organization of Environmental and Social Considerations in Vietnam

(1) Laws, Decrees and Standards Related to Environmental Considerations (Environmental Impact Assessment, Disclosure of Information, Etc.)

1) Major Laws, Etc. Related to Environmental Considerations

The environmental standards, the provisions of EIA, environmental protection and waste management, and the regulations of environmental protection are stipulated in the Law on Environmental Protection amended in 2005.

In addition, with regard to national strategic projects, SEA shall be carried out prior to EIA.

a. 52/2005/QH11 : Law on Environmental Protection
   Law on Environmental Protection (LEP) in Vietnam
b. 80/2006/NĐ-CP : Decree on Providing Guidance for the Implementation of the Law on Environmental Protection
   Decree providing details and guidelines for the execution of the above a.
c. 21/2008/NĐ-CP : Decree on amending and supplementing several articles in the Decree No.80/2006/NĐ-CP dated on 9th of August, 2006 by the Government on detailed stipulation and instructions on some Articles of the Law on Environmental Protection
   Supplements (revisions) to the above b.
d. 05/2008/TT-BTNMT : Circular of Ministry of Natural Resources and Environment guiding strategic environmental assessment, EIA and environmental protection commitment
   Circular providing technical guidelines (execution details) for SEA and EIA.
e. 29/2011/ND-CP : Decree of the Government regulating strategic environmental assessment, EIA and environmental protection commitment
   Decree adding the procedure regulations for SEA and EIA.
f. 26/2011/TT-BTNMT : Decree of the Ministry of Natural Resources and Environment regulating details for several articles in Decree No. 29/2011/ ND-CP dated on 18/4/2011

regulating strategic environmental assessment, EIA and environmental protection commitment
Decree of MONRE providing details of above e.

The environmental assessment shall be carried out in accordance with the related laws, decrees, circulars and regulations as above mentioned.
Execution content (summary) stipulated in the Law on Environmental Protection and related regulations are shown in Table 9.1.8.

Table 9.1.8 Outline of EIA Execution Regulations

	Summary
Projects subject to SEA and EIA	Mainly vital national projects and those that involve big risk of giving adverse impact on environment. As to the railway related projects, railway constructions of 50km or more, any of the elevated railway constructions and bridge constructions of 200m or more are designated. If an underground plan is chosen for the project, provisions of "underground railway construction of 500m or more" and if the execution of the project is accompanied by a large number of inhabitant resettlement, the provisions of "transport facility construction accompanied by inhabitant resettlement of 1,000 or more" are applied to the project on the size conditions. 【Article 18 of the Law on Environmental Protection and Decree No. 29/2011/ND-CP】
Timing for Execution	・At the same time of feasibility study report of the project 【Article 19 of Law on Environmental Protection】 ・Investment, construction or development permits are issued only after the approval of the environmental impact assessment report. 【Article 22 of Law of Environmental Protection】
Content	1. Detail description of the project 2. Status of environment, vulnerability to environmental impacts and assessment of environmental carrying capacity 3. Assessment of environmental impacts, affected environmental and social factors and risk of accidents 4. Methods of mitigation, prevention of environmental accidents and countermeasures thereof. 5. Official commitment to the environmental protection measures during construction and in operation. 6. Environmental management and auditing plan 7. Budget for environmental protection. 8. Public opinions representing communes and inhabitants cooperatives at the project construction sites. 9. Presentation of assessment figures and data, etc. 【Article 20 of Law on Environmental Protection】
Review Committee and Approval Authority	The assessment documents are checked by a review committee or by a party providing reviewing services. Review and approval organizations are classified in the following 3 categories. 1) Projects decided and/or approved by the national parliament, the government or the prime minister and those involving several industrial sectors and multiple provincial governments. 【Review and approval organization】: Consisting of project approval authorities, local government organizations at the project construction sites specializing in environmental matters, and specialist on environment. 【Establishing responsibility】: MONRE 2) Projects authorized by the central government other than above 1)

	【Review and approval organization】: Consisting of project approval authorities, local government organizations at the project construction sites 【Establishing responsibility】: the central government ministry or agency in charge of authorizing the project. 3) Projects authorized by a local people committee on the provincial level 【Review and approval organization】: Consisting of the local people's committee, provincial level organization specializing in environmental matters, and specialists on environment. 【Establishing responsibility】: the local people's committee Each agency of establishing responsibility for the projects of above 3 categories shall study the document and produce a decision within 15 working days after receipt of the document. 【Law on Environmental Protection】
Time limit of review	EIA review result shall be made within 45 days after receipt of complete and effective documents. 【Decree No.29/2011/ND-CP】
Rights of Organizations, Inhabitants Cooperatives and Private Persons etc.	Organizations, inhabitants cooperatives and private persons are endowed with rights to submit petitions to the agencies of establishing responsibility. The agencies shall be responsible for studying the requests and petitions fully before producing conclusions and decisions. 【Article 21 of Law on Environmental Protection】
Disclosure and consultation	The environment protective measures shall be posted in public at the site of project execution. 【Law on Environmental Protection】

Source: JICA Study Team

2) National Standards Related to Environment

In Vietnam, the environmental index values (TCVN) are given as standards of Vietnam, but nowadays the environmental standards (QCVN) with enforcement factors are renewed and applied to many environmental items. The main regulations related to the project are listed hereunder.

a. TCVN 7210:2010 : Vibration caused by means of road transport – Environmental allowable limits in public and residential areas.
b. QCVN 03:2008/BTNMT : The National Technical Standards for the allowable limits on heavy metals in land;
c. QCVN 08:2008/BTNMT : The National Technical Standards for surface water quality;
d. QCVN 09:2008/BTNMT : The National Technical Standards for underground water quality;
e. QCVN 05:2009/BTNMT : The National Technical Standards for surrounding atmosphere quality;
f. QCVN 26:2010/BTNMT : The National Technical Standards for noise;
g. QCVN 27:2010/BTNMT - The National Technical Standards for vibration;
h. QCVN 24:2009/BTNMT - The National Technical Standards for industrial waste water;

Other regulations related to the inhabitant resettlement are described in detail in 9.2.1 analysis of legal framework with regard to the inhabitant resettlement.

3) Deviation from the JICA Environmental Guidelines

As mentioned in the preceding part of the report, the laws and regulations of environmental and social considerations are well established and there are no deficiencies as compared with the JICA guidelines. However, the following shall be considered additionally in the course of further study EIA procedure.

・addition of an alternative plan to be studied specified in the JICA guideline

・confirmation of due execution by related agencies as stipulated
・participation by the representative of inhabitants in the review committee
・execution of “public hearings” which are to be held “if necessary” in the law

(2) Roles of Related Parties

Based on the study of the laws listed in 1) and the hearings with our counterpart and etc. the roles of parties related to the environmental and social considerations are summarized in Table 9.1.9

Table 9.1.9 Agencies related to EIA

Name of Agency	Role/Responsibility
MONRE	・Appraisal and approval agency of EIA ・Responsible for the procedures related to LEP ・Providing environmental monitoring data
MOT	・MOT or VNRA is the agency in charge of EIA procedure
DONRE	Environment Protection Department belonging to Hanoi People’s Committee ・Providing environmental monitoring data ・Execution of on-site inspection against violation activities
Related district	・Contact for LEP related matters in the district under guidance of DONRE ・Assistance for stakeholders’ meetings if necessary

Source: JICA Study Team

9.1.3 Execution of Scoping

Based on the investigation results so far made and on the final proposal set forth in “3.1.2 The study of the railway route”, the scoping plan is summarized in Table 9.1.10. The scoping is made with reference to the stipulations on the railway project of JICA environmental guidelines regarding the environmental items during construction and in operation respectively to be examined. The predictions derived by the investigation are to be examined in detail in the further investigations in the future.

Table 9.1.10 Scoping Plan

Environment Items		Environmental Predictions		Results of Scoping
		During Construction	In Operation	
Measures Against Pollution				
1	Air Pollution	B-	B+	During Construction: Dust will be spread around construction sites by construction machinery and construction vehicles. In Operation: Air pollution is expected to be reduced by easing traffic jams.
2	Water Pollution	B-	B-	During Construction: Water pollution is foreseen at construction sites by using heavy construction machinery and vehicles, and by drainage from the workers camps In Operation: Water pollution may possibly be caused by drainage from the train depot.
3	Soil Pollution	C-	D	During Construction: The area of planned train depot is now used for agricultural field and may involve the risk of spreading polluted soil when large scale excavation is carried out in the area. In Operation: No activities are foreseen to cause soil pollution.

4	Waste	B-	B-	During Construction: Construction wastes such as construction waste soil coming from excavation of foundations and construction waste materials will be generated. In Operation: Wastes may possibly be generated in the stations and the train depot.
5	Noise/Vibration	B-	A-	During construction: Noise and vibration impacts will be caused by using construction machinery and construction vehicles. In Operation: Noise and vibration will be generated by train traffic.
6	Land Subsidence	C-	D	During Construction: Land subsidence may take place if the construction is accompanied by large scale excavation work. In Operation: No activities are foreseen to cause land subsidence.
7	Offensive Odor	D	D	No activities are foreseen to generate offensive odor.
8	Bottom Sediment	C-	D	During Construction: The impacts examinations are necessary when the bridge constructions over the crossing rivers are carried out. In Operation: No activities are foreseen to affect bottom sediment of the rivers.
Natural environment				
9	Sanctuary	D	D	No sanctuaries exist alongside of the project and its vicinity.
10	Topography and Geological Features	C-	D	During Construction: The study of karst formations scattered alongside of Thang Long Highway is necessary if the nature of construction work require such study. In Operation: No activities are foreseen to affect the topography and geological features.
11	Underground Water	C-	D	During Construction: Impacts to the underground water may possibly be seen when the construction is accompanied by large scale excavation work. In Operation: No activities are foreseen to affect underground water.
12	Hydrological Phenomena	C-	D	During Construction: The study of impacts to hydrological phenomena is necessary when construction of bridge foundation is carried out in the crossing rivers. In Operation: No activities are foreseen to affect hydrological phenomena.
13	Ecosystem	D	D	The level of nature is low in the planned area and its vicinity without any impacts on ecosystem.
14	Climate	D	D	No activities are foreseen to affect climate.
15	Global Warming	C-	C+	During Construction: The construction may possibly affect global warming temporally

				by operation of construction machinery and construction vehicles and by using wooden frame for concrete work. In Operation: The reduction of traffic jams contributes to prevention of global warming by offsetting the negative impact of using electricity for the railway operation.
Social environment				
16	Involuntary Inhabitant Resettlement	B-	D	Involuntary resettlement is not involved in the project because of the fact that the construction of railway is planned above the existing road median strips. The construction of planned train depot and the connecting line section to the train depot involves transformation of farm lands and may be accompanied by the possibility of involuntary inhabitant resettlement.
17	Poverty Group	C-	C+	During Construction: Existence of poverty group is not confirmed in the project area and its vicinity, but detail investigation is required for the train depot area and connecting line section to the train depot involving land acquisition. In Operation: The railway facilitates the poverty group without motorized vehicles to move long distance easily and smoothly
18	Ethnic Minority and Indigenous People	D	D	Neither ethnic minority nor indigenous people are confirmed to inhabit the project area and its vicinity.
19	Local Economy, such as Employment and Living Means	B-	C+	The employment opportunities are increased by the construction work and operation of the railway, but in the train depot area and the connecting line section to the train depot, impact on local economy is to be foreseen because there exists a factory and farm lands
20	Utilization of Land and Local Resources	D	D	Most of the project is planned over the road median strips with the train depot being constructed in rice fields and corn fields and therefore no impacts are foreseen in those aspects.
21	Water Use	D	C-	Most of the project is planned over the road median strips and no impact to the water use is expected, but the impacts examination is necessary if the train depot need large quantity of water to be pumped up from underground.
22	Existing Social Infrastructure and Service	B-	B+	During Construction: The social services around construction sites may possibly affected by execution of construction work and traffic of construction vehicles. In Operation: Positive impact to the social infrastructure is expected by upgrading the new railway.

23	Social Structure, such as Society Related Capital , and Decision Making Organization etc.	D	D	The upgrading of railway is decided through appropriate consultation between the Vietnamese Government and Hanoi City.
24	Imbalanced Existence of Damage and Benefit	C-	C-	Most of the project is planned over the road median strips and no impact is expected in this respect, but the detail investigation shall be carried out for the area of planned train depot and the connecting line section to the train depot.
25	Conflict of Interests within the Construc-tion Area	C-	C-	Most of the project is planned over the road median strips and no impact is expected in this respect, but the detail investigation shall be carried out for the area of planned train depot and the connecting line section to the train depot.
26	Cultural Heritage	D	D	No cultural heritage exists in the project area.
27	Landscape	B-	A-	During Construction: Temporary influence to landscape is expected in execution of construction work. In Operation: New elevated railway and piers influence the landscape in the urban route.
28	Infectious Diseases, such as HIV/AIDS, etc.	B-	B-	The study on the risk by influx of new labor forces is necessary because
29	Work Environment	B	B	Work environment for construction and railway operation workers shall be upgraded.
Others				
30	Accidents	B-	D	During Construction: Accidents may possibly be increased due to the traffic of construction vehicles. In Operation: Accident due to the operation of railway is almost impossible to occur.

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)
D: No impact is expected.

Source: JICA Study Team

9.1.4 Comparison examination of alternative plans

1) Comparison examination of the alternative plan

The comparison examination is made on several alternative plans including zero option from the viewpoint of environmental and social considerations.

・Estimated plans

Plan-A　Non execution of the project (zero option)

Plan-B　Execution of the project

There are two plans for execution of the project as mentioned in 3.1.4 Types of Structures (elevated/ground/underground). As to the details of the examination, refer to 3.1.2 examination on route plans.

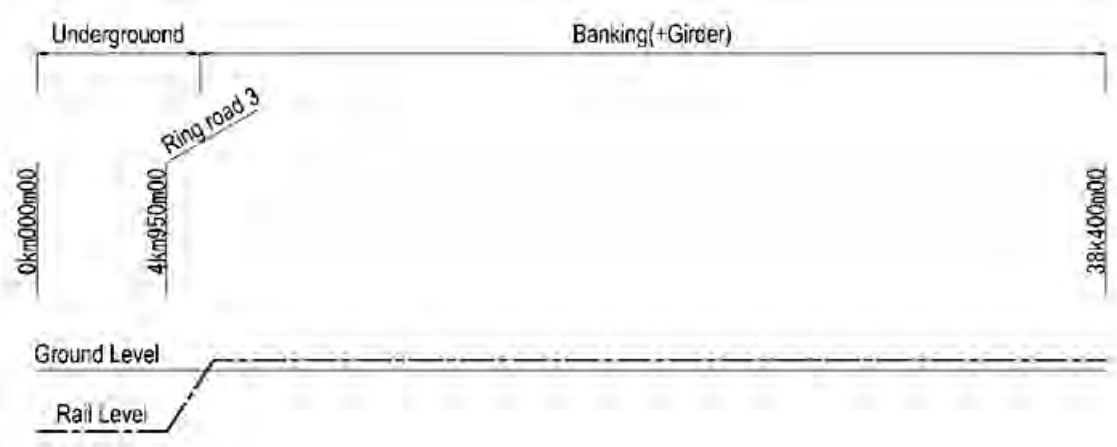
・B-1 Elevated – Banking plan (the final plan of FS)

・B-2 Underground – Banking plan (alternative at the earlier planning stage)

Each portion from the starting point to Ring road 3 is to be constructed in form ①elevated and ②underground and route after the point is on the banking. Each plan is shown in Fig. 9.1.6 and 9.1.7 respectively.

Source: JICA Study Team

Figure 9.1.6 Elevated – Banking plan



Source: JICA Study Team

Figure 9.1.7 Underground – Banking plan

Firstly, the comparison examination on Plan-A (Non execution of the project) and Plan-B (Execution of the project) from the viewpoint of environmental and social considerations is shown in Table 9.1.11

Table 9.1.11 Comparison Examination from the Viewpoint of Environmental and Social Considerations (1)

Plan	Main Merit	Main Demerit
Plan-A Non Execution of the Project	No new environmental problems are generated due to the non-execution of the project associated with land transformation.	The traffic congestions in the center of Hanoi aggravate air pollution, noise and vibration problems of the city, which may possibly entail slowdown of economic activities.
Plan-B Execution of the Project	By easing traffic jams in the city center, air quality and improvement of noise level is foreseen. In addition, economic effects are expected through creation of new employment by upgrading the railway.	Along with the construction of the new railway, the new environmental problems predicted to be generated as described in Table 9.1.5 Scoping Plan.

Source: JICA Study Team

By taking into consideration the present problems of air pollution and noise level in Hanoi, the risks involved in the construction of the new railway as per description in the above table is smaller in comparison with the risks involved in the case of non-execution of the project.

Table 9.1.12 Comparison Examination from the Viewpoint of Environmental and Social Considerations (2)

Plan	Main Merit	Main Demerit
Plan B-1	In comparison with underground plan (B-2), impacts to underground water and land subsidence are smaller and safety in the construction work is more certain.	Noise level is generated by train traffic and landscape is affected by elevated bridges within the city.
Plan B-2	In comparison with the elevated plan (B-1), almost no impact to noise level and landscape is expected.	Construction of underground structure possibly causes disturbance in underground water flow and land subsidence. And if the construction of underground stations is done with open cut method, it may influence local traffic conditions and safety due to traffic restriction during the construction.

Source: JICA Study Team

In comparison of the elevated plan and the underground plan, the noise/landscape matters trade off with the underground water/land subsidence matters. The underground plan entails huge spending on environmental measures for underground water disturbance and land subsidence problems with wide area being influenced by them. In conclusion, the elevated plan finally adopted in the FS is considered to be more feasible on the basis of environmental and social considerations.

In the meantime, as to the laying position of the railway tracks, no other alternatives have been studied in comparison, because as described in 3.1.1 Basic Considerations on Railway Route, the plan was already made in accordance with the master plan of Hanoi City on the existing highway so that it may not incur any involuntary inhabitant resettlement.

9.1.5 Examination on Mitigations (Avoidance/Minimization/Compensation)

With regard to the items that are considered to carry environmental impacts and are rated A-, B- and C- by the scoping, the mitigations (avoidance, minimization and compensation) are summarized in Table 9.1.13

Table 9.1.13 Reduction/Mitigation against Influenced Items

No.	Environmental Items	Mitigation	Executant
1	Air Pollution	During Construction: Proper preventive and escaping measures against dust spreading, such as temporary enclosure of the construction sites, water spray at the sites and surroundings and washing construction vehicles and providing protective covers on the vehicles.	Contractor
2	Water Pollution	During Construction: Drainage from the construction sites and workers' camps are settled and primary treated without releasing directly to the outside to meet the water drainage standards of Vietnam and to prevent water pollution. In Operation: The drainage from the train depot is treated properly, such as absorption of oil residual with mats and so on to meet the water drainage standards of Vietnam and to prevent water pollution.	During Construction: Contractor In Operation: Railway operator
3	Soil Pollution	During Construction: At the time of excavation work for foundation construction, soil survey is carried out as required. In case of soil being found polluted, proper measures are taken to prevent the spreading of pollution in accordance with composition of pollution materials.	To be examined at the stage of detail designing.
4	Waste	During Construction: Examination is made to reuse construction waste soil to the maximum extent including using it positively to other business activities. The construction waste materials are sorted, collected, reused and minimized as a general rule, however, in case of the waste being disposed outside, such disposal is done properly by an authorized specialist in accordance with the regulations of Vietnam. In Operation: Waste coming out from the operation is disposed properly by an authorized specialist in accordance with the regulations of Vietnam.	During Construction: The measure is examined at the stage of detail designing. Execution by a contractor. In Operation: Railway operator
5	Noise/Vibration	During Construction: Preventive measures against noise/vibration during construction, such as temporary enclosure around the construction sites and use of low noise/vibration construction machinery are taken at the sites. In Operation: Long rails and sound barriers shall be installed alongside of the railway, and noise reduction ballast shall be provided (for elevated railway bridge sections) to reduce the noise of operation. With regard to preventive measure against vibration, long rails and low spring track system using solid bed track with resilient ties shall be adopted (for elevated railway bridge sections.) In addition, the places where such measures are taken are examined at the time of detail designing.	During Construction: contractor In Operation: The sound barriers and track structure are examined at the stage of detail designing.

No.	Environmental Items	Mitigation	Executant
6	Land Subsidence	During Construction: In case of large scale excavation being carried out, the cofferdam of high rigidity is installed to prevent or minimize land subsidence.	The measure is examined at the stage of detail designing. Execution by a contractor.
8	Bottom Sediment	During Construction: Proper survey of bottom sediment is made, as necessary, at the time of excavating river bed. In case hazardous material being found in the survey, preventive measures are taken against proliferation, such as installation of prevention screen and proper treatment and disposal of excavated soil, etc.	The measure is examined at the stage of detail designing. Execution by a contractor.
10	Topology and Geological Features	During Construction: The soil survey is carried out at the time of detail designing. In case existence of karst formation being found to disturb the construction work, foundation structures are examined accordingly.	The measure is examined at the stage of detail designing. Execution by a contractor.
11	Underground Water	During Construction: In case of large scale excavation being carried out, the cofferdam of high rigidity is installed to prevent underground water level from lowering.	The measure is examined at the stage of detail designing. Execution by a contractor.
12	Hydrological Phenomena	During Construction: In case of bridge piers being constructed in the crossing rivers, proper measures are examined at the time of detail designing to prevent disturbance in the flow of rivers.	The measure is examined at the stage of detail designing. Execution by a contractor.
15	Global Warming	During Construction: Construction machinery with proper exhaust gas disposer is actively used. And also, proper maintenance and checking is made for the machinery. Wooden concrete frames of reusable materials or reused materials are used.	Contractor
16	Involuntary Inhabitant Resettlement	During Construction: At the time of future studying detail plan, considerations are to be made to minimize possibility of involuntary inhabitant resettlement.	To be examined at the stage of detail designing.
19	Local Economy, such as Employment and Living Means	During Construction: At the time of future studying detail plan, considerations are to be made to minimize impact on the local economy associated with land acquisitions.	To be examined at the stage of detail designing.
22	Existing Infrastructure and Service	During Construction: The construction execution plan is made with consideration to prevent construction vehicles concentration.	Contractor

No.	Environmental Items	Mitigation	Executant
27	Landscape	During Construction: Temporary enclosures are installed at the construction yards with image-up paintings, if necessary. In Operation: Landscaping, such as planting trees, is examined at the time of detail designing, and the design taking landscape into consideration is positively adopted to the extent of it being practicable.	During Construction: The measure is examined at the stage of detail designing. Execution by a contractor. In Operation: The railway operator examines the matter from the designing stage.
28	Infectious Diseases such as HIV/AIDS etc.	During Construction and In Operation: Health and hygiene consideration and guidance on contagious deceases for the workers are made as well as routine checkups to prevent infection and proliferation.	During Construction: contractor In Operation: the railway operator
29	Work Environment	During Construction: Routine safety training is carried out to prevent accident at the construction sites. In Operation: Routine safety training is carried out for the employees.	During Construction: contractor In Operation: the railway operator

Source: JICA Study Team

9.1.6 Examination of Environmental Management and Monitoring Plan

1) Environmental Management Plan

As the project involves elevated railway, it falls into the project category being subject to EIA. And therefore, the EIA report of the project is made in accordance with the regulations in Vietnam on EIA and JICA environmental guidelines at the later stage of investigation of the project. EIA report shall contain description of the environmental management plan.

TOR of EIA to be executed in the next stage of investigation is drafted as follows.

a) Streamlining of the Project Contents

In order to investigate burdens to the environment in detail, the contents of the project are to be thoroughly examined with regard to the items described below.

・Type of structure in the urban route

If the alternative underground plan is chosen, influenced items are to be reconsidered.

・Horizontal alignment of St.2～St.3

In case of widening of the median strips being impossible, the horizontal alignment of the railway is shifted to the west green belt and the matter of the involuntary inhabitant resettlement is necessary to be examined.

・Location , size and contents of the train depot

In case of the train depot being located at a place different from the master plan, new assessment is necessary to be made. The impact assessment is necessary in accordance with the equipment to be installed in the train depot.

・Crossing rivers

In case the crossing rivers being different from the master plan, new assessment is necessary on new rivers and bottom sediment thereof.

・Excavation method

In case of larger volume of excavation being made, new assessment is necessary on underground water and ground subsidence.

b) Review of existing documents and information

Collection and review of available existing documents and information on social and natural environment is to be made. The existing documents are supposed to be available as most recent EIA report for other projects and investigation results of MONRE and DONRE of Hanoi City.

c) Site survey

Additional information that is not covered by the existing documents review b) is to be obtained through site survey. The contents of the site survey are mentioned in Table 9.1.14.

Table 9.1.14 Draft Proposal for the Site Survey

Environmental Item	Items to be Investigated	Place of Survey	Contents of Survey	Remarks
Air Pollution	SO2、CO、NOX、TSP、PM10	Surroundings of the construction yards	As per the methods specified in the Standards of Vietnam QVVN05:2009/BTNMT	
Water Pollution	pH, SS, oil, coliform bacteria group	Rivers into which the drainage from the project is released.	As per the methods specified in the Standards of Vietnam QVVN08:2008/BTNMT	
Soil Pollution	Heavy Metals	The places where large volume of excavation is planned.	As per the methods specified in the Standards of Vietnam QVVN03:2008/BTNMT	As necessary
Noise/Vibration	Environmental Noise and Vibration	Surroundings of the construction yards	Noise: As per the methods specified in the Standards of Vietnam QVVN26:2010/BTNMT Vibration: As per the methods specified in the Standards of Vietnam QVVN27:2009/BTNMT	
Underground Water	Underground Water Level, pH and Coliform Bacteria Group	The surroundings of the places where large volume of excavation is planned.	Underground water level: observation by boring Underground water quality: As per the methods specified in the Standards of Vietnam QVVN09:2008/BTNMT	As necessary
Bottom Sediment	pH, Heavy Metals	At sites where transformations within the rivers are planned	As per the methods specified in the Standards of Vietnam QVVN03:2008/BTNMT	As necessary

Source: JICA Study Team

d) Stakeholders' meetings

The stakeholders' meetings are stipulated in Article 15 of 29/2011/ND-CP. The regulations of the meetings are mentioned as follows.

(1) The project proponents submit a request for consultation and the outline of EIA report to the people's committee of the communes and the representatives from the area to be influenced by the execution of the project, and solicit their comments on the project.

(2) As necessary, the people's committee of the commune hold explanatory meeting for the community and organizations to be directly influenced by the project execution. In such case, the project proponents are also invited to the meeting.

(3) The meeting held as per the preceding paragraph (2) is recorded and documented.

(4) The people's committee of the commune gives its response within 15days after receipt of the letter of request of the project proponents. In case of the response being not given within the deadline, the project is regarded as being approved by the committee.

(5) Any comments obtained in the process is reflected in the EIA report and the meeting record is attached in full to the EIA report.

Up until today, no stakeholders' meeting has been held for the project due to the reason that

the project stays at the IEE stage. In the future, a stakeholders' meeting (explanatory meeting) must be held two times (at the stage of scoping and at the time of making final draft) in accordance with the JICA Environmental Guidelines and the regulations of Vietnam. Upon maturity of the project, the project would better be presented to the local people's committee with request for the meeting before EIA.

e) Environmental management plan

Environmental management plan included in the EIA is drafted as follows.

(a) Management system.

(b) Organizations related to the designing, and role and responsibility of each organization.

(c) Design work execution plan and items necessary to be considered to properly reflect the requests and comments from EIA, DONRE, inhabitants and etc., in the design.

(d) Necessary items to be considered in order to duly execute the minimization and mitigation measures as specified.

(e) System and method of monitoring supervision.

2) Monitoring Plan

Monitoring plan at the time of project execution is mentioned in Table 91.1.15. Monitoring is carried out for items that are predicted to carry large impacts with uncertainty remaining as to the contents of the predictions and the protective measures. The table needs to be reviewed at the later stage of EIA execution and detail designing, and substantiated accordingly.

Table 9.1.15 Draft of Monitoring Plan

Environmental Item	Items to be Investigated	Monitoring Point	Frequency and Content	Responsible Organization
【During Construction】				
Air Pollution	SPM	Surroundings of the Construction yards	Once per month during construction. To confirm that the level satisfies the standards of Vietnam (QCVN) without any complaints from inhabitants.	Contractor
Waste	Waste Management	Construction Sites	Periodically during construction. To confirm recycling, treatment and disposal of construction waste material in reporting (manifest).	Contractor
Water Pollution	pH, SS, Oil, Coliform Bacteria Group	Drainage Outpost	Once per month during construction. To confirm that the level satisfies the standards of Vietnam (QCVN) without any complaints from inhabitants.	Contractor

Environmental Item	Items to be Investigated	Monitoring Point	Frequency and Content	Responsible Organization
Noise/Vibration	Noise and Vibration Generated by Construction Work	Surroundings of the Construction Yards	Once per month during construction. To confirm that the level satisfies the standards of Vietnam (QCVN) without any complaints from inhabitants.	Contractor
Involuntary Inhabitant Resettlement	Status of Land Acquisition	Places of incurring Inhabitant Resettlement	Periodically till the end of land acquisitions. To confirm the due execution of land acquisitions in due course	Railway operator and external monitoring organization on inhabitant resettlement (EMA)
Local Economy, such as Employment and Living Means	Status of restoration of living standards	Places of incurring adverse effects in employment and living standards	Periodically till the end of restoration of living standards. To confirm implementation of living standards restoration in due course	Railway operator and EMA
【In Operation】				
Water Pollution	pH, SS, Oil, Coliform Bacteria Group	Drainage Outpost	Once per month. To confirm that the level satisfies the standards of Vietnam (QCVN) without any complaints from inhabitants.	Railway Operator
Noise/Vibration	Noise and Vibration Generated by the Railway Operation.	In the Vicinity of the Facilities Subject to Protective Measures Along the Railway.	Once per month. To confirm that the level satisfies the standards of Vietnam (QCVN) without any complaints from inhabitants.	Railway Operator

Source: JICA Study Team

9.2 Making of RPF Draft

As described in 9.1 IEE report draft, this project shall develop a railway along the existing median strip of the road. For this reason, there shall be no direct inhabitant resettlement in the construction of housing and main line railway station. However, there shall be an exception for the train depot and connecting line section to where factories and farmlands are located.

9.2.1 Analysis of Legal Framework with Regard to Inhabitant Resettlement

1) Laws and Regulations and etc., with Regard to Inhabitant Resettlement etc.

・Legal System in Vietnam

The Law on Land coming into force in 1933 in Vietnam as amended in 2003 generally provides for land administration and land acquisition in a concrete manner.

a. 13-2003-QH11：Law on Land

The Law provides for land expropriation and compensation for inhabitant resettlement.

b.17/2006/ND-CP：amending Decree 181/2004/ND-CP,197/2004/ND-CP and other decrees

Addition and amendment to the Law stipulates resettlement and compensation thereof.

c. 123/2007/ND-CP

The guideline for execution of b.

d. 84/2007/ND-CP

Supplement to the Law with regard to land expropriation by the Government, compensation, procedure for resettlement, and dispute settlement of land-use rights.

e. 69/2009/ND-CP

Supplement to the Law with regard to land utilization plans, land value, land acquisition, compensation, support and resettlement.

・System in Hanoi City

Decrees of Hanoi city on land is prepared in accordance with the Law on Land of Vietnam

a. 108/2009/QD-UBND

Decree of Hanoi People's Committee with regard to inhabitant resettlement within the city. Support and resettlement regulations are provided for.

b. 32/2010/QD-UBND

Decree of Hanoi People's Committee with regard to expenses for executing building compensation.

2) JICA's Policy on Involuntary Resettlement

JICA's policy on involuntary inhabitant resettlement is described as follows.

I. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.
II. When, after such an examination, avoidance is proved unfeasible, effective measures to minimize impact and to compensate for losses are to be taken.
III. People who must be resettled are to be compensated and supported to improve their standards of living, income opportunities, and production levels, or at least to restore these to pre-project levels.
IV. Compensation must be provided at full replacement cost as much as possible.
V. Compensation and support otherwise must be provided prior to the physical resettlement.
VI. For projects that will result in large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12.
VII. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.
VIII. Appropriate participation by affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures

to prevent the loss of their means of livelihood.

IX. Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

As JICA declares that the JICA guidelines on environmental and social considerations are compatible with the safeguard policy of the World Bank without any major deviation, the JICA guidelines on inhabitant resettlement are well supplemented by the World Bank OP 4.12 stipulations, some of which are mentioned hereunder.

X. Upon identification of the need for involuntary resettlement in a project, a census is carried out at earliest possible stage to the persons who will be affected by the project to determine who will be eligible for assistance, and to discourage influx of people ineligible for assistance.

XI. Persons eligible for compensation and assistance are those who have formal legal rights to land, those who have a claim to such land or assets--provided that such claims are recognized under the laws of the country and those who have no recognizable legal right or claim to the land they are occupying.

XII. Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.

XIII. The displaced persons are provided assistance during relocation.

XIV. Particular attention is paid to the needs of vulnerable groups among those displaced, especially those below the poverty line, the landless, the elderly, women and children, indigenous peoples, ethnic minorities.

XV. A resettlement plan (summary) is prepared for projects involving resettlement of less than 200 inhabitants and land expropriations.

In addition to the above main principles, examinations on the inhabitant resettlement plan, organization for execution, monitoring/evaluation mechanism, execution schedule and detail financial plan are required.

3) Deviations from JICA Environmental Guidelines

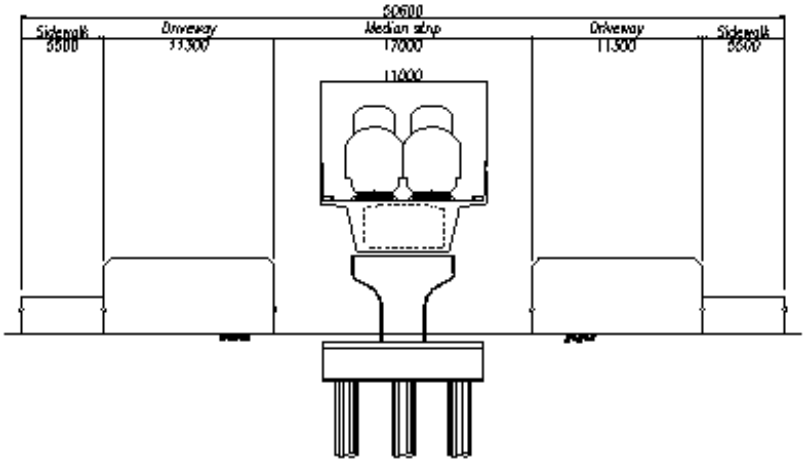
The laws in Vietnam related involuntary inhabitant resettlement and the Law on Land amended in 2003 provide for the main principles and related regulations on the issue. And in addition, the detail execution regulations (108/2009/QD-UBND) established by Hanoi City where the project is implemented set forth the rules and procedures on compensations, restorations of living and grievance settlements as described in the JICA guidelines.

However, as a few actual cases exist after the regulations were put into force and due execution remains uncertain, following points are to be confirmed case by case at the stage of making RAP and physical execution.

- Compensation for irregular inhabitants (the definition is unclear in land administration laws and circulars of Hanoi City)
- Confirmation on due execution (the procedures that are assigned to People's Committees of districts and communes are to be confirmed on their authenticity .)
- Supervision on execution schedule (in case of Nhat Tan Bridge project, more than 2 years were spent for the settlement)

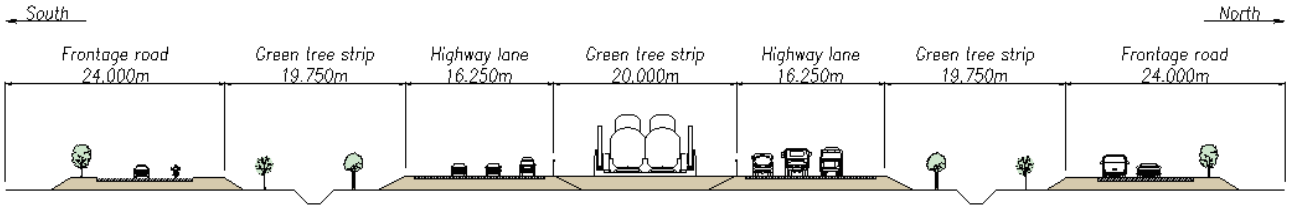
9.2.2 Project Objectives and Inevitability of Involuntary Resettlement

As shown in Fig. 9.2.1 and Fig. 9.2.2 as well as in Fig. 3.4.3 and Fig. 3.4.4. of "3.4 Civil Construction Work Plan", the railway of the project is planned to be built above the median strips of the existing highway in the public domain for the urban and the suburban routes in accordance with the master plan of Hanoi City. In urban route, the elevated railway bridge is 11m wide in general and 17m at the stations, which are both within the width of the highway. In the suburban route, the railway is built on the embankment of 10.4m bottom width in general and 20m at the stations, which are both within the width of the median strips. Therefore, land acquisition and inhabitant resettlement as a result of this construction will not occur. (As to details of the structure, reference is made to "3.4 Civil Construction Work Plan").



Source: JICA Study Team

Fig. 9.2.1 Cross section of the highway above which the railway is built in the urban route



Source: JICA Study Team

Figure 9.2.2 Cross section of the highway above which the railway is built in the suburban route

On the other hand, as shown in Fig. 9.2.3, land acquisition is required in Hoai Duc District, connecting line to the train depot and main railway is required for the land acquisition to develop. In accordance with the master plan of Hanoi City, the planned train depot will be on farm land and the connecting line section to the depot is planned so that it will avoid dwelling areas, but land acquisition will be required.

* Location names in Fig. are Commune names (pertinent to train depot and connecting line only are listed)

Source: JICA Study Team

Figure 9.2.3 Planned Location of Train Depot and Connecting line to the Train Depot

As shown in Table 9.1.7, at present the land for the planned train depot has currently no inhabitant. However, the site is currently used as rice fields and farmlands. Therefore project affected persons (PAPs) are unavoidable. In the connecting line section, the plan is made to be away from inhabitants and the land is used mainly for rice fields and farm lands same as the train depot. However, between the main line and 200m radius curvature to the train depot, there is a factory, of which a portion is subject to removal, manufacturing signage among other products. In conclusion, no direct involuntary inhabitant resettlement is involved, but resettlement plan including compensation for the acquisition of farm lands and for the factory based on the degree of its facility alteration is required.

Scope of acquisition

- Subject area: Hoai Duc District
- Land for the train depot: 172,000m^2
- Land for the connecting line section: 25,300m^2
- Number of dwellings subject to inhabitant resettlement: None as far as direct alteration of houses are concerned, except for one business premise (factory facility) located in the connecting line section.
- Number of dwellings subject to partial land acquisition not accompanied by resettlement: To be investigated at the later stage. The possibility of involving indirect inhabitant resettlement is to be studied as a part of socio-economic investigation at the time of making RAP.

Seven locations are planned power transformer stations, but these are designed to be built under the elevated highway or in the public domain of the highway. No land acquisition is foreseen.

9.2.3 Reason for Not Being Able to Prepare Inhabitant Resettlement Plan

As mentioned in 9.2.2 Project Objectives and Inevitability of Involuntary Inhabitant Resettlement, no inhabitant resettlement plan shall be prepared as the railway shall be built within the premises of an existing highway.

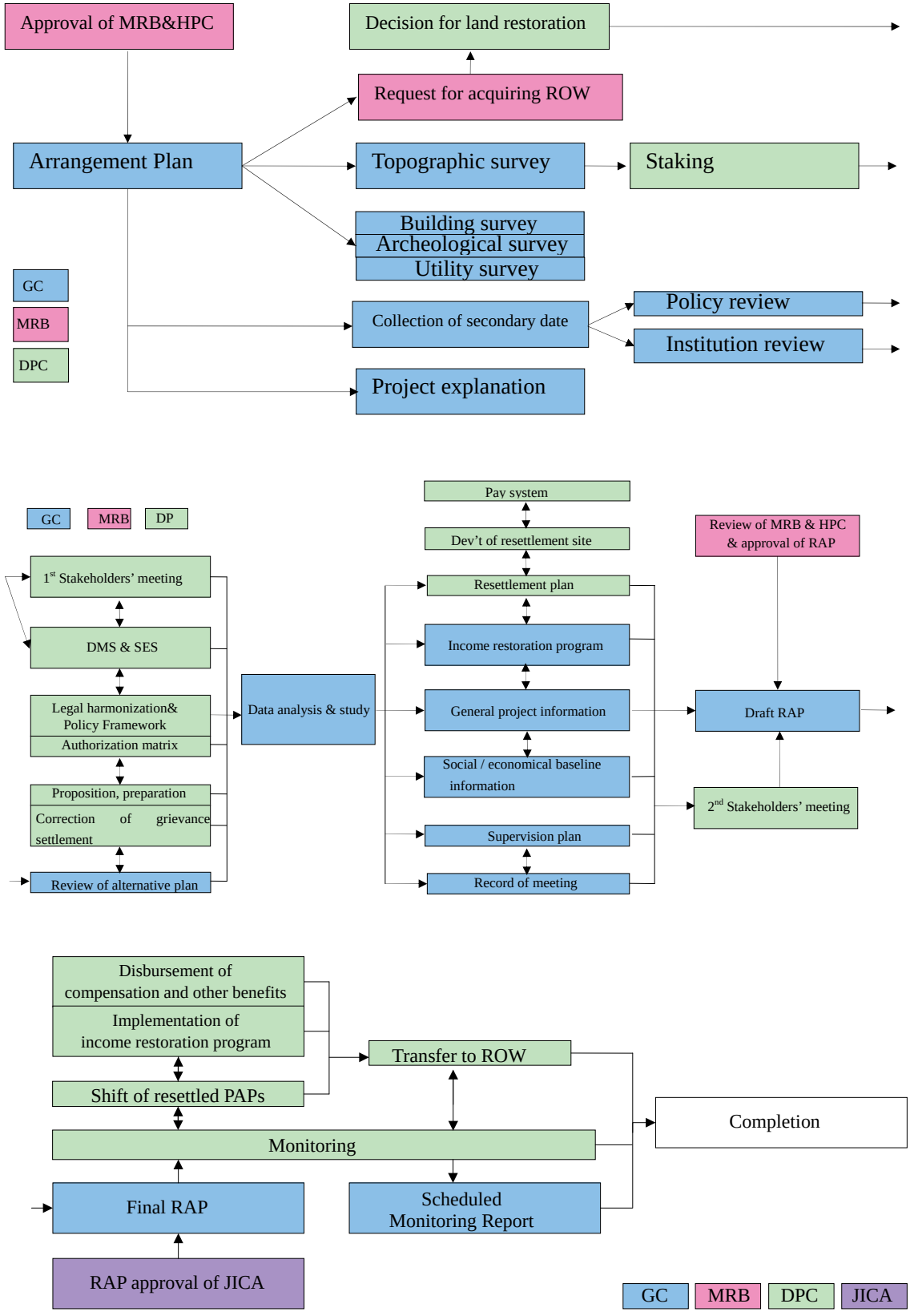
9.2.4 Making of Resettlement Action Plan and its Approval

In Hanoi City, Vietnam, the inhabitant resettlement procedure is carried out in accordance with the Law on Land 13-2003-QH11 and Hanoi People's Committee Decree 108/2009/QD-UBND that stipulates specific execution regulations of the Law on Land.

As mentioned in 9.2.2. Project Objectives and Inevitability of Involuntary Inhabitant Resettlement, land acquisition for the train depot and the connecting line section to the train depot is required. Therefore, an involuntary inhabitant resettlement plan shall be made. At this moment, no transformations of dwellings are foreseen, but a substantial socio-economic investigation shall be made at later stage at the time of preparing RAP so that an involuntary inhabitant resettlement plan may be made involving necessity of inhabitant resettlement and compensation for transformation of business premises (factory facilities).
The TOR for such investigation is mentioned below.

- Establishment of responsible organization : Request for establishing DCSRC (District Compensation, Support and Resettlement Committee) and CCSRC （Commune Compensation, Support and Resettlement Committee）in charge of contacts with HPC concerning involuntary inhabitant resettlement.
- Execution of socio-economic investigation : Investigations on population census, property and land, household and living, repurchase pricing, needs for living means restoration planning and etc.
- Preparation of CSRP（CSR Plan）: Resettlement plan shall be prepared by DCSRC, CCSRC

Based on the hearings from MRB in charge of foregoing Line-2 and from Line-2 GC, procedure for making RAP and approval process shall be per Fig. 9.2.4.



Source: Line-2 Document made by Line-2 GC being modified by JICA Study Team

Figure 9.2.4 RAP Flowchart

9.2.5 Estimated Number of Inhabitant Resettlement

Results of Investigation on land use situation at Hoai Duc District influenced by the land acquisition for the planned train depot and the connecting line section to the train depot are mentioned in the following Table 9.2.l.（as to the locations of the communes subject to the investigation, refer to Fig. 9.2.3）

Table 9.2.1 Situation of Influenced Locations

№	Commune	Railway Extension	Transformed Area	Altered Dwellings	Principal Land Use
1	Song Phuong	2.2km	25,300m^2	None, but 1 facility in the factory area is to be removed. (refer to the table 9.1.7)	Factory area (facility), rice fields, farm land (banana, tomato and etc.) Tombs, though small in number, exist within farm lands)
2	Tien Yen	172,000m^2 for the train depot		None	Rice fields
3	Dac So			None	Rice fields and farm lands (corn)
4	Yen So			None	Rice fields

Source: JICA Study Team

As shown in the above table, no dwellings are to be altered in the planned construction site. However, land acquisition (rice fields and farm lands) of 20,000m^2 will be required in the 4 concerned communes. As shown in Table 9.1.7, a factory facility exists in the connecting line section to the train depot, which currently is most probably not used. A hearing shall be held at the time of socio-environmental study to confirm if only removal of a part of the factory is enough for settlement. In addition, factories and tombs exist in the vicinity of the connecting line section to the train depot, thorough consideration shall be made in establishing detail ROW to avoid disturbances involved as much as possible.

9.2.6 Eligibility for Compensation Against Lost Property and Support for Reconstruction of Living Means

Article 42 of the Law on Land stipulates that those who hold Land Use licenses (as per Article 50 of the Law on Land) or are qualified to obtain the licenses are eligible for the right of compensation in case that the lands of their use are expropriated by the government. In addition, those who have been using the lands before enforcement of the Land Law or have been using the lands without finishing appropriate assignment procedure are also eligible for compensation in special cases as per Decision 108/2009/QD-UBND of Hanoi People's Committee.

As mentioned in "9.2.5 Estimated Number of Inhabitant Resettlement", none of the dwellings are to be altered in the Project, but lands totaling 200,000m^2 (mainly rice fields and farm lands) are subject to compensation. A concrete socio-economic study on living is to be carried out at the time of preparing RAP, based on which the qualified people such as land owners, lessees, merchants, factories employees and unlawful occupants) are to be identified as PAPs eligible to compensations and supports.

9.2.7 Study of the Compensation Procedure Based on the Complete Compensation of the Repurchase Cost for the Lost Property

If the government of Vietnam expropriates lands for public interest, compensation against lost property is made as per stipulations in the law. The same procedure under the Law on Land shall be followed for the Project.

The following three types of compensations are mentioned in the law (Article 42 of the Law on Land)

・Provision of new housing
・Provision of new land for living
・Provision of monetary compensation to purchase new housing

The following Decision 108/2009/QD-UBND of Hanoi People's Committee stipulates the amount of compensation.

(1) Compensation

1) Housing: 100% of the cost as per the latest housing price list issued by Hanoi People's Committee.
2) Business premises: Compensation amount for construction cost shall be calculated in the consultative meeting.

However, removal only, unaccompanied by resettlement, shall be compensated in accordance with the following formula.

・Compensation amount = Present appraised value + (New construction cost - present appraised value) * 60%

(2) Support related to the resettlement

Relocation cost support of 3,000,000VND/owner for owners of housing relocated within the city shall be provided. For relocations outside of the city 5,000,000VND/owner shall be provided.

Resettlement locations are studied by DCSRC and CSRC. In principle, the housing areas prepared by the Government are to be recommended to the people, or else they will select the resettlement locations by themselves.

In addition, the Decision 108/2009/QD-UBND also stipulates provision of support for temporary leasing of housings, and thus, sufficient compensations are provided.

Moreover, in accordance with Article 55 of the Law on Land the value of lands is appraised and published every year by the People's Committees and Municipal Governments of Major Cities. The values published annually by the Hanoi City People's Committee shall be used for the Project.

9.2.8 Measures to reconstruct the living of eligible persons to improve the household and living standards, or at least to restore them to pre-project levels.

The support policy is stipulated in Chapter 4 of the Decree 108/2009/QD-UBND of Hanoi People's Committee as follows. The support by CSRC shall be provided for the Project in accordance with the regulations of Hanoi City.

(1) Support for stability of living and production

1) Farm lands

In case of 30% - 70% of farm lands are acquired without resettlement, support is provided for 6 months to stabilize the living, and in case the acquisition involves resettlement, support is provided for 24 months.

The monthly amount of such support is calculated and set as equivalent to average price of 30kg rice published by Hanoi City at the time of the support.

2) Business premises

In case that commercial and production activities are stopped, 30% of the annual income after tax for preceding 3 years average is supported. The employees are eligible to temporary unemployment allowance for 6 months.

(2) Support for change of jobs

For those who are unable to maintain farming, support is provided for change of jobs. The amount of support is 5 times of the farm lands acquired in proportion of the land areas.

9.2.9 Authorities of organizations in charge of grievance settlement, and procedure of complaint settlement

Grievance settlement with regard to inhabitant resettlement is described in Chapter 8 of the Decision 108/2009/QD-UBND of Hanoi People's Committee/

- Those who are regarded PAPs may file complaint to Commune People's Committee
- Hanoi People's Committee is responsible for the settlement of the filed grievance.
- The grievance settlement organizations are staged below.

1.CCSRC → 2.DCSRC → 3.HPC → 4.District Court

（In case that settlement is not made within 30 days of receiving the grievance, the steps are taken as above mentioned.）

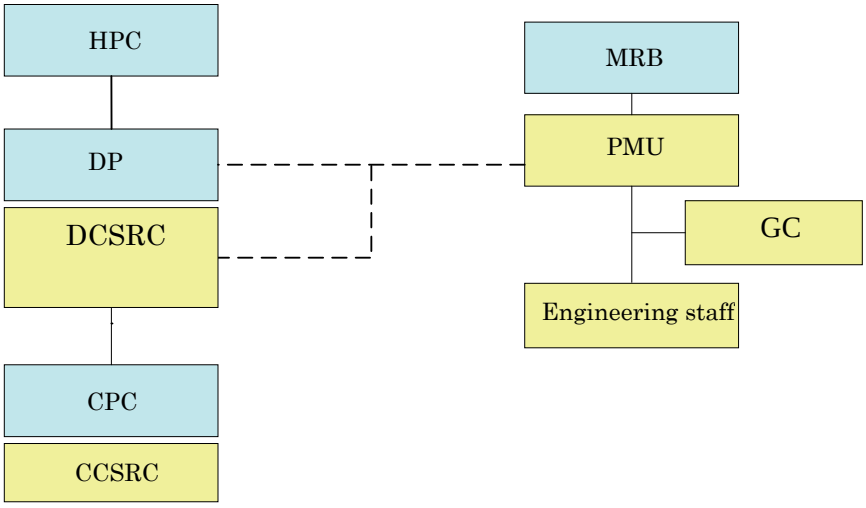
In the case of the Project, the grievance settlement shall be arranged in Hoai Duc District in accordance with the rules mentioned above

In the meantime, for Line-2 Project, the EMA (External Monitoring Agency) under contract with MRB is in charge of external monitoring and follow up of the grievance settlement. It is necessary for the Project to establish the same type of organization at an early stage of the project execution so that the procedure of inhabitant resettlement may be taken smoothly.

9.2.10 Responsible Party in Charge of Inhabitant Resettlement

HPC is designated in the decree 17/2006/ND-CP and the Circular 108/2009/QD-UBND as the party responsible for inhabitant resettlement in Hanoi city. HPC instructs the implementation area (District, Commune) of the project execution to set up the CSRC, the corresponding agency responsible for inhabitant resettlement.

As a result of the hearings from MRB in charge of the foregoing Hanoi Line-2 project and Line-2 GC, the responsible parties (implementation organization) for the Project are thought to be as per attached Fig. 9.2.5



Source: Line-2 RAP document modified by the investigation team

Figure 9.2.5 Related Parties for Inhabitant Resettlement

As shown in the above, DCSRC (District Compensation, Support, Resettlement Committee) is set up on the district level and CCSRC (Commune Compensation, Support, Resettlement Committee) is set up on the commune level and each provide correspondence for compensation/resettlement in their respective jurisdictions. Decision 108/2009/QD-UBND by the Hanoi People's Committee stipulates that it is compulsory for the CCSRC to hold public hearing for PAPs within the commune and disseminate the project information from early stage of the project.

9.2.11 Time schedule of execution of the physical resettlement after the payment of compensation for the lost property

It is uncertain at this moment whether inhabitant resettlement is involved or not, but the time schedule of execution from land acquisition to resettlement is estimated to be 3 years and 8 months as per "Chapter 4, Appendix 1, The Construction Schedule of Line No.5"

The time schedule corresponds to the period from the approval of EIA and of the Project under PPP to the start of construction work. In order to finish the inhabitant resettlement smoothly within this time schedule, ROW shall be determined at the early stage and request for setting up CSRC shall be made to HPC as early as possible.

9.2.12 Cost and Financial Source

The costs related to the inhabitant resettlement shall be calculated and determined based on the socio-economic study at the time of preparing RAP. The approximate costs related to the inhabitant resettlement at this stage of investigation are estimated in Table 9.2.2.

Table 9.2.2 Approximate Costs Related to the Resettlement

Expense Item	Unit	Rate (VND)	Quantity	Amount (Million VND)
I Compensation for lost lands				
・Farm lands	m^2	2,850,000 [1)]	20,000	57,000
II Compensation for lost structures				
・Business premises	m^2	2,663,503 [2)]	700	1,864
III Compensation of lost crops				
(Approx. 0.5% of the lands compensation) [3)]	set		1	200
IV Support				
(Approx. 10% of the farm lands compensation) [3)]	set		1	5,700
V Sum Total				**64,764**
VI Administration cost (9% of the sum total) [3)]	set		1	5,829
VII Other expenses				
・Physical provisions (15% of the sum total) [3)]	set		1	9,715
・Other provisions (15% of the sum total) [3)]	set		1	9,715
・Inclusive Sum				**90,023**

1) As per Regulated Price List 2011- issued by HPC under Decision 89/2001 QD-UBND on 28 Dec.2010
2) As per Decision 32/2010/QD-UBND
3) Estimation based on Line-2 RAP

Source: JICA Study Team

9.2.13 Monitoring System by Execution Agency and by Independent Agency

The Decision 108/2009/QD-UNBD stipulates obligation of supervision of CSRC execution laid by the Hanoi People's Committee. In Line-2 Project, an External Monitoring Agency (EMA) is hired by MRB in charge of the monitoring the execution. It is advisable for the Project to establish similar system under the guidance of MRB, in which the monitoring is carried out regularly, and to enable advancing the procedure of inhabitant resettlement smoothly.

Monitoring formulas of inhabitant resettlement are drafted in Table 9.2.3.

Table 9.2.3 List of Monitoring Formulas for Inhabitants Resettlement (Draft)

Resettlement Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organization
			During the Quarter	Till the Last Quarter	Up to the Quarter	Till the Last Quarter	Up to the Quarter		
Preparation of RAP									MRB
Employment of Consultants		Man-month							
Implementation of Census Survey (including Socioeconomic Survey)									
Approval of RAP			Date of Approval:						
Finalization of PAPs List		No. of PAPs							
Progress of Compensation Payment		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							
Progress of Land Acquisition (All Lots)		ha							
Lot 1		ha							
Lot 2		ha							
Lot 3		ha							
Lot 4		ha							
Progress of Asset Replacement (All Lots)		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		ha							
Progress of Relocation of People (All Lots)		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		ha							

Source: JICA Study Team

9.2.14 Measures to Secure Inhabitant Participation in the Process from Resettlement Plan Preparation to its Implementation

The Decision 108/2009/QD of Hanoi People's Committee stipulated that CCSRC on the commune level is designated as the contact organization in charge of inhabitants resettlement as mentioned in "9.2.10 Responsible Party in charge of Inhabitant Resettlement", holds public hearings at the early stage of the process, and secures the opportunities of inhabitants' participation in the process. But, as the actual cases in the concerned region do not provide sufficient information and leave many uncertainties, the monitoring by EMA is indispensable for the Project as mentioned in "9.2.13 Monitoring System by Execution Agency and by Independent Agency".

9.3 Drafting the Check List

With reference to the environmental check list of JICA environmental guidelines (8. Railway), the check list of the project planned in this report are drafted as follows.

Table 9.3.1 Environmental Check List

Environmental Items		Items to be Checked	Yes: Y No: N	Specific Environmental and Social Considerations
1 Approval and Explanation				
1	EIA and Environmental Approval	(a) Has the EIA report been made? (b) Has the EIA report been approved? (c) Is the approval of EIA report accompanied by any collateral conditions? If so, are they to be fulfilled? (d) Has the project obtained other approval(s) with regard to environment of the local administrative agencies in charge, if necessary, in addition to the above?	(a)N (b)N (c)N (d)N	(a) (b) (c) In September of 2012, VNRA, the counterpart, placed an order for the EIA work, and an EIA report is prepared as follows. ・ Contractor: Scientific Technological Center for Environmental Protection in Transportation ・ Work period : until end of January, 2013 (d) No additional approval is required for the project other than that of EIA.
2	Explanation to the Local Stakeholders	(a) Have the contents of the project as well as environmental impacts been explained properly to the local stakeholders including disclosure of information and obtained their understandings? (b) Has the project taken into consideration the opinions of local people and others to reflect them in the project contents?	(a)N (b)N	(a) In accordance with JICA Environmental Guidelines and regulations in Vietnam, the stakeholders meetings are to held two times (at the stage of preparing scoping plan and at the time of preparing the final draft) in the process of making EIA. Prior to that stage, request is to be made to the counterpart to hold the project explanatory meeting. The timing of the meeting is set at a proper time in accordance with the project maturity. (b) It is necessary to hold Stakeholders' meetings at an early time and make the detail project plan reflecting the opinions of local stakeholders.
3	Study of Alternative Plans	(a) Are multiple number of alternative plans studied (including items with regard to environmental and social considerations)?	(a)Y	(a) In urban route, the alternative plan of underground was studied along with environmental and social considerations. (Refer to 9.1.4 for the details.)
2 Measures Against Pollution				
1	Water Quality	(a) Is the water quality of the downstream degraded due to soil runoff from exposed surface soil such as embankment and cut earth and others?	(a)N (b)N	(a) For the sake of safe operation of the railway, no structure is designed to cause soil runoff, but as there are several embanking and cut earth portions in the

Environmental Items		Items to be Checked	Yes: Y No: N	Specific Environmental and Social Considerations
		(b) Does the drainage from the stations and the train depot comply with the allowable drainage standards of Vietnam, and are there any areas so degraded that the water quality does not satisfy the environmental standards and others?		project, specific measures are to be considered and adopted at the time of working out the detail plan in the future. (b) As penalty is imposed against discharging polluted drainage in Vietnam, the equipment in the train depot is to be considered that the drainage from the train depot complies with the drainage standards in Vietnam.
2	Waste	(a) Are the wastes from the stations and the train depot properly treated and disposed to comply with the regulations in Vietnam?	(a)Y	(a) The measures of treating and disposing wastes from the stations and the train depot properly to comply with the regulations in Vietnam are to be considered and adopted at the time of working out the detail plan in the future.
3	Noise/Vibration	(a) Do the noise and vibration from the railway operation comply with the standards in Vietnam?	(a)N	(a) As no standards exist as to the railway noise and vibration, it is necessary to study the protective measures, such as installation of sound barriers, referring to the Japanese standards of 60dB at daytime and 55dB at night.
4	Land Subsidence	(a) Is there any risk of land subsidence due to pump up of large quantity of underground water (especially in case of the underground railway)?	(a)N	(a) The elevated + banking railway plan adopted in the final FS is not accompanied with any risk of land subsidence, but if large volume of underground water is used in the train depot for washing the trains in the future, the measures are considered to prevent land subsidence.
3 Natural environment				
1	Sanctuary	(a) Does the project site occupy any sanctuaries designated by the laws of Vietnam or by the international treaties? Does the project give any impacts to such sanctuaries?	(a)N	(a) No sanctuary designated by the laws of Vietnam or by the international treaties exists in the vicinity of the project site.
2	Ecosystem	(a) Does the site include primeval forests, tropical natural forests, ecologically important habitats, such as coral reef, mangrove coast, tideland and others? (b) Does the site include habitats of endangered	(a)N (b)N (c)N (d)N (e)N	(a), (b), (c), (f): No ecological problem is foreseen for the project due to the reason that the construction of the railway is planned above the median strips that is already developed and transformed. The train depot is planned on the farm lands

Environmental Items		Items to be Checked	Yes: Y No: N	Specific Environmental and Social Considerations
		creatures protected by the laws of Vietnam or by the international treaties? (c) If there exists any concern of causing large impact to the ecosystem, are any mitigation measures to be taken to minimize such impact? (d) Is any counter measures considered against blocking moving routes of wild animals and cattle, breaking up habitats, and traffic accidents to animals? (e) With the construction of the railway, does any concern arise as to forest destruction, illegal hunting, desertification, drying up of wetland associated with land development? (f) If the railway is constructed in the wildlife area, is there any concern to destroy natural environment to a great extent by development of the new area?	(f)N	and others utilized artificially with low grade of nature, and does not involve any concern ecologically. (d) The construction of the railway in the suburban route are planned on the embankment of the median strips of the existing highway. As the barriers are installed around the track for the safety of the railway operation, no impacts are foreseen as to blocking moving routes of wild animals. (e) The construction area of the project has very little ecosystem factors, and therefore almost no impact of the project execution is expected on the ecosystem.
3	Hydrological Phenomena	(a) Does any possibility exist for the transformation of topology or construction of structures such as tunnels and others to influence the flows of surface water and underground water?	(a)N	(a) As neither large scale transformation of topology nor tunnel construction of is planned, no hydrological impact stemming from structures is expected. However, in case of subsequent river bridge pier construction or the pumping of a large volume of underground water at the train depot, it is necessary to examine the impact on the surface and underground water.
4	Topology and Geological Features	(a) Are the countermeasures in the construction method considered for executing the work in the places of adverse geological features, where land destructions or landslides may take place? (b) Are there any anxiety of land destructions or landslides by execution of the embankment and earth cutting work? Are any proper countermeasures considered to prevent the land fallings and landslides?	(a)Y (b)N (c)Y	(a) The karst formations were found in part during the construction of Thang Long Highway. They are not susceptible to landslides, but consideration is required to be made on the matter at the time of establishing the construction plan. (b) Large scale embanking and earth cutting which may cause land fallings or landslides are not planned. (c) Large scale embanking and, earth cutting structure, and sand dumping area are not planned, but

Environmental Items		Items to be Checked	Yes: Y No: N	Specific Environmental and Social Considerations
		(c) Do soil runoffs take place at the places of embanking, earth cutting, soil dumping and soil collection?		countermeasures to prevent soil runoff need to be studied during the design stage.
4 Social Environment				
1	Involuntary Resettlement	(a) Does the project entail any involuntary inhabitant resettlement in its execution? (b) Is proper explanation scheduled for the inhabitants to be resettled on compensation and reconstruction of living measures in advance of the resettlement? (c) Is the investigation made with regard to inhabitant resettlement, and is the inhabitant resettlement plan established as to compensation of new purchase cost and restoration of living infrastructure after the resettlement (d) Is the payment of compensation to be made in advance of the resettlement? (e) Is the compensation policy documented? (f) Are proper considerations included for the socially weak people, such as women, children, senior persons, persons in poverty, ethnic minorities, and indigenous people and others? (g) Is the agreement made with inhabitants in advance of the resettlement? (h) Is the system established to execute inhabitant resettlement properly? Is it given full capability and budget for the due execution of the resettlement? (i) Is the monitoring of impacts of resettlement planned? (j) Is the system established to cope with grievance settlement?	(a)Y (b)Y (c)Y (d)Y (e)N (f)N (g)Y (h)N (i)N (j)Y	(a) In planning the railway route (3.1), efforts have been made not to involve direct transformation of living places, but involuntary inhabitant resettlement may take place by acquisition of farm lands in the area of planned train depot and the connecting line section to the train depot. (b) The explanation to the inhabitants is obligatory in accordance with the regulations set forth in the Law on Land and related decrees and circulars. The explanatory meeting is to be held in the future after establishing a resettlement plan. (c) In accordance with the regulations set forth in the Law on Land and related decrees and circulars, the investigation on the inhabitant resettlement is made and the resettlement plan is established including compensation for new purchase cost and restoration of living infrastructure after the resettlement (d) The payment of compensation is to be made in advance of the resettlement. It is also important to establish an implementation system to facilitate such payment without any delay. (e) The compensation policy is established in the Law on Land and related decrees, circulars and decisions. (f) In the future, based on the investigation on social and economic factors etc., requests are necessary to be placed to the related departments asking their due considerations on socially weak people. (g) In accordance with the regulations set forth in the Law on Land and related decrees and circulars, the project is executed under cooperation with related

Environmental Items		Items to be Checked	Yes: Y No: N	Specific Environmental and Social Considerations
				departments in order for the agreement with affected inhabitants to be made in advance of the resettlement. (h)(i) The monitoring by EMA is necessary as the capabilities of execution by Hanoi City (District & Commune) in charge of inhabitant resettlement are uncertain ,. (j) The grievance settlement system is established in the regulations set forth in the Law on Land and related decrees and circulars.
2	Life and Living	(a) Does the new railway give any impacts on the existing transport means and living of persons engaged therein? In addition, does it entail a large scale alteration of land use and living means, unemployment etc.? Is the mitigation against such social impacts involved in the project planning? (b) Does the project involve any adverse impacts on the living of inhabitants or others? Are the mitigation measures considered to minimize such impacts as required? (c) Does the influx of people from other areas involve the risk of inviting deceases (including infectious deceases, HIV and etc.)? Are the considerations made with regard to proper public health as necessary. (d) Does the project give any adverse impacts on the traffic conditions (aggravated traffic jams, increase of traffic accidents and etc.) surrounding the project sites? (e) Does the railway give disturbances against the inhabitants moving? (f) Does any sunshine blocking or radio disturbance take place?	(a)Y (b)N (c)Y (d)Y,N (e)Y (f)N	(a) Commuting buses run in the area of the planned railway project. In the future, the request is to be made to the related departments asking the creation of the bus networks centering around the railway stations. As large scale alterations are expected with regard to the land use and living means in the area of the train depot, the concrete care is to be made thereon. (b) No adverse impact is expected on the living of inhabitants in other respects. (c) AS the influx of workers from other area increases the risk of infectious deceases like HIV and etc., considerations and countermeasures are necessary to be made on the public health before the execution stage of the project. (d) As the worsening of the traffic jams around the construction sites by construction vehicles are foreseen, the considerations are necessary to be made on equalization of the construction work. In the stage of the operation, the project will contribute to easing the traffic jams.. (e) The railway is constructed above the median strips both in the urban route and in the suburban route, no disturbances are foreseen in the inhabitant movement,

Environmental Items		Items to be Checked	Yes: Y No: N	Specific Environmental and Social Considerations
				but study is to be carried out for improving traffic roads and associated facilities because it is possible for inhabitant movement to be affected by construction of the train depot and the connecting line section to the train depot.. (f) As the height of the elevated railway in the urban route is same as or lower than the surrounding buildings and constructed above the median strips of the existing highway, no sunshine blocking or radio disturbance will take place.
3	Cultural Heritage	(a) Is any possibility of the project damaging archeological, historical, cultural or religious heritages? If so, are considerations made to protect them in accordance with the regulations of the country concerned?	(a)N	(a) No cultural heritage exists in the project area and its surroundings.
4	Landscape	(a) If any landscapes be subject to special considerations, are the necessary countermeasures to be taken to mitigate the adverse or any impacts to the landscapes.	(a)Y	(a) The consciousness of landscapes is high in Hanoi and the construction of the elevated railway bridge in the urban route gives big impacts to the landscapes. Thus, the measures, such as adoption of the design respecting the landscapes at the planning stage of the project.
5	Ethnic Minority and Indigenous People	(a) Are considerations made to mitigate impacts on the ethnic minorities and indigenous people? (b) Are special rights of ethnic minorities and indigenous people respected with regard to the lands and natural resources?	(a)N (b)N	(a),(b) Neither ethnic minorities nor indigenous people are confirmed to inhabit in the project area.
6	Work Environment	(a) Are the laws followed with regard to the country's work environment in the project? (b) Are the hardware safety measures such as safety means and equipment preventing accidents at work and managing hazardous materials and etc. taken into consideration for the project related people? (c) Are the software measures such as establishment of	(a)Y (b)Y (c)Y (d)Y	(a)(b)(c)(d) It is necessary for the project proponent to oblige the contractor to execute the work properly in accordance with the laws on the work environment of Vietnam.

Environmental Items		Items to be Checked	Yes: Y No: N	Specific Environmental and Social Considerations
		safety and health care plan, execution of safety training (including traffic safety and public health) for the construction workers and etc. are taken into consideration for the project related persons. (d) Are the proper measures to be taken to prevent the security staff from violating the safety of the project related people and the local inhabitants?		
5 Others				
1	Impacts During Construction	(a) Are the mitigation measures prepared against pollutions (noise, vibration, polluted water, dust, exhaust gases, wastes and etc.) during construction? (b) Does the construction give adverse impacts to the natural environment (ecosystem)? If so, are the mitigation measures prepared against them? (c) Does the construction give adverse impacts to the social environment? If so, are the mitigation measures prepared against them. (d) Does the construction cause traffic jams? If so, are the mitigation measures prepared against them.	(a)Y (b)N (c)Y (d)Y	(a) In order to mitigate the pollutions during construction, the considerations on the due implementation of minimization and mitigation measures as described in Table 9.1.13 are necessary to be made from the project planning stage. (b) The project is planned to be constructed above the median strips of the highway, no impact to ecosystem is expected during construction. As the planned area of the train depot is now artificially used as farm lands and the grade of nature is low, no impact to ecosystem is expected. (c)(d) As adverse impacts to social environment, such as temporary traffic jams during construction and etc., the considerations on due implementation of minimization and mitigation measures as described in Table 9.1.13 are necessary to be made from the project planning stage.
2	Monitoring	(a) Is the monitoring planned and executed by the project proponent with regard to the affected environmental items as described above? (b) Are the monitoring plan considered to be appropriate with regard to the items monitored, method, frequency and etc.? (c) Is the monitoring system (organization, manning,	(a)Y (b)Y (c)Y (d)N	(a)(b)(c)(d) The monitoring plan described in Table 9.1.5 shall be examined again at the time of conducting EIA in the future in accordance with degree of the impacts, and shall be substantiated more detail accordingly.

Environmental Items	Items to be Checked	Yes: Y No: N	Specific Environmental and Social Considerations
	equipment and apparatus, budget and etc. and their continuity)? (d) Are the reporting method, frequency and etc. of the project proponent to the related administrative bodies stipulated?		
6 Precautions			
Reference to Other Environmental Checklist	(a) If necessary, a check list of forestation shall be referred to additionally on the relevant items and is evaluated accordingly (such as in case the project being accompanied by large scale of logging and etc.). (b) If necessary, a check list of transmission, transformation and distribution shall be referred to additionally on the relevant items and is evaluated accordingly, (such as in case the project being accompanied by the construction of transmission lines, transformer stations and distribution stations and etc.)	(a)N (b)N	(a) No large scale logging is involved in the project. (b) The power transmission is assigned to the electric power company. The transformer stations are planned to be built in the public domain.
Precaution on the Use of the Environmental checklist	(a) If necessary, the environmental impacts beyond the border and global environmental issues (such as in case the project involving elements of waste disposal beyond the border, acid rain, destruction of ozone layer, global warming)shall be confirmed.	(a)Y	(a) The considerations against the global warming shall be taken into account such as using specific materials suitable to that effect.

Source: JICA Study Team