Ministry of Public Works and Transport
Lao Peoples Democratic Republic (Lao PDR)

THE COMPREHENSIVE STUDY ON LOGISTICS SYSTEM IN LAO PEOPLE'S DEMOCRATIC REPUBLIC

FINAL REPORT

Volume 2: Feasibility Study on Vientiane Logistics Park

January, 2011

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

INTERNATIONAL DEVELOPMENT CENTER OF JAPAN (IDCJ)
NIPPON KOEI

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PREFACE

Lao PDR is located at the center of Greater Mekong Sub-region (GMS). This preferable location currently provides Lao PDR with strategic advantages to transform itself from a “land-locked” to a “land-linked” country, particularly due to globalization in trade and transport and regional economic integration. In this respect, Lao PDR faces a great opportunity to become a regional logistics hub in the GMS and ASEAN region. In cognizance of these situations, the Lao Government has embraced the transformation into a “land linked country” as a major policy essential to the country’s aspirations of graduating from a developing country.

However, there are still several constraints in logistics in Lao PDR; in particular the insufficient logistics system. The current logistics system in Lao PDR still falls below international standards in terms of efficiency, reliability and cost due to unsatisfactory performance by inadequate infrastructure and immature domestic logistics industry.

In this regards, the Japan International Cooperation Agency (JICA) decided to conduct the Comprehensive Study on Logistics System in Lao PDR. JICA selected and dispatched the Study Team between March 2009 and November 2010.

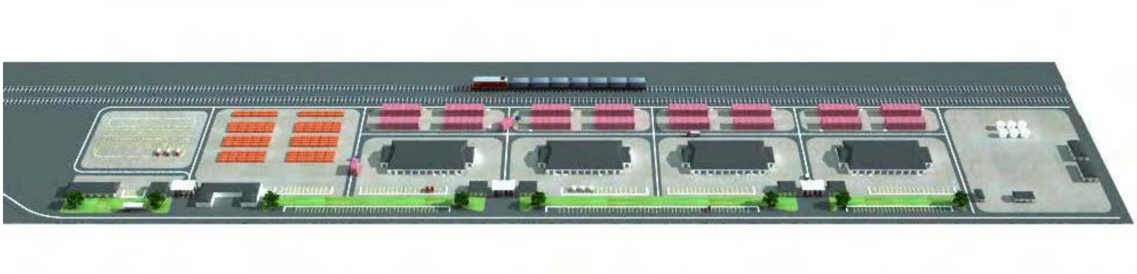
The Study Team held discussions with the concerned officials in the Government of Lao PDR and conducted field surveys in the study area. Upon returning to Japan, the Study Team conducted further studies and prepared this final report.

It is my hope that this report will contribute to development in the Lao PDR, and to the enhancement of a friendly relationship between our two countries. Finally, I wish to express my sincere appreciation to all the people for their generous cooperation with the Study Team.

January 2011

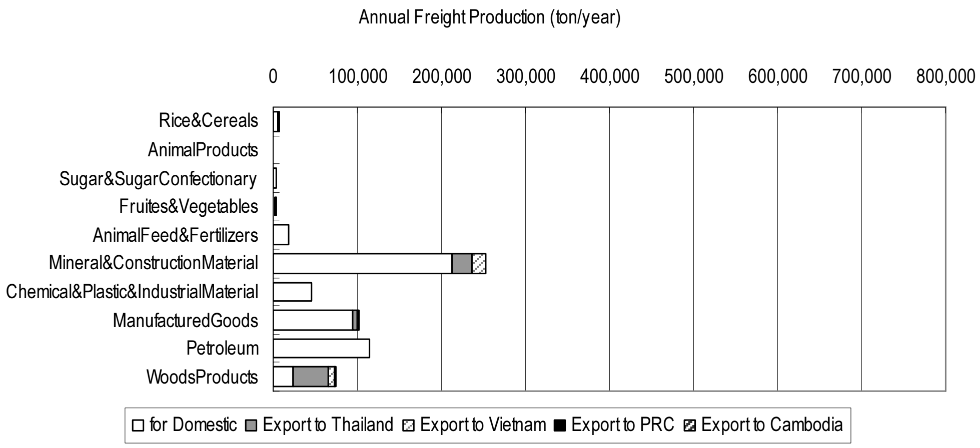
Kiyofumi KONISHI,
Director General
Economic Infrastructure Department
Japan International Cooperation Agency

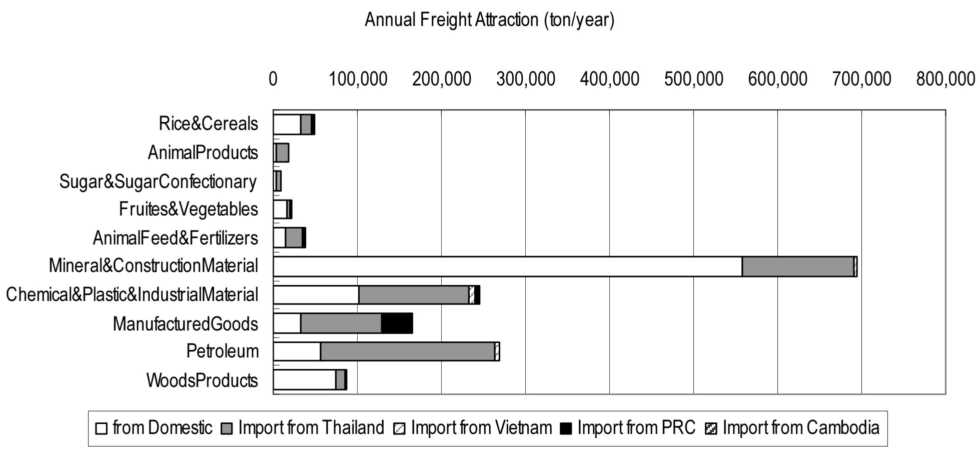
Study Area Map



Images of Vientiane Logistics Park

<table>
<tr><td>Project Name</td><td>Vientiane Logistics Park (VLP)</td></tr>
<tr><td>Current Logistics in Vientiane</td><td>
In Vientiane Capital, current freight attraction volume which consists of imports and trans-shipments from other provinces in Lao PDR was estimated to be about 623,000 tons per year. Current freight production which consists of exports and trans-shipments to other provinces is about 1,597,000 tons per year. Transit freight relevant to Vientiane Capital is less than 5,000 tons per year and is dominated by manufactured goods, vegetables and fruits from Thailand.





Current Freight Generation Volume in Vientiane Capital
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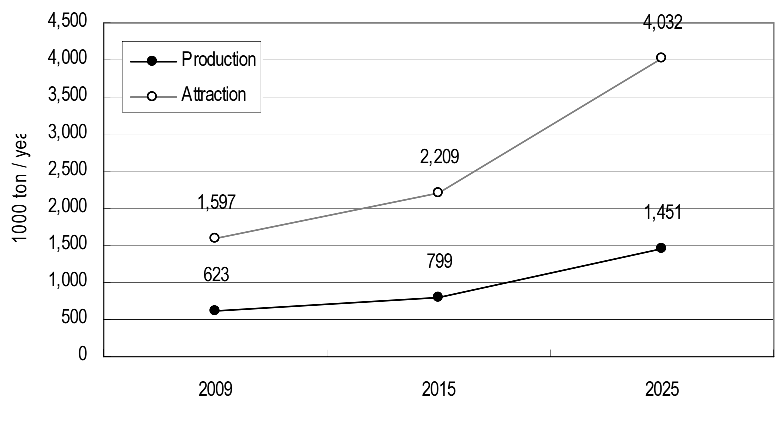
<tr><td>Freight Demand</td><td>
Future freight production and attraction volumes relevant to Vientiane Capital are expected to reach 1.5 and 4.0 million tons /year respectively.



Forecasted Freight Generation in Vientiane Capital
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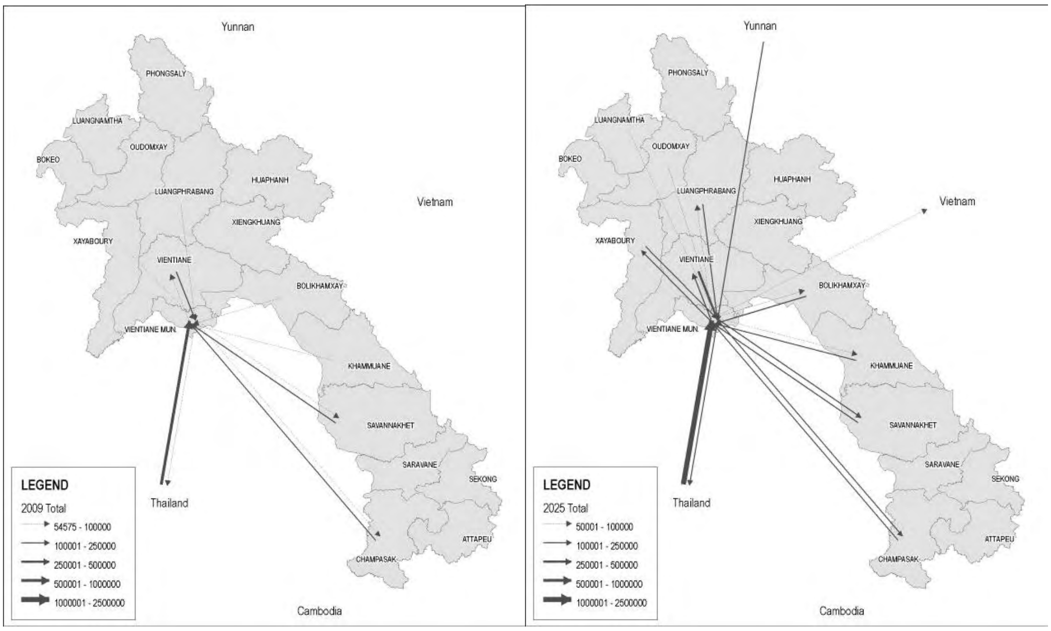
Freight Demand



Forecasted Freight Distribution to/from Vientiane Capital

Logistics Strategy

Logistics development in Lao PDR can be achieved by the following 3 key strategies: (i) Integration of Cargo Flow, (ii) Business Stimulation, (iii) Market Expansion. To realize these strategies, Vientiane is expected to become a core of the logistics system in Lao PDR, providing up-to-date logistics park in the heart of Lao PDR, to combine and integrate cargo flows to generate scale merits for Lao PDR, by utilizing geographic and economic advantages of Lao PDR.

Functions and Services Provided at VLP

The VLP is expected to provide the following functions and services.

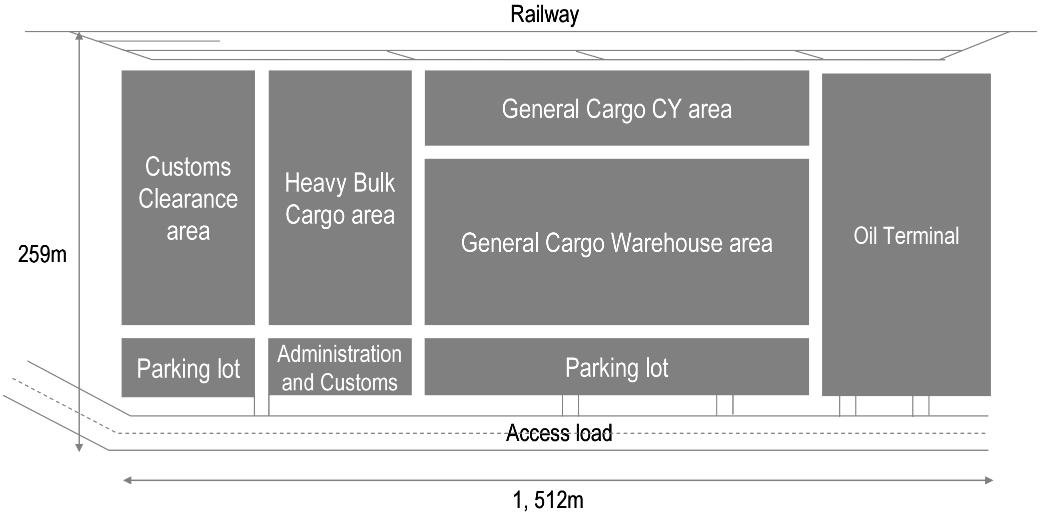
- Interface with Thailand for import/export and transit cargo
- Integration of cargo flow along NR-13N to reduce empty return haulage
- Trans-shipment and Consolidation
- Inventory and storage service for the areas along Mekong River including Thai side
- Distributive processing for goods imported from Thailand in the short term, goods in-transit from China to Thailand in the short and medium-term, and then parts and semi-products inventory center in the medium to long term.

Handling Volume at VLP

Based on this future freight demand, the volume of cargo handled at the VLP was estimated for target years 2015 and 2025 and summarized in the following table.

Daily Cargo Demand in VLP (Unit: tons/day)

Mode of Transport	Truck			Rail		
Year	2009	2015	2025	2009	2015	2025
Import Cargo						
Petroleum Freight	0	0	0	0	92	515
Heavy Bulk	250	396	759	0	37	206
General Cargo	469	700	1,137	0	68	315
Container	99	141	386	0	59	571
Export Cargo						
Petroleum Freight	0	0	0	0	0	0
Heavy Bulk	0	18	81	0	18	89
General Cargo	0	3	12	0	3	10
Container	0	1	8	0	2	18
VIP cargo						
Container	0	37	176	0	9	689
Total	818	1,297	2,559	0	288	2,412

Facility Plan at VLP	The facilities proposed at the VLP include (i) Customs clearance area, (ii) Heavy bulk cargo area, (iii) General cargo CY area, (iv) General cargo warehouse area, (v) Parking lots, (vi) Administration and customs office, (vii) Operator office, (viii) Maintenance workshop. Unlike the logistics parks in other cities, the VLP also has railway siding and oil terminal area. The area required for the VLP was calculated as 34.9 ha, including oil terminal area.  Layout Plan of VLP
Project Cost of VLP	Project cost of the VLP consists of construction cost, administration cost, consultant cost and contingency and was estimated at USD 32 million (as of November 2009).
Economic Benefit	The EIRR, which is 12.5%, exceeds the opportunity cost of capital (12%), therefore, VLP is a viable project from the perspective of the national economy. Creation of value added at VLP, opportunity cost of cargos, opportunity cost of vehicles (trucks and trailers), reduction of Vehicle Operation Cost (VOC) which comes from modal shift from trailers to train cars are identified as economic benefit of the project.
Financial Appraisal	Project FIRR, which could be translated that the VLP Project would be conducted by a single implementation body, is 6.8%. Since loan rate of US dollar from 3 to 6 years is 9.1%, the project is not financially attractive if a private company develops and operates the facility. Therefore, the project should be conducted under cooperation between public sector and private sector. Project IRR which is the while financial profitability of the project is FIRR for VLP-Management Company and tenants are 12.1% and 11.7%, respectively: these are high enough to attract private investment. In order to secure participation of the private sector, Lao PDR Government should prepare measures to mitigate project risks. The FIRR for project owner is 5.4%: the project would be financially feasible if a soft loan such as yen loan were used for the project.

The Comprehensive Study on Logistics System in Lao People's Democratic Republic

Final Report

Volume 2: Feasibility Study on Vientiane Logistics Park

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List of Abbreviation

Abbreviations	Name
ADB	Asian Development Bank
ADSL	Asymmetric Digital Subscriber Line
AFTA	ASEAN Free Trade Agreement
ASEAN	Association of Southeast Asian Nations
ASW	ASEAN Single Window
CBTA	Cross Border Transport Agreement
CCA	Common Control Area
CCTV	Closed Circuit Television
CFS	Container Freight Station
CIQ	Custom, Immigration and Quarantine
CO2	Carbon Dioxide
CY	Container Yard
D/D	Detailed Design
DEU	Delegated Examine Unit
DMU	Diesel Multiple Unit
DPA	District Protected Area
DPRA	Development Project Responsible Agency
DPWT	Department of Public Works and Transport
DR	District Road
ECC	Environmental Compliance Certificate
EDL	Enterprise D'electricite du Lao
EdL	Electricite du Laos
EIA	Environment Impact Assessment
EIRR	Economic Internal Rate of Return
EMDP	Ethnic Minority Development Plan
EMP	Environmental Management Plan
EPZ	Export Processing Zone
ESDF	Education Sector Development Framework 2009 - 2015
ETL	Enterprise of Telecommunications Lao
EXIM	Export and Import
FAR	Floor Area Ratio
FCL	Full Container Load
FEU	Forty-foot Equivalent Unit
FIRR	Financial Internal Rate of Return
FTL	Full Truck Load
GDP	Gross Domestic Product
GL	Ground Level
GMS	Great Mekong Sub region
GRDP	Gross Regional Domestic Product
ICD	Inland Container Depot
ICEM	International Centre for Environmental Management
IEE	Initial Environmental Evaluation
IMF	International Monetary Fund
IRR	Internal Rate of Return

Abbreviations	Name
ISA	Initial Social Assessment
IUCN	International Union for Conservation of Nature
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JIT	Just In Time
JPY	Japanese Yen
LAK	Laos Kip
LCL	Less than Container Load
LMA	Land Management Authority
LNLS	Laos National Logistics Strategy
MAF	Ministry of Agriculture and Forestry
MOF	Ministry of Finance, Lao PDR
MOIC	Ministry of Industry and Commerce
MPI	Ministry of Planning and Investment
MPWT	Ministry of Public Works and Transport
NBCA	National Biodiversity Conservation Area
NEDA	Neighboring Economy Development Agency
NLMA	National Land Management Authority
NPA	National Protected Area
NPNKL	Nam Papa Nakhoneluang
NPV	Nam Papa Vientiane
NR	National Road
NRAL	National Railway Authority of Lao PDR
NSW	National Single Window
O&M	Operation and Maintenance
OD	Origin and Destination
PAP	Project Affected Person
PC	Prestressed Concrete
PI	Public Involvement
PMO	Prime Minister Office
PPA	Provincial Protected Area
PR	Provincial Road
RP	Resettlement Plan
SA	Social Assessment
SCF	Standard Conversion Factor
SCM	Supply Chain Management
SEZ	Special Economic Zone

CHAPTER 1 INTRODUCTION

1.1 Introduction

GMS and ASEAN have gradually progressed in formulating regional economic integrations. Cross-border transport has been activated, reflecting the ease of border crossings, expansion of markets, and progress of international divisions of labor. This seems to give Lao PDR a great opportunity to materialize the policy of transforming itself from a "Land-locked Country" to "Land-linked Country". It is greatly expected that certain developments focusing on developing international logistics business in GMS region will be realised. Meanwhile, the industrialization in Lao PDR has fallen behind neighboring countries in spite of her abundant natural resources and relatively low labor costs. However the completion of several key infrastructures and international agreements, such as ASEAN Free Trade Agreement (AFTA) in ASEAN and Cross-Border Trade Agreement (CBTA) in GMS, have gradually stimulated regional movement of money, peoples and goods, which is greatly expected to activate horizontal division of labor of production in GMS region.

Lao PDR has a good position in GMS in terms of geographic location and advancement of cross-border agreements with surrounding countries: these present major growth opportunities for Lao PDR in the future. However, Lao PDR has constraints to development such as limited capacity in investment capital, technology, human resources and a specially limited small domestic market. Consequently, there are more opportunities in GMS market for Lao PDR: hence the need to prioritize seeking the GMS market rather than relying on the domestic market.

In light of these intricacies, Laos National Logistics Strategy (LNLS) proposes the following basic strategies:

- To exploit the abundant business opportunities in GMS, Lao PDR should play a leading role in pursuing the next step of economic integration of GMS countries by opening up a GMS regional single market with more seamless and barrier-free cross-border trade.
- To take advantage of situation where Lao trucks are able to visit surrounding countries, Lao PDR should promote logistics industries by promoting relocation of foreign transport and logistics businesses into Lao PDR as well as encouraging strengthening of domestics logistic businesses, utilizing advantages of advanced state of cross-border agreements and location in GMS.
- Lao PDR should give high priority to human resource development in logistics and related sectors to spread benefits of logistics business promotion over logistics related and supporting businesses.

Vientiane Logistics Park (VLP) is a key facility in realizing the above basic strategies of LNLS.

VLP upgrades (1) interface function of international trade, (2) Support function to further industrialization and urbanization of Vientiane; in particular support to Vientiane Industrial Park (VIP), (3) incubation function of logistics businesses in Lao PDR, and (4) hub function of domestics transport. To realize these functions, VLP has to offer 3 multi-services, namely:

- Multi-modal transport service
- Multi-logistics service
- Multi-service for industrial and logistics service development

To delineate more clearly and materialize the development concept mentioned above, which is proposed in the Lao National Logistics Strategy (LNLS), this feasibility study on Vientiane Logistics Park (VLP) was undertaken.

1.2 About This Report

The overall objectives of the Comprehensive Study on Logistics System in Lao PDR (hereinafter referred to as "the Study") are to improve the international and domestic logistics system in Lao PDR. The major focuses of this particular study are accordingly: (1) to prepare national logistics strategy, consisting of national logistics strategy and logistics strategy in major regional cities, (2) to carry out a feasibility study on the logistics parks in Vientiane, Savannakhet and Pakse which will be the hub of logistics activities and network in Lao PDR.

The Study is scheduled to produce an inception report, progress report, interim report, and draft final report as intermediate outputs of the study. A final report is produced at the end of the study as a final output. This report is the Final Report of the Study. This Final Report consists of 4 volumes such as:

Volume1: National Logistics Strategy

Volume 2: Feasibility Study on Vientiane Logistics Park

Volume 3: Feasibility Study on Savannakhet Logistics Park

Volume 4: Feasibility Study on Champasack Logistics Park

This report is the feasibility study on Vientiane Logistics Park (Volume 2).

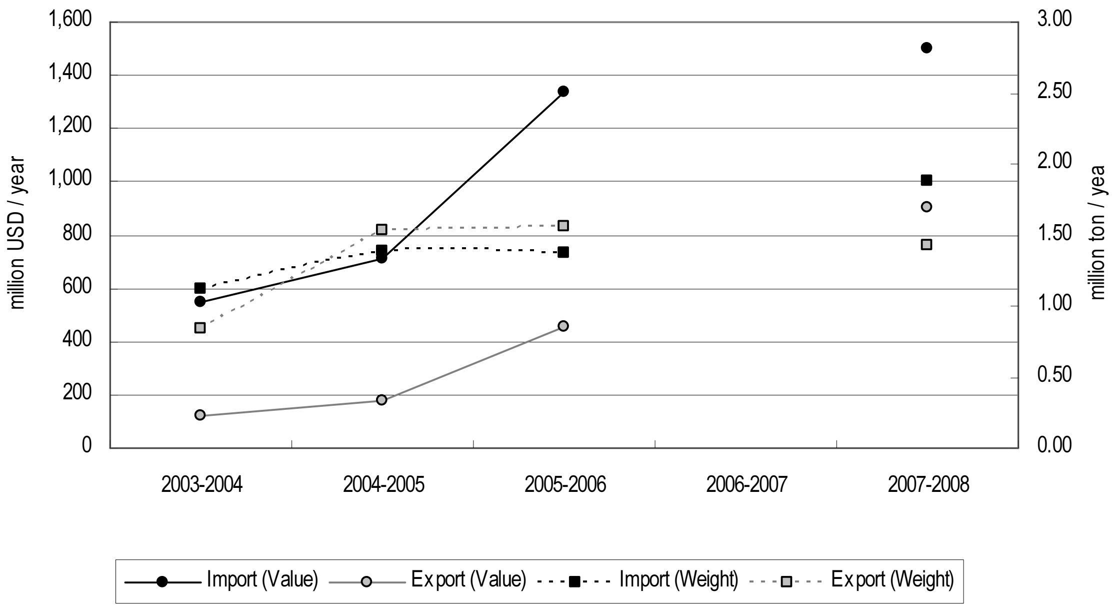
CHAPTER 2 CURRENT LOGISTICS IN VIENTIANE

2.1 Current Logistics in Vientiane

2.1.1 Volume and Movements

(1) Trade Volume and Movements in Lao PDR

Section 4.3 of the Lao National Logistics Strategy documents the current features of the trade in Lao PDR. Figure 2.1.1 shows annual import and export volumes in Lao PDR over the past 5 years in terms of both weight and monetary value. The trade in Lao PDR is increasing and in the last few years, export and import volumes have remained almost the same while the import value has been observed to be 2-3 times larger than export value.



Note: 2006/07 data is blank because data from Oct. 2006 to Sep. 2007 are missing.

Source: C2000 Database

Figure 2.1.1 2002-2008 Import/Export Volumes

The following table shows trade volume by origin/destination country in 2007/08. The trade in Lao PDR is dominated by trade with surrounding GMS countries, showing some 90% of the trade in Lao PDR are to/from other GMS countries in both volume and value terms.

Table 2.1.1 2007/08 Trade Volumes to/from Lao PDR

Category		GMS Country	Outside GMS	Total (All Country)	Share of GMS
Volume in million tons / year	Imports to Lao PDR	1.82	0.10	1.92	95.0%
	Exports from Lao PDR	1.41	0.02	1.43	98.9%
	Transit (from)	0.11	0.01	0.12	92.0%
Volume in million USD / year	Imports to Lao PDR	1,291	207	1,498	86.2%
	Exports from Lao PDR	822	78	900	91.3%
	Transit (from)	86	118	204	42.0%

Note1: GMS Countries include Vietnam, Thailand, Cambodia and whole China (PRC).

Note2: Exports to the outside of the GMS are dominated by gold (48.4 million USD), coffee (18.2 million USD) and refined copper (8.6 million USD).

Note3: Transit cargo from outside the GMS is dominated by cigarettes from Indonesia (81.3 million USD), ethyl alcohol or spirits (25.6 million USD) from Singapore at customs in Savannakhet.

Source: C2000 Database (Oct. 2007 – Sep. 2008)

Table 2.1.2 shows trade matrix within GMS countries in 2007/08. As seen in the table, import and export volumes in Lao PDR are dominated by Thailand. Major transit cargo through Lao PDR is from Thailand to Vietnam, however the volume of the transit cargo is observed to be relatively smaller than that of export/import cargo to/from Lao PDR.

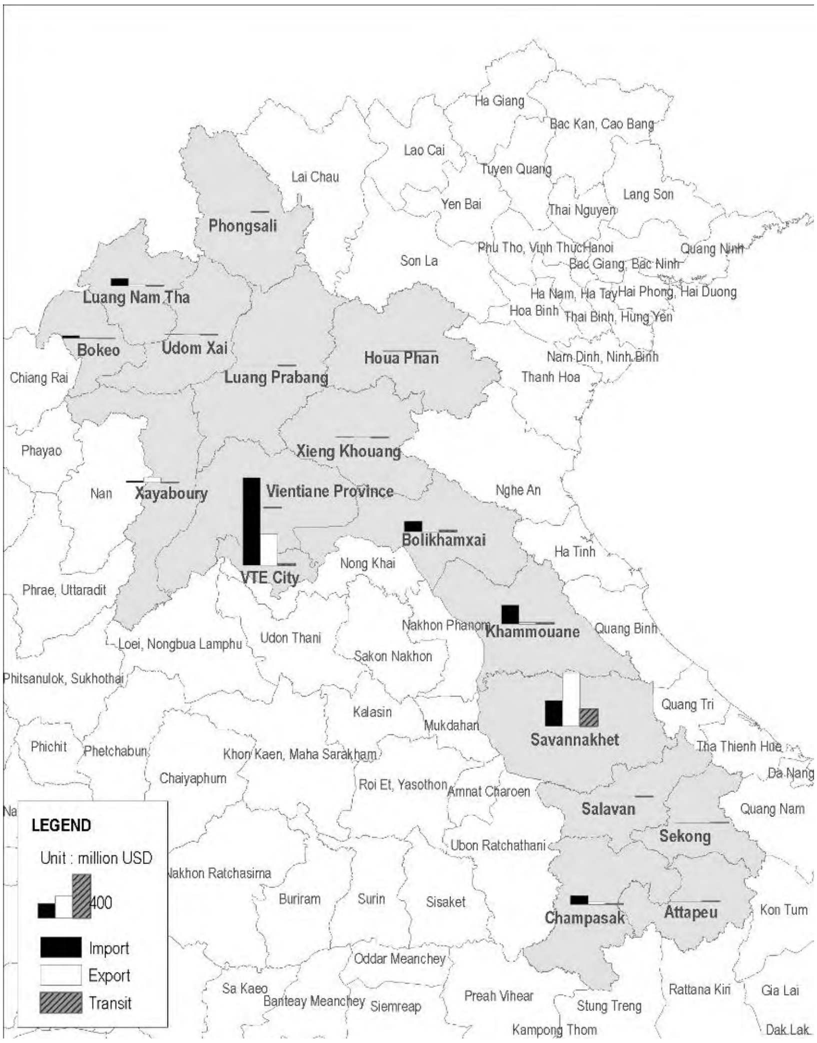
Table 2.1.2 2007/08 Trade in GMS to/from Lao PDR

Unit: USD million

	LAO PDR	VIETNAM	THAILAND	CAMBODIA	CHINA (PRC)	TOTAL
LAO PDR		98.7	476.8		14.7	590.2
VIETNAM	80.5		14.6			95.1
THAILAND	1091.4	184.8			1.2	1277.4
CAMBODIA			0.1			0.1
CHINA (PRC)	118.3		3.4			121.7
TOTAL	1290.2	283.5	494.9	0	15.9	2084.5

Source: C2000 Database (Oct. 2007 – Sep. 2008)

Figure 2.1.2 shows monetary trade volume in 2007/08 by province. 53% of import volume in Lao PDR was concentrated at customs in Vientiane Capital while 53% of export volume was concentrated at customs in Savannakhet.



Source: Prepared by JICA Study Team based on C2000 Database (Oct. 2007 – Sep. 2008)

Figure 2.1.2 2007/08 Trade Volumes by Province

(2) Trade Volume and Movements in Vientiane

Table 2.1.3 shows import tonnage by custom in Vientiane Capital in 2007/08. Almost all commodities, except petroleum, were through Thanaleng or Lao-Thai Friendship Bridge customs and share of Thanaleng was 23% of import cargo in Vientiane Capital.

As regards export cargo in Vientiane Capital, Lao-Thai Friendship Bridge and Wattay International Airport customs took up almost 100% of the export cargo; 99.9% of export cargo in weight through Lao-Thai Friendship Bridge customs, and 54.0% of export cargo in price through Wattay International Airport.

Table 2.1.3 2007/08 Import Volumes by Customs in Vientiane Capital

Unit: 1,000 tons / Year

Commodity Type	Thanaleng		Wattay International Airport		Lao-Thai Friendship Bridge		Other Customs in Vientiane Capital	
1) Rice & Cereals	4.7	(12.0%)	0.0	(0.0%)	34.4	(87.8%)	0.1	(0.2%)
2) Animal Products	5.1	(12.4%)	0.0	(0.0%)	36.2	(87.3%)	0.1	(0.3%)
3) Sugar & Sugar Confectionary	13.1	(77.9%)	0.0	(0.0%)	3.7	(22.1%)	0.0	(0.0%)
4) Fruits & Vegetables	0.2	(1.5%)	0.0	(0.0%)	9.6	(95.4%)	0.3	(3.1%)
5) Animal Feed & Fertilizers	21.2	(74.9%)	0.0	(0.0%)	7.1	(24.9%)	0.1	(0.2%)
6) Mineral & Construction Material	59.3	(39.0%)	0.0	(0.0%)	92.6	(61.0%)	0.0	(0.0%)
7) Chemical & Plastic & Industrial Material	45.5	(26.4%)	0.2	(0.1%)	126.6	(73.4%)	0.1	(0.1%)
8) Manufactured Goods	54.6	(32.2%)	2.2	(1.3%)	112.0	(66.2%)	0.5	(0.3%)
9) Petroleum	0.2	(0.1%)	0.0	(0.0%)	25.8	(9.5%)	245.2	(90.4%)
10) Woods Products	8.8	(55.0%)	0.0	(0.1%)	7.2	(44.7%)	0.0	(0.2%)
Total	212.6	(23.2%)	2.5	(0.3%)	455.0	(49.6%)	246.5	(26.9%)

Source: C2000 Database (Oct. 2007 – Sep. 2008)

Table 2.1.4 2007/08 Export Volumes by Customs in Vientiane Capital

Unit: 1,000 tons / Year

Commodity Type	Thanaleng		Wattay International Airport		Lao-Thai Friendship Bridge		Other Customs in Vientiane Capital	
1) Rice & Cereals	0.0	(0.0%)	0.00	(0.2%)	1.0	(99.8%)	0.0	(0.0%)
2) Animal Products	0.0	(0.0%)	0.01	(2.6%)	0.3	(97.4%)	0.0	(0.0%)
3) Sugar & Sugar Confectionary	0.0	-	0.00	-	0.0	-	0.0	-
4) Fruits & Vegetables	0.0	(0.0%)	0.02	(0.6%)	4.1	(99.4%)	0.0	(0.0%)
5) Animal Feed & Fertilizers	0.0	(0.0%)	0.00	(0.0%)	0.7	(100%)	0.0	(0.0%)
6) Mineral & Construction Material	0.0	(0.0%)	0.00	(0.0%)	48.3	(100%)	0.0	(0.0%)
7) Chemical & Plastic & Industrial Material	0.0	(0.0%)	0.00	(0.0%)	0.1	(100%	0.0	(0.0%)
8) Manufactured Goods	0.0	(0.0%)	0.01	(0.1%)	11.5	(99.9%)	0.0	(0.0%)
9) Petroleum	0.0	-	0.00	-	0.0	-	0.0	-
10) Woods Products	0.0	(0.0%)	0.00	(0.0%)	43.3	(100%)	0.0	(0.0%)
Total	0.0	(0.0%)	0.04	(0.0%)	109.2	(100%)	0.0	(0.0%)

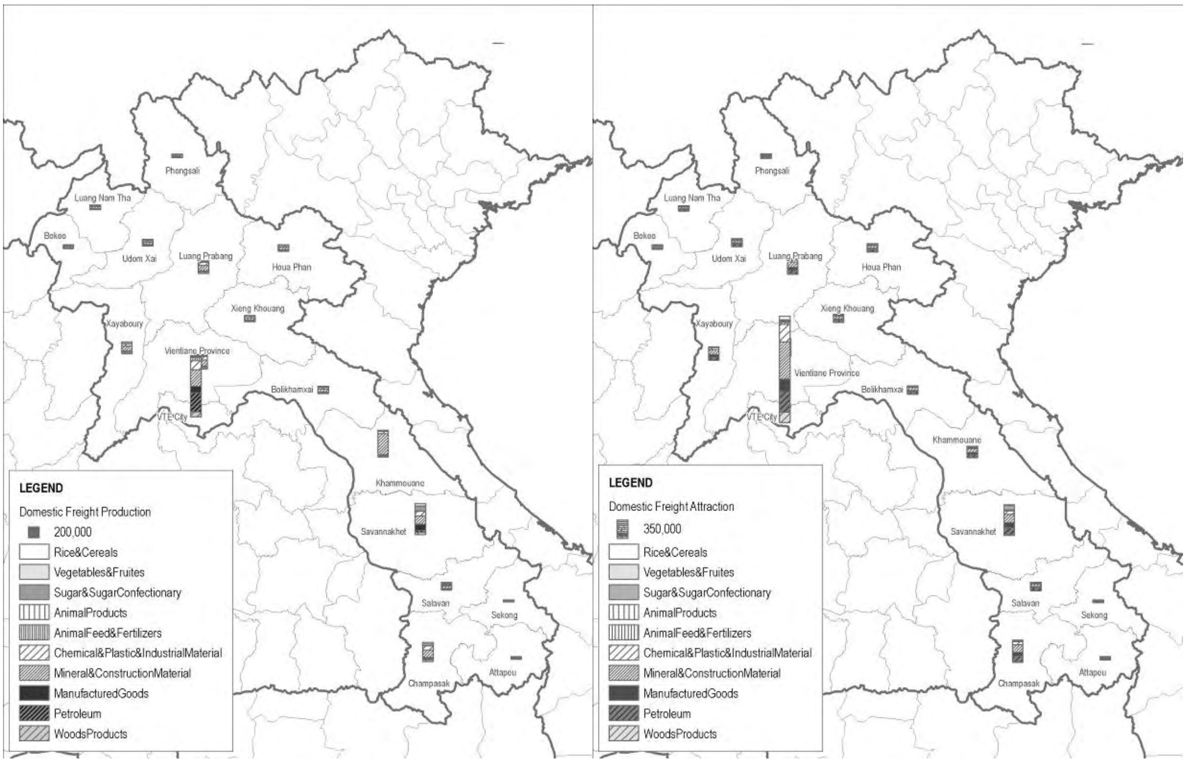
Source: C2000 Database (Oct. 2007 – Sep. 2008)

(3) Volume and Movements of Domestic Cargo in Vientiane

There wasn't any numerical evidence pertaining to the domestic cargo in/between region(s) until this Study completed its analysis. The comprehensive freight demand forecast model for export and import cargo was developed in this Study, using the results of the roadside interview survey, traffic count survey and the secondary data and information such as transport statistics. Figures 2.1.3 and 2.1.4 show the freight generation/attraction and distribution of the domestic cargo.

Looking at the freight generation and attraction in Vientiane Capital, the volume of freight generation is dominated by minerals, petroleum and consumable goods and was estimated to reach 521,000 tons per year. On the other hand, the freight attraction is dominated by minerals and industrial products and is expected to reach 894,000 tons per year in 2009.

As regards freight distribution in Vientiane Capital, figure 2.1.4 shows that more freight is delivered from the major cities, such as Savannakhet and Pakse to Vientiane Capital, compared to the volume that is delivered from Vientiane Capital. Moreover, the trade volume between Vientiane Capital and Thailand is estimated to exceed the volume of the domestic cargo between Vientiane Capital and other provinces.



Source: JICA Study Team

Figure 2.1.3 Estimated Domestic Freight Production (left) and Attraction (right) in 2009

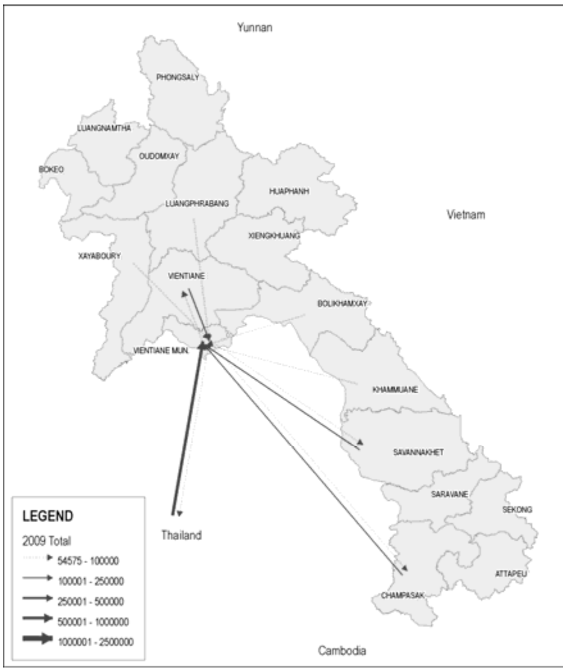


Figure 2.1.4 Estimated Freight Distribution in 2009

(4) Other Features – Empty Truck Ratio and Packing Type.

Table 2.1.5 shows empty truck ratio by international cross-border point and domestic category. At the Lao-Thai Friendship Bridge and Savannakhet customs, 95% of outbound trucks (from Lao PDR to Thailand) are empty at both cross-border points while 15.8% and 21.5% of inbound trucks (from Thailand to Lao PDR) are empty at Lao-Thai Friendship Bridge and Savannakhet customs respectively.

Table 2.1.5 Empty Truck Ratio

		2 axles	3 Axles and more	Trailer	Total
Lao-Thai Friendship Bridge	inbound (Import)	19.7%	9.1%	16.2%	15.8%
	outbound (Export)	99.2%	91.3%	88.1%	94.5%
Savannakhet customs	inbound (Import)	16.8%	10.6%	30.7%	21.5%
	outbound (Export)	94.6%	98.1%	87.6%	94.5%
Van Tao customs	inbound (Import)	40.2%	38.7%	70.0%	47.1%
	outbound (Export)	7.5%	14.9%	14.3%	12.8%
Domestic	Weekday	41.5%	33.2%	50.6%	40.8%
	Holiday	49.3%	35.8%	48.7%	47.1%

Note: Empty truck ratio in Japan is about 30% in 2006 (2006) and 37% in PRC in 2002 (2002).

Source: JICA Study Team

Figure 2.1.5 shows composition of package type by commodity-type with the number of trucks expanded to three weekday volume. Share of truck carrying containers is about 8%, and 53% of containers are 40ft containers as shown in the figure.

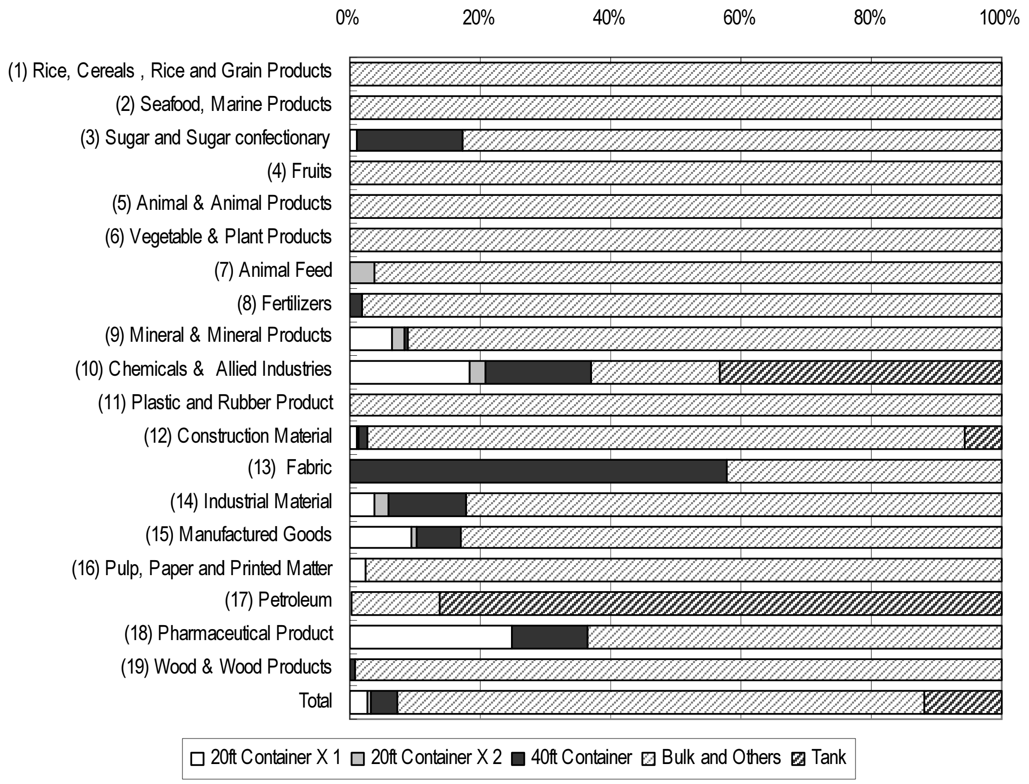


Figure 2.1.5 Type of Packaging by Commodity (Vehicles / three weekday)

2.1.2 Logistics Features in Vientiane

The previous section reveals current features of the trade in the GMS countries and indicates that trade in Lao PDR is heavily dominated by trade-relationship between Thailand and Lao PDR. Also, it indicates that there are two major customs facilities in Vientiane Capital: Thanaleng Warehouse and Friendship Bridge customs (It should be noted that at Lao-Thai Friendship Bridge customs, physical inspection for customs clearance is done at individual factories/warehouses). The following discussion details the current trade relationship between Thailand and Lao PDR and identifies the potential users and cargo of the proposed VLP.

(1) Commodity-wise Import/Export Cargo at Vientiane Customs

First of all, the kind of commodities to be handled at the VLP are discussed. Table 2.1.6 compares the volumes of cargo imported at the Friendship Bridge and Thanaleng Warehouse: it indicates that there is no significant difference in terms of proportions of the commodities handled at both facilities. This means that the VLP will, by large and small, handle all kinds of commodities. Looking at the cargo imported at Thanaleng Warehouse, the table also indicates that major commodities to be handled at the VLP include construction materials, industrial materials and manufactured goods, when the existing warehouse is converted into the VLP. Petroleum can also become a major commodity at the VLP, since petroleum will be transported by the new railway, directly connecting to the VLP. It should be noted that the remaining import cargo through the Friendship Bridge, of which the customs procedures is not done at the Thanaleng Warehouse, are directly transported to the individual warehouse/factory/company by clearing the import procedures at the Friendship Bridge.

As discussed before, the volume of export cargo from Vientiane is relatively small, compared to that of import cargo (see the details in Table 2.1.6). Only heavy bulk cargo such as minerals and wood are major export cargo. Besides, existing Thanaleng Warehouse does not handle any export cargo and customs procedures for all the export cargo are currently done at individual factories/warehouses, when necessary (for instance, container cargo requires to be sealed). However, the new VLP will also handle export cargo since heavy bulk cargo will be transported by the new railway through the VLP.

Table 2.1.6 2007/08 Import Volumes through Friendship Bridge and Thanaleng Warehouse

Commodity Type	All imports through Friendship Bridge (000 tons/year)			Imports cleared at Thanaleng Warehouse (000 tons/year)	
		including Petrol	excluding Petrol		
1) Rice & Cereals	39	4.3%	6.1%	5	2.2%
2) Animal Products	41	4.5%	6.4%	5	2.4%
3) Sugar & Sugar Confectionary	17	1.8%	2.6%	13	6.1%
4) Fruits & Vegetables	10	1.1%	1.6%	0	0.1%
5) Animal Feed & Fertilizers	28	3.1%	4.4%	21	10.0%
6) Mineral & Construction Material	152	16.6%	23.5%	59	27.9%
7) Chemical & Plastic & Industrial Material	172	18.8%	26.7%	45	21.4%
8) Manufactured Goods	169	18.5%	26.2%	55	25.7%
9) Petroleum	271	29.6%	-	0	0.1%
10) Woods Products	16	1.8%	2.5%	9	4.2%
Total	917	100.0%	100.0%	213	100.0%

Source: JICA Study Team

(2) Destinations of Import/Export Cargo in Vientiane

The customers who would use the VLP are discussed next. Table 2.1.7 shows the volumes of import and export cargo crossing the Friendship Bridge based on the result of the roadside interview survey conducted by the Study Team. It indicates that around 2/3 of the cargo is generated from or transferred to individual factories while the major destination for cargo to be handled at VLP will be factories and industrial parks in/around Vientiane Capital.

Table 2.1.7 Trucks observed at Friendship Bridge and Thanaleng Warehouse

Facility Type	Freight Volume (tons/day)	Composition
Factory / Industrial Park	1,264	68%
Market / Wholesale market / Office	2	0%
Mining Place	192	10%
Seaport / River Port	115	6%
Truck Terminal	21	1%
Warehouse/ Silo / Store place	259	14%
Total	1,853	100%

Source: JICA Study Team

(3) Types of Vehicles Carrying Import/Export Cargo in Vientiane

The question as to which customers would use the VLP can also be answerable by classifying types of vehicles carrying cargo at the customs. Table 2.1.8, prepared from the results of roadside interview survey and freight generation survey by the Study Team, shows the number of truck per day observed at Friendship Bridge and Thanaleng Warehouse. Comparing the composition of truck type (excluding light trucks and tankers), the trucks observed at the Thanaleng Warehouse tend to be smaller than those at Friendship Bridge. For instance, the share of trailers, carrying container cargo in general, at Thanaleng Warehouse is half of that at Friendship Bridge. It can be concluded that smaller factories/warehouses tend to use the existing Thanaleng Warehouse while larger factories/warehouses are provided customs service separately.

Table 2.1.8 Trucks observed at Friendship Bridge and Thanaleng Warehouse

Vehicle Type	All trucks observed at Friendship Bridge (trucks /day)			Trucks observed at Thanaleng Warehouse (trucks /day)		
		All	excluding (1) and (7)		All	excluding (1) and (7)
(1) 2 Axles Truck (Light)	371	36.6%	-	6	3.0%	-
(2) 2 Axles Truck (Heavy)	69	6.8%	13%	30	15.0%	16%
(3) 3 Axles Truck	84	8.3%	16%	73	36.5%	38%
(4) 4 Axles Truck	20	2.0%	4%	18	9.0%	9%
(5) Dump Truck	4	0.4%	1%	0	0.0%	0%
(6) Articulated Truck	114	11.2%	22%	26	13.0%	13%
(7) Tanker	121	11.9%	-	1	0.5%	-
(8) Trailer	231	22.8%	44%	46	23.0%	24%
Total	1014	100.0%	100.0%	200	100.0%	100.0%

Source: JICA Study Team

2.1.3 Existing Cross-Border Facility

(1) Current Operation

Vientiane has an inland container depot (ICD), which used to be managed by Lao-Thai joint-venture company: the management was transferred to a state enterprise under Ministry of Finance whose contract is due to expire. The state enterprise is called “Vientiane Public Warehouse Enterprise” (hereinafter referred to as “the existing ICD”) in 2007. Vientiane ICD was directly managed by the Ministry of Industry and Commerce before 1992.

The existing ICD has an area of approximately 6.0 ha, which consists of 3.5 ha of administration, cargo handling yard, warehouse, bonded warehouse and weight station, and 2.5 ha of waiting truck parking lots and Imported car storage area. The 2.5 ha area was added as part of a recent expansion in response to an increase in demand of imported cars. The facilities have 3 cranes, 12 forklifts and 2 weight stations.

The working hours of the existing ICD are 8 hours a day from 8:30 am to 4:30 pm, while Friendship Bridge is open from 6:00 am to 10:00pm. The existing ICD will extend working hours up to 10:00 p.m. at the end of this year. Freight handling after 5:00 pm is subjected to an overtime bill. Before the opening hour, the trucks that arrive at ICD wait for it to be opened in the parking lot at ICD.

On average, approximately 130 trucks a day use the existing ICD for custom clearance, warehousing, sorting and trans-shipment between Lao trucks and Thai trucks. Most cargo packed is general cargo and construction materials and electronics from Thailand. Capacity of ICD ranges from 200 to 300 trucks per day. The existing ICD gives Free Time that lasts for only one day: storage fees are charged when freight is held for over one day.

The existing ICD deals with only import cargo, but no export cargo. Out of the 255,000 tons/year of the total import cargo in 2008, approximately 61% of the cargo is general cargo, 32 % is heavy bulk cargo and only 7% is Container cargo as shown in Table 2.1.9.

Table 2.1.9 Estimated Import Cargo Volume at Thanaleng ICD (2008)

Packing Type	Unit	Import	Export	Total	Remarks
Heavy Bulk	Tons/year	81,726	0	81,726	
General Cargo	Tons/year	155,971	0	155,971	
Container	Tons/year	17,211	0	17,211	
Total	Tons/year	254,908	0	254,908	

Source: JICA Study Team

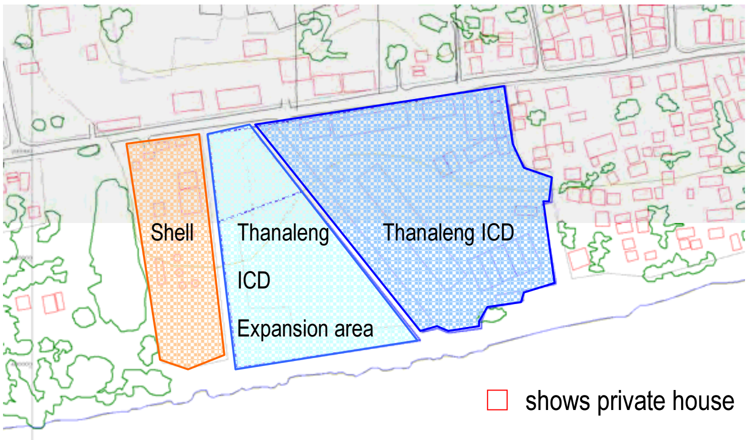
Source: JICA Study Team

Figure 2.1.6 Layout of Existing Private ICD at Thanaleng

(2) Problems of the Existing ICD

1) Space

This year, Thanaleng ICD expanded to 6 ha from 3.5ha to create space for parking lots of waiting trucks and imported car storage; however, the space is still insufficient. As much as it is insufficient, there isn't any more space to allow further expansion: the surrounding area is densely built-up with Shell oil tanks in the west and private houses in the east and north.



Source: JICA Study Team

Figure 2.1.7 Map of Thanaleng ICD and Surrounding Area

2) Facilities

The existing ICD has 2 types of floors in the Freight Station (FS): high and low floors. In-coming/out-going traffic flows overlap because ICD has only 1 gate.

The low floor of FS is observed to have little cargo, while the high floor of the FS is filled with cargo. The low floor has an approximate 1.2m gap between load/unloading platform and the ground, such that it is inefficient in operation of cargo while operation of heavy cargo is dangerous for workers. These seem to be the reasons for low occupancy/ operation of the low floor of the FS. In addition, the low floor of FS has no walls, such that there is a high risk of cargo pilferage.

Figure 2.1.8 shows heavy bulk cargo at the low floor of the FS.

Source: JICA Study Team

Figure 2.1.8 Heavy Bulk Cargo at Low Floor FS

3) Operation

Operation at the existing ICD depends on man-power without using any machines such as forklifts. Accordingly, the existing ICD needs to employ a lot of workers. Since the existing ICD operates on ad hoc basis without any schedule of operation, the workers have to wait until the cargo arrives. This results in a difference between working hours and on-duty hours. Figure 2.1.9 shows a scene of loading operation at the existing ICD.

Source: JICA Study Team

Figure 2.1.9 Scene of Loading Operation at Thanaleng ICD

4) Handling Capacity

The current handling volume at the Thanaleng Warehouse already exceeds its capacity. According to the interview with officials of the Thanaleng Warehouse, the Thanaleng Warehouse can accommodate at most 200-250 heavy vehicles per day. To confirm this, the traffic count survey was conducted in May 2010 for five consecutive weekdays by the Study Team and 203 heavy vehicles per day were observed during the survey period. This oversaturated traffic contributes to the delays in the off-loading and loading operations, lack of warehouse area, delays in the customs procedure, increase in the waiting time, and as a result, high transport costs and unreliable transport service in Thanaleng Warehouse.

(3) Current Tariff

Table 2.1.10 indicates current tariffs at the existing ICD.

Table 2.1.10 Thanaleng Warehouse Tariffs

No.	Detail	Calculation Unit	Unit price (Kip)
1	General goods and Cars parking fees		
1.1	Fee rate (inside warehouse) for General goods		
	# From 01 – 15 days		
	- Calculated by weight	ton/day	230
	- Calculated by volume	m^3/day	190
	- Calculated by area	m^2/day	300
	# From 16 – 30 days		
	- Calculated by weight	ton/day	280
	- Calculated by volume	m^3/day	230
	- Calculated by area	m^2/day	380
	# >> 01 month		

No.	Detail	Calculation Unit	Unit price (Kip)
	- Calculated by weight	ton/day	380
	- Calculated by volume	m^3/day	280
	- Calculated by area	m^2/day	450
1.2	Fee rate (outside warehouse) for General goods		
	# From 01 – 15 days		
	- Calculated by weight	ton/day	220
	- Calculated by volume	m^3/day	180
	- Calculated by area	m^2/day	270
	# From 16 – 30 days		
	- Calculated by weight	ton/day	270
	- Calculated by volume	m^3/day	220
	- Calculated by area	m^2/day	310
	# >> 01 month		
	- Calculated by weight	ton/day	310
	- Calculated by volume	m^3/day	270
	- Calculated by area	m^2/day	380
1.3	Refer Container Rate		
	- Calculated by room	room/day	249,000
	- Calculated by hour	hour	16,000
1.4	Parking Rate (outside warehouse) and 50% added to (indoors)		
	# From 01 – 15 days		
	- Motorcycle, Tricycle and Farming Tricycle	unit/day	1,800
	- Sedan, Pick up, Van << 2,500kg	unit/day	7,500
	- Truck 6 wheels, 10 wheels or truck 2,501 – 10,000 kg	unit/day	9,000
	- Truck 12 wheels truck 10,001 – 15,000 kg	unit/day	11,000
	- All kinds of Truck >>15,001 kg	unit/day	13,000
	# From 16 – 30 days		
	- Motorcycle, Tricycle, Farming Tricycle	unit/day	2,500
	- Sedan, Pick up, Van << 2,500kg	unit/day	9,000
	- Truck 6 wheels, 10 wheels or truck 2,501 – 10,000 kg	unit/day	11,000
	- Truck 12 wheels truck 10,001 – 15,000 kg	unit/day	13,000
	- All kinds of Truck >>15,001 kg	unit/day	16,000
	# >> 01 month		
	- Motorcycle, Tricycle and Farming Tricycle	unit/day	3,500
	- Sedan, Pick up, Van << 2,500kg	unit/day	13,500
	- Truck 6 wheels, 10 wheels or truck 2,501 – 10,000 kg	unit/day	17,000
	- Truck 12 wheels truck 10,001 – 15,000 kg	unit/day	20,000
	- All kinds of Truck >>15,001 kg	unit/day	24,000
1.5	Motor Engine Rate		
	# From 01 – 15 days		
	- Motor Engine << 4 V	unit/day	1,700
	- Motor Engine >> 4 V	unit/day	2,000
	# From 16 – 30 days		
	- Motor Engine << 4 V	unit/day	2,000
	- Motor Engine >> 4 V	unit/day	2,300
	# >> 01 month		
	- Motor Engine << 4 V	unit/day	2,200
	- Motor Engine >> 4 V	unit/day	2,700
2	Warehouse transit, weigh rate		
2.1	Transit rate		

No.	Detail	Calculation Unit	Unit price (Kip)
	- Motorcycle, Tricycle, Farming Tricycle		600
	- Sedan, Pick up, Van		3,000
	- Truck 6 wheels, 10 wheels		12,000
	- Truck 12 wheels, Trailer >>10,001 kg		17,000
2.2	Weigh rate		
	- by goods and car weight	ton	400
3	Lifting by worker and Forklift rate		
3.1	Worker		
	# Calculated by weight		
	+ Calculated by Volume		
	- Pick up (lift up or down)	unit	22,000
	- Truck 6 wheels (lift up or down)	unit	48,000
	- Truck 10 wheels (lift up or down)	unit	64,000
	- Truck 12 wheels (lift up or down)	unit	85,000
	- Trailer (lift up or down)	unit	120,000
3.2	Forklift rate		
	3.2.1 Forklift 3 - 5 tons rate		
	+ Calculated by weight	ton	5,700
	+ Calculated by Volume		
	- General Pick up (lift up or down)	unit	42,000
	- Truck 6 wheels (lift up or down)	unit	72,000
	- Truck 10 wheels (lift up or down)	unit	84,000
	- Truck 12 wheels (lift up or down)	unit	111,000
	- Trailer (lift up or down)	unit	140,000
	3.2.3 Lifting Motor Engine by using forklift 3 - 5 tons		
	- Motor Engine << 4 V	unit	5,500
	- Motor Engine >> 4 V	unit	7,600
	3.2.4 Lifting by using Crane		
	# Using Crane 20 – 25 tons		
	+ Calculated by weight	ton	9,500
	+ Calculated by Volume		
	- Truck 6 wheels (lift up or down)	unit	76,000
	- Truck 10 wheels (lift up or down)	unit	93,000
	- Truck 12 wheels (lift up or down)	unit	123,000
	- Trailer (lift up or down)	unit	198,000
	3.2.5 Lifting by using Crane 50 tons		
	- Calculated by weight	ton	24,000
4	The Calculation on goods imported from abroad by US Currency		(US$)
4.1	Transit at the transit port or from truck to truck		
	- Truck weight 8.1 – 15 Tons	car	52.00
4.2	Warehouse transit fee		
	- Truck 12 wheels	times/unit	6.41

Source: Ministry of Industry and Commerce

2.2 Overview of Socio-economic Characteristics in Vientiane

Vientiane Capital is the center of economic activities, administration and culture in Lao PDR and has approximately 740,000 persons, as per population figures in 2008, within 3,920 m^2 of administrative boundary.

Population has steadily increased of recent with a growth rate of more than 3% per year and it is expected reach 1.4 million persons in 2025.

Table 2.2.1 Population Changes in Vientiane Capital

Year	Population		Share (%)	Population Density (persons/km²)	
	Whole Country	Vientiane Capital		Whole Country	Vientiane Capital
1985	3,618	381	10.5	15.3	97.2
1995	4,605	532	11.5	19.4	135.7
2005	5,622	698	12.4	23.7	178.1
2006	5,748	712	12.4	24.3	181.6
2007	5,874	726	12.4	24.8	185.2
2008	6,000	740	12.3	25.3	188.8

Note: The year s1985, 1995, 2005 are census years.

Source Statistical Yearbook in 1975-2005 and each year

Table 2.2.2 Population by District in Vientiane Capital

District	Population		Urban Population		Urban Population Ratio (%)		Urban Village Ratio (%)	
Year	1995	2005	1995	2005	1995	2005	1995	2005
Chanthabuly	58,855	68,858	57,740	68,858	98	100	97	100
Sikhottabong	74,251	99,908	64,639	84,598	87	85	78	80
Xaysetha	75,255	97,514	55,333	97,514	74	100	57	100
Sisattanak	58,178	68,686	55,724	68,686	96	100	95	100
Naxaithong	44,104	58,368	19,312	56,204	44	96	36	90
Xaythany	97,829	150,793	38,429	125,195	39	83	26	63
Hadxaifong	64,962	78,338	32,961	60,949	51	78	42	67
Sangthong	16,728	24,215	1,771	1,787	11	7	3	3
Mayparkngum	33,945	45,041	4,889	5,938	14	13	9	8
Vientiane Capital	524,107	691,721	330,798	569,729	63	82	46	68

Source: Census data in 1995 and 2005

On the other hand, economic growth in Vientiane Capital is currently remarkable. The size of Economy in Vientiane is 10,500 billion Kips, which accounts for 28% of GDP of whole country. Growth rate of GRDP in Vientiane Capital was recorded at 9.8 % on average between 2001 to 2005. According to the Vientiane Capital, the proportions of primary, secondary and tertiary industry are 23%, 52% and 25%, respectively.

Income level in Vientiane is thus 1.7 times as high as the national average on a GRDP per capita basis. Vientiane economy has been based on service and limited industry. However, it is expected to shift to service and manufacturing based economy by industrial developments such as the Vientiane Industrial park (VIP) development.

2.3 Spatial and Physical Conditions

2.3.1 Overview of Vientiane

(1) Current Land Use

Vientiane traditionally developed as a city along Mekong River with large fertile plain lands in its hinterland. The origin of Vientiane is the bank of the Mekong River in front of Don Chang Island, where it still performs as downtown and city center of Vientiane with a concentration of business and commercial activities.

The urban structure of Vientiane is based on 3 main truck roads, namely: Tadua Road (Wattay International Airport to Sangthong District), inner ring road, and Lang Xan Avenue to NR-13 (President house – Tat Luang – Doean Nueang). Urban central functions such as administration, banking, business and commerce are concentrated in the downtown areas along Luangprabang Avenue and Lang Xan Avenue. The urbanized area currently spreads over to the northern and western directions and then to the areas along NR-1, inner ring road and NR-13 up to Doean Nueang. The areas around these urbanized areas and urbanizing areas are less densely populated and built-up.

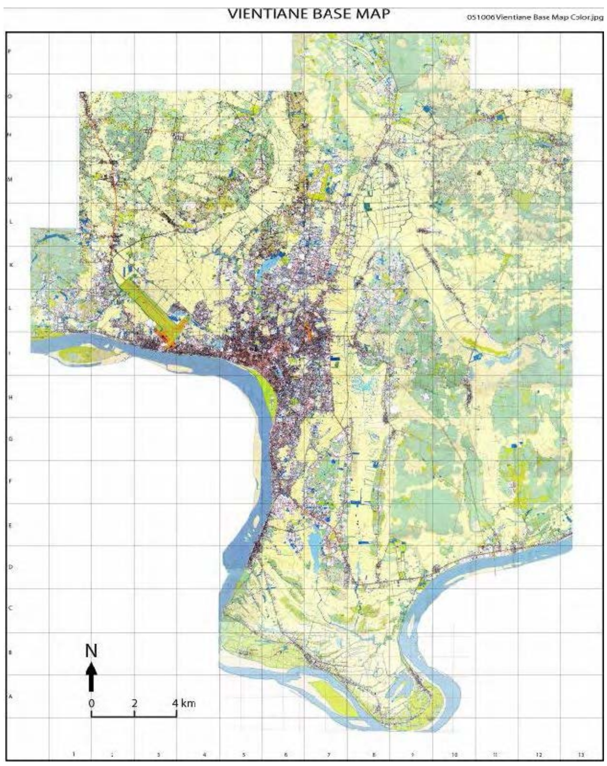
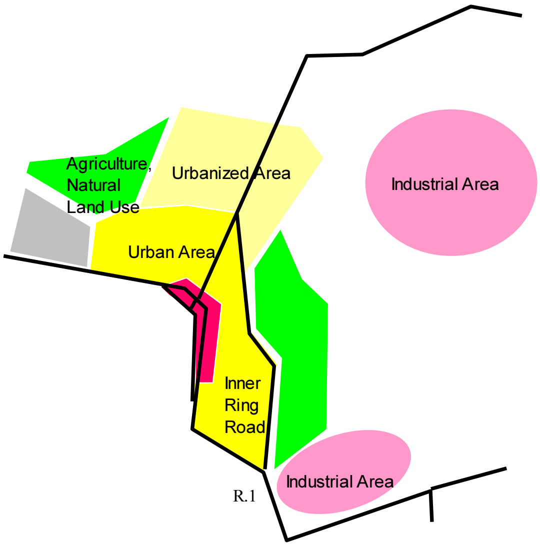


Figure 2.3.1 Current Land Use of Vientiane

(2) Transport Network

Urban road network is developed to form ring and radius systems. The radius system is formed by NO1, NR-13N and NR-13S, Fa Ngum Road and Settha Thirat (Luangprabang) road. As for the ring system, the inner ring road is developed to connect NR-1 and NR-13 through approximately 5 km radius area. The newly developed “450 Years Road” functions as an outer ring road, connecting NR-1 at Thanaleng and NR-13S at Vangkao Village through Dongphosy and Xaisettha areas. This outer ring road will be an edge of the urbanized area. In addition, the railway extension project from Thanaleng to Vientiane is now in its design stage.



Source: JICA Study Team

Figure 2.3.2 Road Network Concept

2.3.2 Thanaleng Area

Vientiane Logistics Park (VLP) will be an inter-modal transport facility, such that the location of VLP will be selected in a certain place along the railway; hence the area around Thanaleng station. This section focuses on the current physical conditions of Thanaleng area.

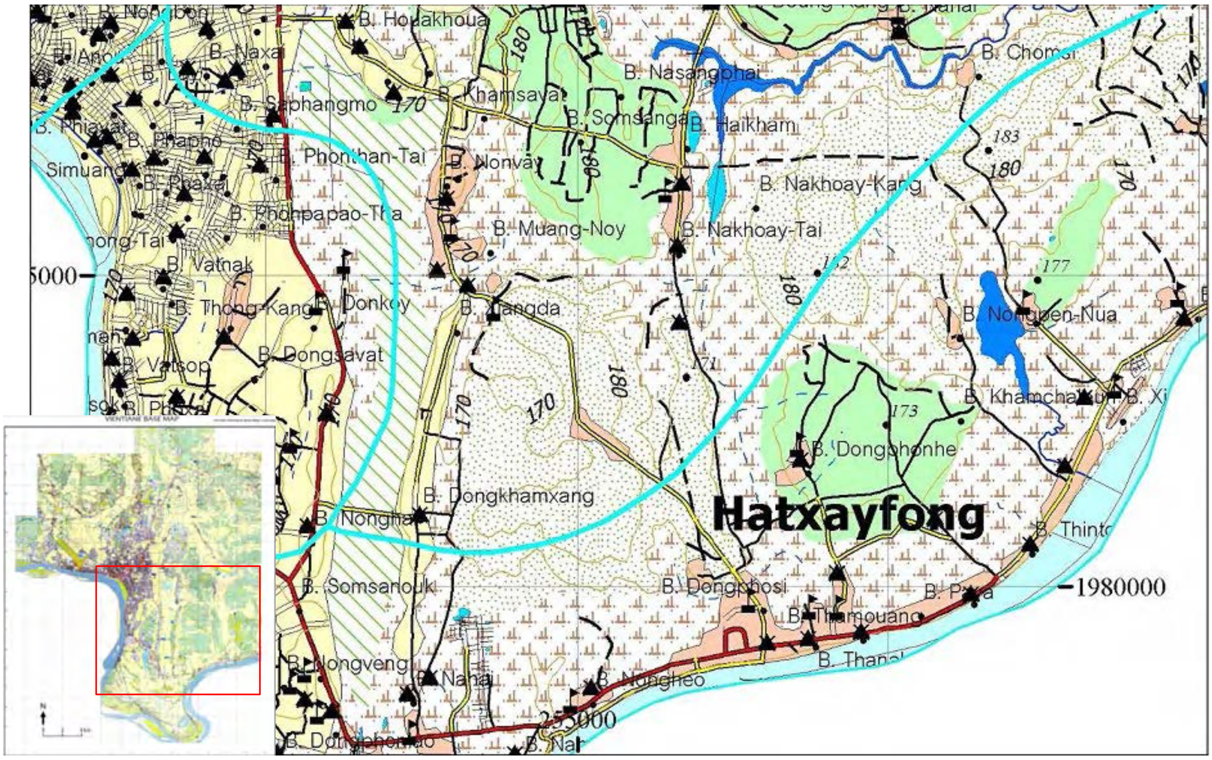
(1) Administrative Boundary

Lao PDR has Provinces, Districts and Villages as administrative units. The Province governs broad areas, while District is a local administrative unit in Lao PDR. The Village is a traditional neighborhood unit in Lao PDR which normally has a district branch office. In this regard, Vientiane Capital Province, which is normally referred to as Vientiane Capital, is divided into 9 districts.

Thanaleng area is the area around Xaisettha District and Hadxaifong District.

(2) Natural Conditions and Land Use

Thanaleng area is a flat land along riverbank of Mekong River: lower flat land spread over in the southern part of Thanaleng area faces the Mekong River. The land generally gradually elevates to a terrace in the north. Lower flat land is well cultivated as paddy field. Paddy fields act as retention areas. Villages are scattered on terrace or highland areas to avoid inundation in the rainy season as well as to cultivate up-land crops and tree crops. Dongphosy forest, which is located near Mekong River, is designated as Reserve Forest.



Source: JICA Study Team

Figure 2.3.3 Natural Conditions of Thanaleng Area

(3) Social Conditions

Thanaleng area is currently an urbanizing area.

Currently, Xaisettha District has a population of approximately 58,000 persons with 52 villages, while Hadxaifong District has approximately 68,000 persons with 60 villages. Xaisettha District's urban village ratio increased from 57 % in 1996 to 100% in 2006, while that of Hadxaifong District increased from 42% in 1996 to 67% in 2006.

Dongphosy Forest Reserve is located in Nakhay Tai Village of Xaisettha District and Dongphosy Village of Hadxaifong District. The populations of Nakhay Tai Village and Hadxaifong Village are approximately 1,680 persons and 2,230 persons, respectively. Villagers are mostly farmers who engage mainly in paddy field cultivation; however, non-farming workers commuting to Vientiane are gradually increasing within this area.

(4) Transport Network

Thanaleng area has the NR-1 passing through it in an east-west direction in its southern part as the main trunk road with the Friendship Bridge across Mekong River. However, there isn't any trunk road that passes through the area in a north-south direction, such that a few non-paved roads such as DR-108, DR-109 and DR- 111 serve as routes for north-south transport.

In addition, there is the first railway line from the Friendship Bridge to Thanaleng Station, which connects with Thailand. Currently passenger trains operate twice a day between Thanaleng station and Nong Khai station.

(5) Utility

1) Water Supply

Most Households use water from shallow and deep wells. A minority of the households use water from streams and ponds. Dongmakkhai Water supply project also supplies water for households, and industry in this area. The main water pipeline of the project is under the NR-1 road and extends to the center of Dongphosy Village along DR-109. Water supply is distributed from main pipeline to villages along the road.

2) Electricity Supply

Electricity supply system was completed in Thanaleng area. Almost all villages in this area are connected to permanent electricity network. The rest have connected with neighboring districts. This zone has already installed 1 main electricity station at Saphankkanong Village. At Thakokhai Village, 1 main electricity station for export will be constructed.

High voltage (115kV) transmission line comes from the north and the substation is located behind the Thanaleng CIQ office at the border. 22 kV of electricity is distributed to the areas from the substation after step-down of voltage by transformers at electric poles.

3) Telecommunications

Telecommunications system has not been available in Thanaleng area except for a part of Dongphosy Village. Telephone lines of ETL run along NR-1 road up to CIQ office at Friendship Bridge and currently extend to Thanaleng railway station.

4) Drainage

Drainage system is available only along roads in Thanaleng area, but there are some irrigation channels substituting as drainage in the area.

5) Waste Water

Sewage disposal is done with Septic tank.

6) Solid Waste

District Office provides solid waste disposal service as a paid service. Villagers have to contact district office individually to receive the service.

2.4 Development Control and Restrictions

2.4.1 Land Use

Vientiane has an urban plan targeting the year 2010, which was developed in 2000. The urban plan consists of land use plan, regional plan and urban facility plan including urban transport plan, and water supply and drainage plan. The urban use area is designated along NR-13 and Mekong River within inner outer ring road, which follows current urbanization directions. Thanaleng area is outside the urban planning area.

Figure 2.4.1 shows regional spatial development concept. Vientiane urban plan basically follows multi-core urban system. The urban core exists in downtown and surrounding areas, which seems to be the urban planning area; together with 5 satellite towns, namely: Naxaithong, Donnoune, Xangthon, Hadxaifong, Pakngeum and 4 economic zones (Khokphang, Houaycheam, Thangon, Banphaonaxon). The urban core and satellite towns/ economic zones are connected by regional highways. New industrial zones are also designated at Thanaleng and eastern suburb of Vientiane, which is currently being studied to establish Vientiane Industrial Park (VIP).

2.4.2 Building Control

Lao PDR has building control regulation to control capacity, height and use of buildings within urban planning area. As the building control measures, maximum floor area ratio (FAR), maximum building area ratio and maximum height are specified. Industrial area and transport area are categorized as special land use, adopting building area ratio of 30 % and maximum building height of 14m. FIR is subject to detailed plan.

Since Xaisettha District and Hadxaifong District are outside the urban planning area currently, they do not have any explicit regulations pertaining to capacity of buildings; however, the building control regulations for industrial and transport land use may be applied.

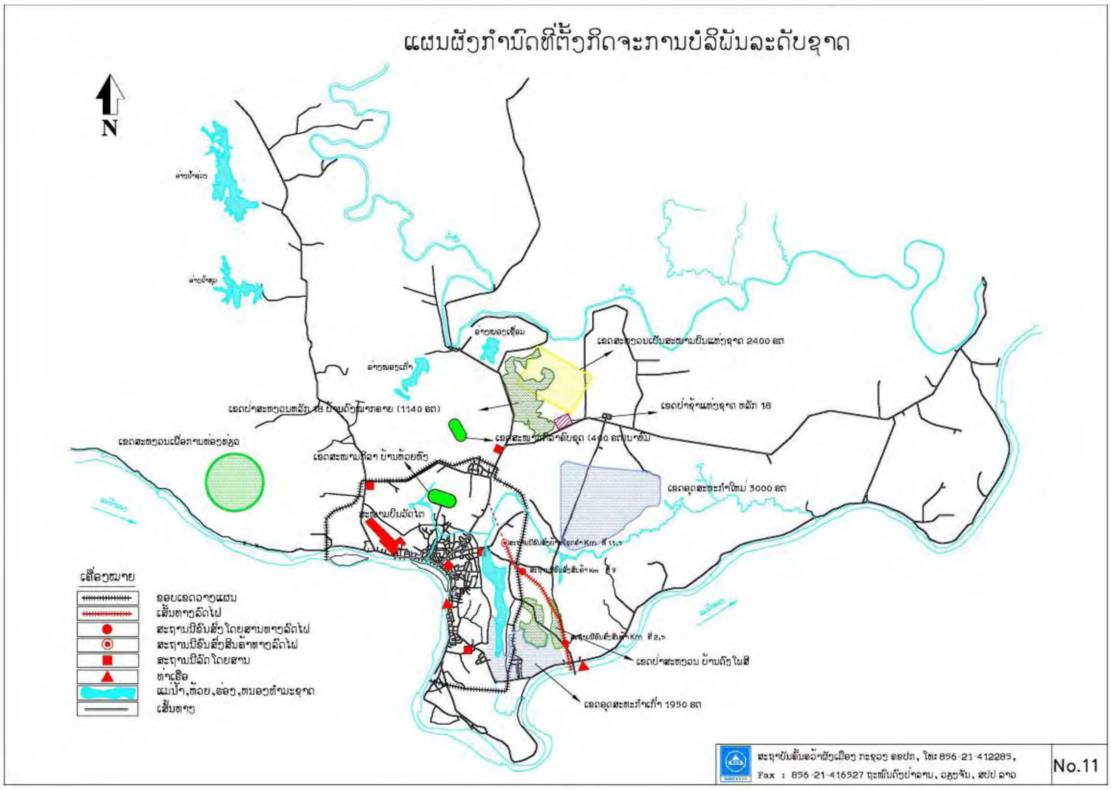


Figure 2.4.1 Regional Spatial Concept

2.5 Relevant Development Projects around Thanaleng Area

2.5.1 Development Projects

(1) Overview

Vientiane has many development projects in accordance with recent continuous economic growth. Urban renewal projects as well as large-scale development projects which may affect urban structure are ongoing. Figure 2.5.1 shows major development projects in Vientiane. Some projects such as NR-13 rehabilitation, 450 Years Road and Sports Stadium (for SEA Games) are under construction. Many of the projects are done with assistance from foreign countries; however, private investment projects are observed as well, for example Dongphosy Commercial SEZ project and Golf Course project.

Looking at Thanaleng area, several development projects are concentrated around Dongphosy forest besides the Vientiane Logistics Park (VLP) project, namely:

- Vientiane Industrial Park (VIP) Project
- Dongphosy Commercial Special Economic Zone (SEZ) project
- That Luang New Town project

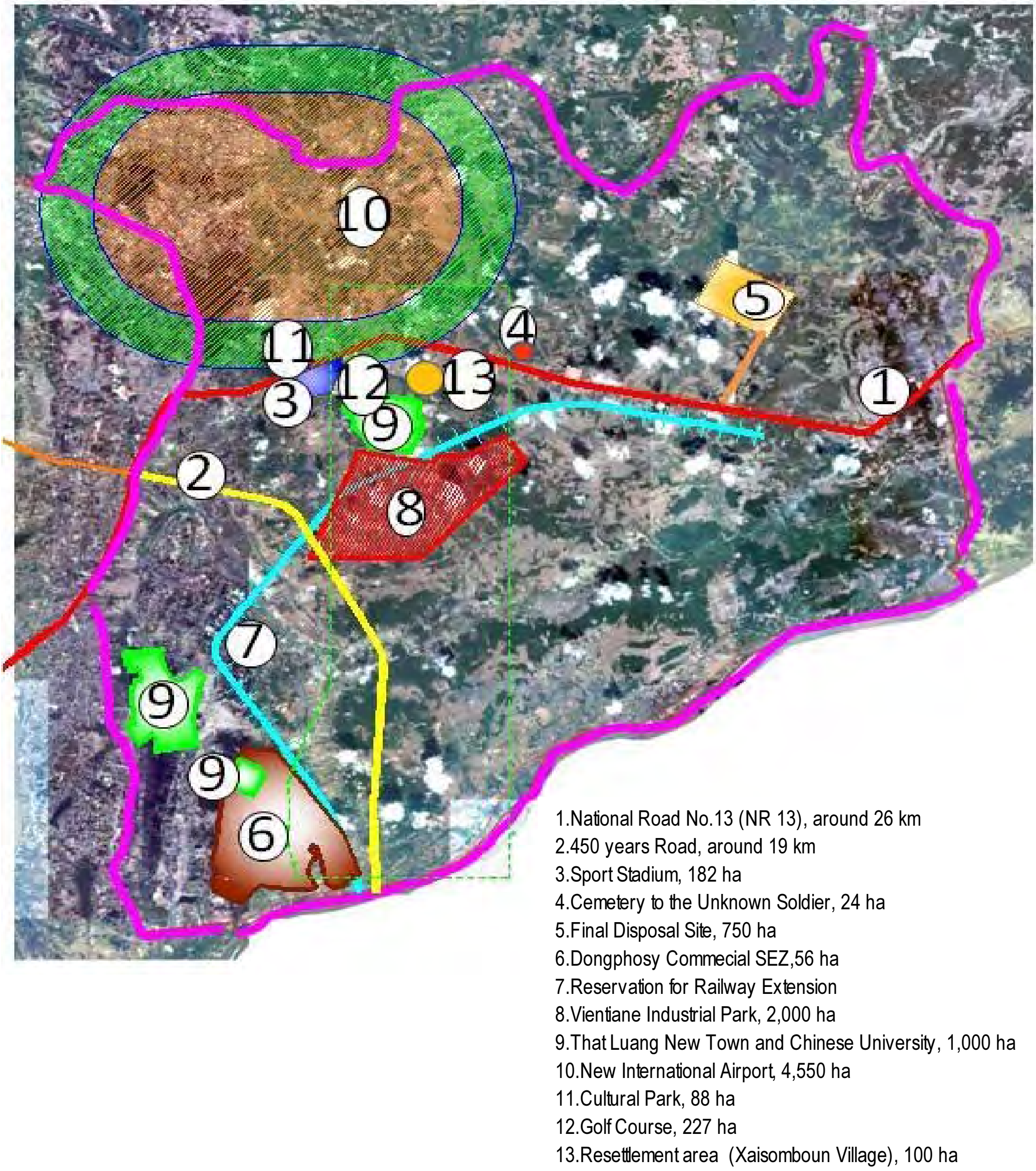


Figure 2.5.1 On-going Development Projects in Vientiane

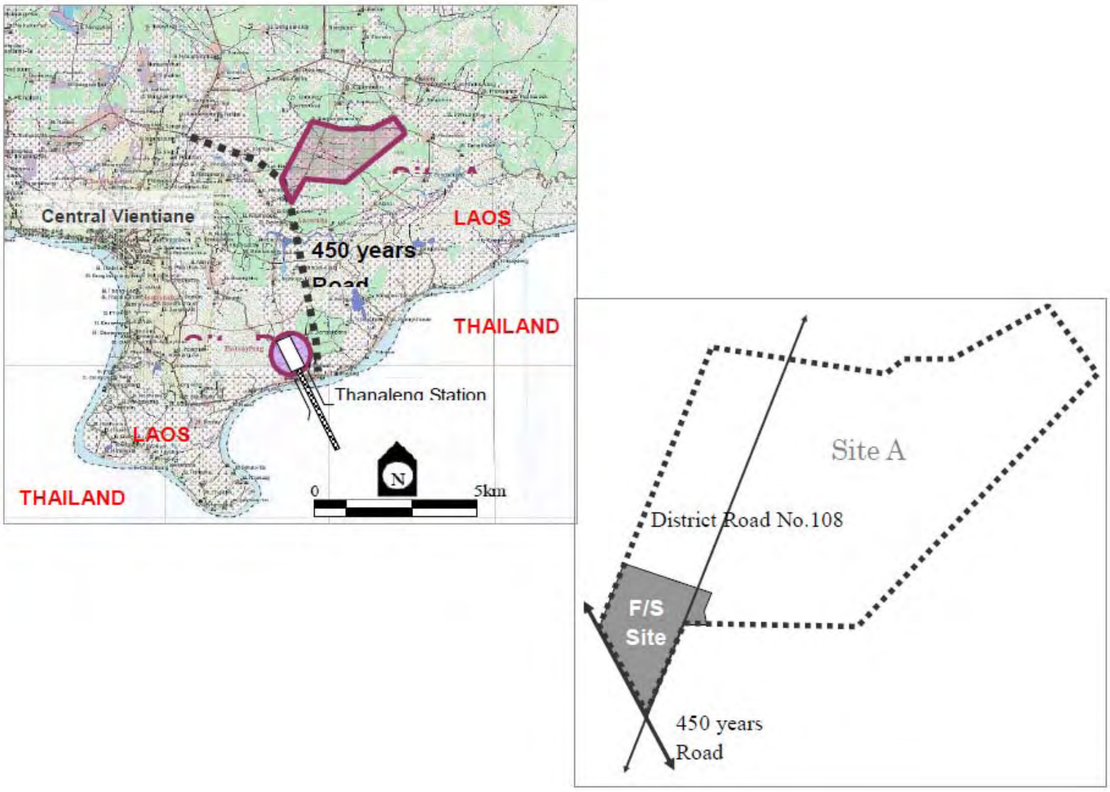
(2) Vientiane Industrial Park (VIP) Project

Lao PDR achieved the numerical development target in industrial sector for the 5th National Socio Economic Development Plan (2001-2005) period, which was an 11.3 % average annual growth rate compared to the annual target growth rate of 10 to 11 %. In particular, the 6th Plan concluded that the sectors receiving foreign investment achieved an impressively rapid growth rate, followed by the non-state sector, with the domestic private sector growing slowly. Accordingly, the 6th Plan indicates that "a number of industrial zones have been established in such places as Vientiane and Savannakhet. They include many standard to modern technology zones, attracting investment from many enterprises. The development of such industrial zones helps to attract more foreign investment. The 6th Plan (2006-2011) emphasizes that “the orientation of industrial development in the coming years is to give priority to developing the electricity and processing industries catering to domestic consumption and exports” as overall strategy. Then, as one of the development targets, the 6th Plan confirms the establishment and development of some industrial zones with high technology at potential places such as Vientiane, Champasack and Savannakhet. In cognizance of the above, the Lao Government requested the Japanese Government to formulate project by carrying out feasibility study. Japan International Cooperation Agency (JICA) conducted the feasibility study, namely, "Preparation Study on Industrial Zone Development in the Lao PDR" (hereinafter referred to as "the VIP Study").

The VIP Study proposes 4 important development principles for VIP, namely:

- Trigger of Lao PDR to fasten industrialization growth
- Special Zone meets global standards,
- Satellite city of Vientiane
- Interface between enterprises and educational functions

VIP is planned to be established as a SEZ with bonded area and equal incentives for all investors in VIP. As the first stage by the year 2015, approximately 140 ha of the area, which consists of 130 ha of industrial area and 10 ha of residential area, is proposed to be developed on the south edge of the industrial zone (Site A), as shown in Figure 2.5.2.



Source: Preparation Study on Industrial Zone Development in the Lao PDR Interim Report, JICA, 2009

Figure 2.5.2 Vientiane Industrial Park

(3) Dongphosy Commercial Special Economic Zone (SEZ) project

A Malaysian private investor proposed to Vientiane Capital a large-scale commercial complex development project in the Dongphosy area. The project site is the area behind existing CIQ office at Friendship Bridge with an area of 53ha. The project consists of commercial buildings, hotels, and play-land and parks targeting guests from Vientiane and Thailand. The project, namely "Dongphosy Commercial Special Economic Zone (SEZ)", is a joint-venture project between Malaysian company and Vientiane Capital. Vientiane Capital is responsible for preparing and providing land to the Joint venture and will get 15.5% of stock in return: the Malaysian company is responsible for construction, management and operation of the project. The project was approved by Vientiane Capital on 12th Sept. 2009 with a concession period of 50 years. The joint-venture company is currently planning for the project.

(4) That Luang New Town project

Chinese investor (Suzhou Development Company) with Lao Land Development Corporation established a joint-venture company, namely "Laos-China Vientiane Joint Development Company" in order to carry out urban development project. The project consists of 3 sub-projects, namely: That Luang New Town project, Dongphosy commercial development project and University development near the SEA Games Stadium. Among them, That Luang New town project is the project to develop 630 ha of residential areas at That Luang swamp area.

2.5.2 Infrastructure Development Projects

(1) Thanaleng-Vientiane Railway

3.5km railway line between Thai border and Thanaleng station passes through Friendship Bridge, which is connected to the Northeastern line of SRT. The project was constructed with Thai funds and started passenger service running twice a day in March 2009.

Currently, Neighboring Economy Development Agency (NEDA) of Thai Government financed the detailed design study to extend railway to Vientiane station. The project, namely "Thanaleng–Vientiane Railway Construction Project", includes: extension of railway by approximately 9.5 Km from existing Thanaleng station to Vientiane station in the north; construction of Vientiane station and station plaza with headquarters building for Lao National Railway Authority (LNRA) and container yard at Thanaleng station. The design and tender document preparation were completed in May 2010. According to articles of the local newspaper, NEDA is committed to supporting the railway extension project and urban road improvement project in Vientiane, providing 100 million USD in total. These two projects will be probably financed by 30% grant and 70% loan. The project cost of the railway extension project was estimated at around 40 million USD. The project is scheduled to commence in 2011 and be completed by 2014.

There is no concrete plan for the railway operation at the moment. However, the SRT (State Railway of Thailand) will operate the passenger railway between Vientiane and Nongkhai Stations, as is the case for the existing railway operations between Thanaleng and Nongkhai Station. Like the passenger railway, there is no concrete plan for the freight railway operation. However, the SRT will probably become the freight railway operator when the VLP is developed. It is because the SRT operates its freight railway which transports significant amount of cargo (e.g., 17% of the petroleum products and 26% of the containers in Thailand are currently transported by railway) and the SRT has currently enhanced its freight railway operations by purchasing new locomotives and wagons for freight transport. The operation of the freight railway in the VLP is detailed in Chapter 5 and Chapter 6.

The locations of the existing railway and extension plan are shown in Figure 2.5.3, together with the 450 Years Road described below.

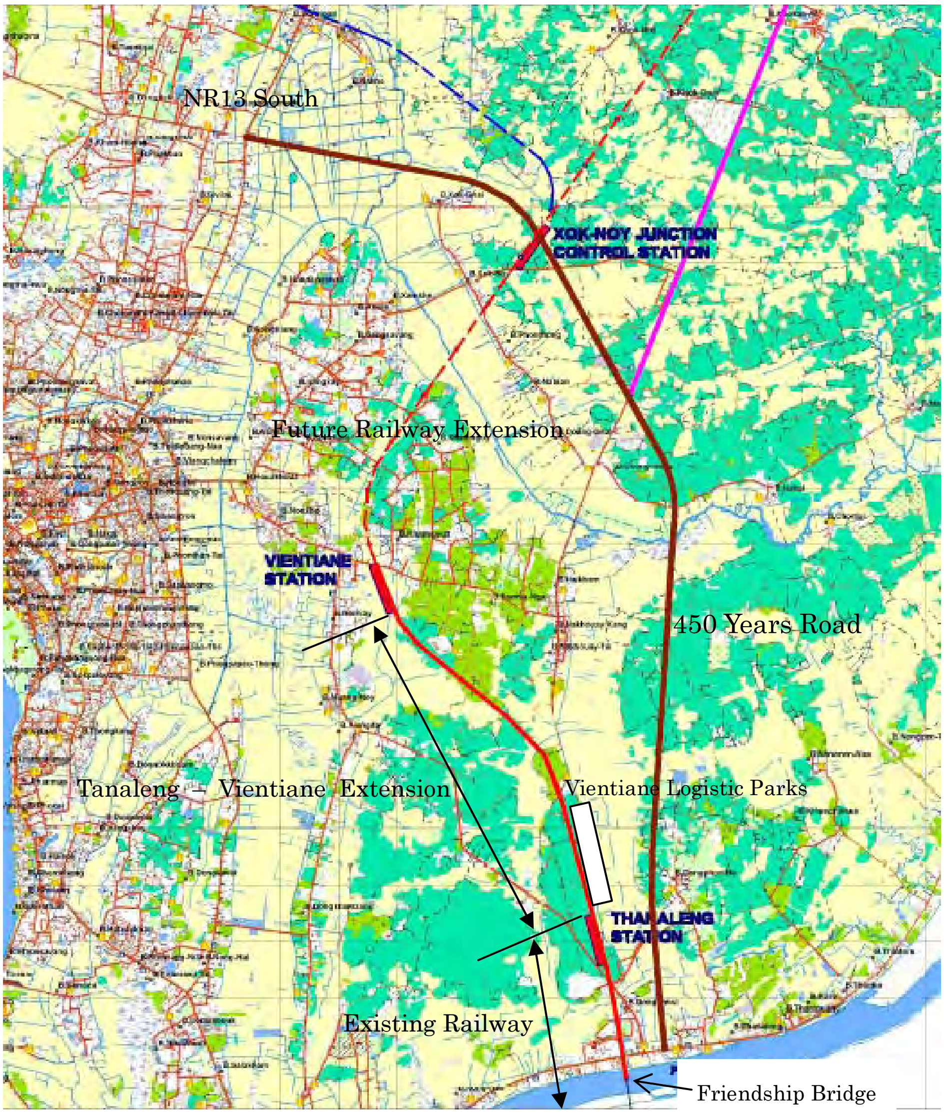
(2) 450 years Road (Dongphosy- Dongdock)

The construction of 450 Years Road (450-YR) is on-going. This 450 Years road is a southern part of the Outer Ring Road of Vientiane Capital. The project is being implemented by Vientiane Capital with Korean assistance. In commemoration of the founding of the country 450 years ago, it is planned to be completed by October 2010; however, it is currently only partially completed and opened.

The road starts from NR-1 beside Friendship Bridge, then passes along eastern edge of the Dongphosy Forest Reserve, and then connecting with NR-13S in the north. The outline of the road structure and implementation schedule is summarized as follows:

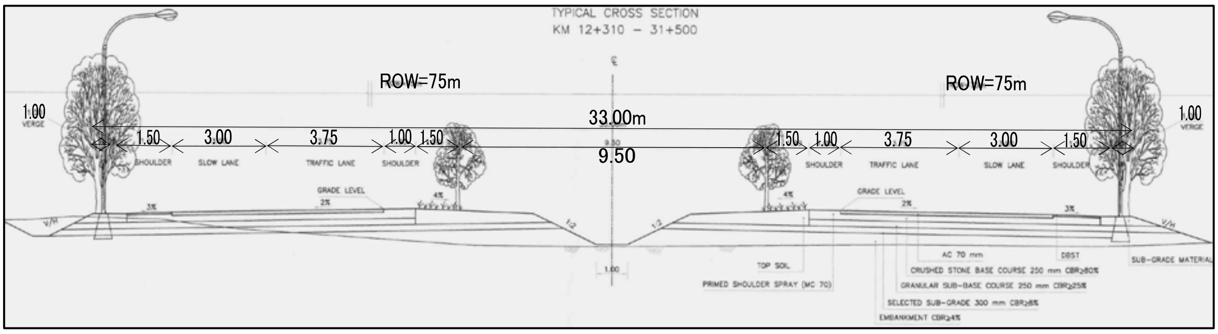
- Length: 20.30 km
- Width: 33.0 m (6 lanes, initial stage: 4 lanes)
- Pavement: Asphalt
- Associated Facilities: Sidewalk, Street Lights, Tree Plantations
- Construction Period: 28 months (from 25/04/2008 to October in 2010)

The typical cross-section of the road in the section next to the VLP is shown in Figure 2.5.4.



Source: Railway Authority, edited by JICA Study Team

Figure 2.5.3 Railway Extension and 450-years Road



Source: Vientiane Capital

Figure 2.5.4 Typical Cross-Section of 450 Years Road in the Section Next to VLP

CHAPTER 3 FREIGHT DEMAND FORECAST

3.1 Introduction

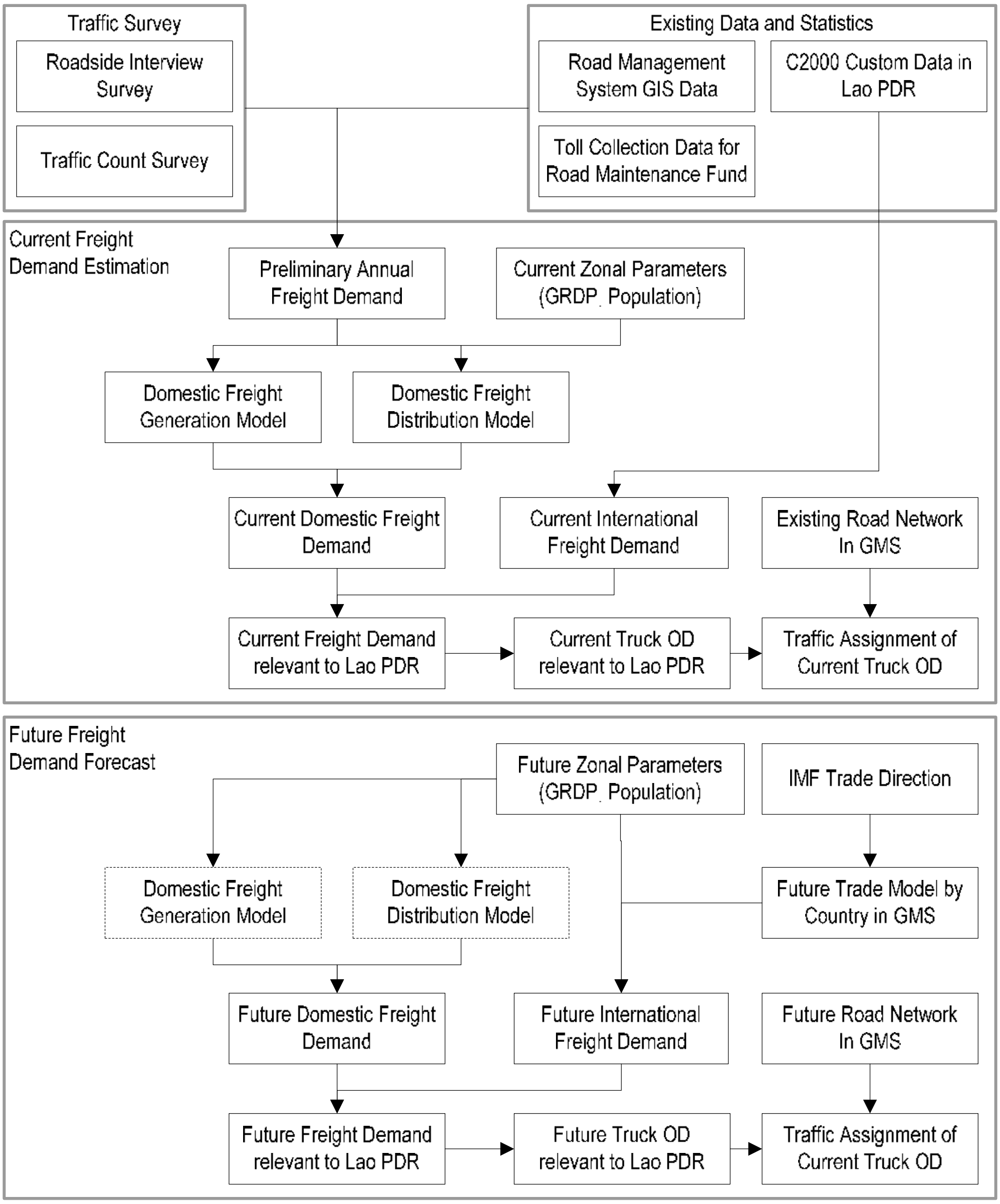
As explored in Chapter 4 of the Lao National Logistics Strategy (Volume 2), a comprehensive freight demand forecast model was developed at the national/regional level to foresee domestic, export/import and transit cargo in/though Lao PDR. Based on this freight demand forecast model, this Chapter estimates the future freight demand in the Vientiane Logistics Park (VLP), and provides numerical inputs for planning and designing the VLP and for testing its economical and financial validity, which will be discussed in the following chapter.

3.2 Methodology of Freight Demand Forecast for EXIM Cargo

The comprehensive freight demand forecast model for export and import cargo was developed, using the results of the roadside interview survey, traffic count survey and the secondary data and information such as transport statistics and customs data. The methodology of this freight demand forecast model is summarized below.

- The target year for the projection was set as Year 2025 for the long-term and Year 2015 for the medium term.
- Commodity-wise freight demand forecast model was developed, based on the conventional four-step model: Freight Generation Model, Freight Distribution Model, and Traffic Assignment, for domestic, export/import and transit cargo.
- Commodities analyzed by the demand forecast model include (1) Rice and Cereals, (2) Animal Products, (3) Sugar and Sugar Confectionary, (4) Fruits and Vegetables, (5) Animal Feed and Fertilizers and (6) Minerals and Construction Materials, (7) Chemical, Plastic and Industrial Materials, (8) Manufactured Goods, (9) Petroleum (10) Woods Products.

Figure 3.2.1 shows the work flow for the overall freight demand modeling and forecasting.



Source: JICA Study Team

Figure 3.2.1 Work Flow for Freight Demand Modeling and Forecast

3.3 Summary of the Results of Freight Demand Forecast for EXIM Cargo

3.3.1 Socio-economic Framework Applied

A planning framework, which was prepared referring to IMF staff report, is shown in Table 3.3.1. GDPs in 2009, 2015 and 2025 were estimated based on forecasted annual growth rate.

Table 3.3.1 Estimated GDP in GMS Countries

GDP (USD billion)	2000	2001	2002	2003	2004	2005	2006	2007	2009	2015	2025
Cambodia	3.65	3.98	4.28	4.66	5.33	6.29	7.26	8.69	9.67	14.55	27.93
Yunnan	22.73	25.13	26.94	29.84	35.76	42.34	50.17	62.13	73.07	119.21	269.52
Lao PDR	1.74	1.77	1.83	2.15	2.51	2.87	3.51	4.14	4.72	7.29	14.46
Myanmar	8.91	6.48	6.78	10.47	10.57	11.99	14.50	19.62	N/A	N/A	N/A
Thailand	122.73	115.54	126.88	142.64	161.34	176.35	206.99	246.05	265.88	363.09	592.84
Vietnam	31.20	32.50	35.15	39.63	45.55	53.05	61.00	69.23	80.73	123.55	246.18
GMS Total	190.95	185.40	201.86	229.38	261.06	292.89	343.43	409.86	434.06	627.7	1,144.9

Source: The World Economic Outlook (IMF), National Statistic Bureau of PRC.

Note: GDPs in 2009, 2015 and 2025 were estimated by annual growth rates in IMF Staff Report.

3.3.2 Freight Generation

Future trade to/from Lao PDR, which provides the control total of import/export volume, was initially estimated by the regression model using the GDP of the home country and other neighboring countries. Table 3.3.2 summarizes the results of the forecasted trade volume, indicating that both imports and exports are estimated to grow by 1.6 times by 2015 and over 3.0 times by 2025 and both would continue to rely on Thailand till 2025.

Table 3.3.2 Existing and Forecasted Trade in Lao PDR

Country	Export (million USD)			Import (million USD)		
	2009	2015	2025	2009	2015	2025
Cambodia	1.3	2.5	5.7	0.4	0.7	1.4
Thailand	538.9	863.9	1,631.9	1,569.6	2,602.4	5,489.2
Vietnam	214.9	370.8	817.2	118.5	169.9	313.6
Yunnan	38.9	69.5	169.3	51.5	85.0	178.5
Total	794.0	1,306.7	2,624.1	1,740.1	2,858.0	5,982.7

Source: JICA Study Team

Commodity-wise future trade volume was estimated by the regression model, using GDP of the home country and other neighboring countries. Tables 3.3.3 and 3.3.4 show forecasted import and export values. With the exception of food products that rely heavily on the population growth, all the commodities were estimated to increase at the same pace as the overall import and export volumes.

Table 3.3.3 Existing and Forecasted Import and Expansion Factors

Commodity Type	Forecasted Import Value (million USD)			Expansion Factors	
	2009	2015	2025	2015/2009	2025/2009
1) Rice & Cereals	25	36	71	1.44	2.84
2) Animal Products	18	25	48	1.39	2.67
3) Sugar & Sugar Confectionary	8	7	10	0.88	1.25
4) Fruits & Vegetables	11	19	41	1.73	3.73
5) Animal Feed & Fertilizers	25	39	82	1.56	3.28
6) Minerals & Construction Materials	54	85	174	1.57	3.22
7) Chemical & Plastic & Industrial Materials	635	1,099	2,369	1.73	3.73
8) Manufactured Goods	521	822	1,671	1.58	3.21
9) Petroleum	425	697	1,457	1.64	3.43
10) Woods Products	18	29	59	1.61	3.28
Total	1,740	2,858	5,983	1.64	3.44

Source: JICA Study Team

Table 3.3.4 Existing and Forecasted Export and Expansion Factors

Commodity Type	Forecasted Export Value (million USD)			Expansion Factors	
	2009	2015	2025	2015/2009	2025/2009
1) Rice & Cereals	41	46	59	1.12	1.44
2) Animal Products	2	2	4	1.00	2.00
3) Sugar & Sugar Confectionary	0	0	1	1.00	1.00
4) Fruits & Vegetables	34	56	113	1.65	3.32
5) Animal Feed & Fertilizers	0	0	0	1.00	1.00
6) Minerals & Construction Materials	108	178	377	1.65	3.49
7) Chemical & Plastic & Industrial Materials	420	724	1,485	1.72	3.54
8) Manufactured Goods	141	234	473	1.66	3.35
9) Petroleum	5	6	9	1.20	1.80
10) Woods Products	43	58	103	1.35	2.40
Total	794	1,307	2,624	1.65	3.30

Source: JICA Study Team

3.3.3 Freight Distribution

Future trade volume was distributed to the provinces in Lao PDR by the gravity model. This gravity model was formulated using freight generation and attraction of the domestic freight demand and transport distances between traffic analysis zones as the explanatory factors. Using this gravity model, the future import and export volumes to/from Vientiane Capital was estimated as tabulated in Tables 3.3.5 and 3.3.6. The expansion factors, estimated for 2009, 2015 and 2025 trade volumes, provided an essential input in the estimation of future freight volumes handled at the VLP.

Table 3.3.5 Forecasted Import Volumes and Expansion Factors (Vientiane Capital)

Commodity Type	Forecasted Import Volumes (000 tons)			Expansion Factors	
	2009	2015	2025	2015/2009	2025/2009
1) Rice & Cereals	12	17	35	1.45	2.92
2) Animal Products	15	21	40	1.36	2.63
3) Sugar & Sugar Confectionary	6	6	8	0.96	1.28
4) Fruits & Vegetables	4	6	14	1.78	3.87
5) Animal Feed & Fertilizers	20	32	68	1.59	3.36
6) Minerals & Construction Materials	132	208	429	1.58	3.26
7) Chemical & Plastic & Industrial Materials	131	228	495	1.75	3.79
8) Manufactured Goods	97	155	318	1.59	3.26
9) Petroleum	208	345	726	1.66	3.49
10) Woods Products	11	18	40	1.62	3.46
Total	637	1,038	2,174	1.63	3.41

Note: The figures show import volumes from Thailand.

Source: JICA Study Team

Table 3.3.6 Forecasted Export Volumes and Expansion Factors (Vientiane Capital)

Commodity Type	Forecasted Export Volumes (000 tons)			Expansion Factors	
	2009	2015	2025	2015/2009	2025/2009
1) Rice & Cereals	0	1	1	1.08	1.26
2) Animal Products	0	0	0	1.24	2.13
3) Sugar & Sugar Confectionary	0	0	0	1.00	1.00
4) Fruits & Vegetables	1	2	3	1.57	2.89
5) Animal Feed & Fertilizers	0	1	1	1.18	1.68
6) Minerals & Construction Materials	23	36	73	1.61	3.24
7) Chemical & Plastic & Industrial Materials	0	0	0	1.67	3.21
8) Manufactured Goods	6	10	19	1.60	2.97
9) Petroleum	0	0	0	1.00	1.00
10) Woods Products	42	51	78	1.23	1.88
Total	73	101	176	1.39	2.41

Note: The figures show export volumes to Thailand.

Source: JICA Study Team

CHAPTER 4 VLP DEVELOPMENT POLICY

4.1 Project Rationale

4.1.1 Justification of VLP

(1) Position of VLP in National Logistics Development Context

Cross-border transport has been gradually increasing, reflecting the economic growth in the region and the development of international divisions of labor. This seems to present Lao PDR with a great opportunity to materialize the policy of transformation from a “Landlocked Country” to a “Land-linked Country”. In this regard, it is expected that development of international logistics business in GMS region will be realised. In addition to this, the completion of several key infrastructures and international agreements such as ASEAN Free Trade Agreement (AFTA) in ASEAN and Cross-Border Trade Agreement (CBTA) in GMS will gradually stimulate regional movement of money, people and goods, which is greatly expected to activate horizontal division of labor for production in GMS region.

Lao PDR occupies good position in GMS in terms of geographic location in GMS and advancement of cross-border agreements with surrounding countries, which enhances Lao PDR’s potential for future development. However, Lao PDR has constraints to development such as limited capacity in investment capital, technologies, human resources, and especially a very limited domestic market. Consequently, there are more opportunities in GMS market for Lao PDR such that Lao PDR is better off prioritizing seeking the GMS market rather than fostering the domestic market.

Based on those facets, Laos National Logistics Strategy (LNLS) proposes the following basic strategy:

- To seize more business opportunities in GMS, Lao PDR should take leading role in next step of economic integration of GMS countries by pursuing GMS regional single market with more seamless and barrier-free cross-border transport.
- To take advantage of situation where Lao trucks are able to travel in any of the surrounding countries, Lao PDR should promote logistics industries by promoting relocation of foreign transport and logistics businesses into Lao PDR as well as encouraging strengthening of domestics logistic businesses, utilizing advantages of its advanced position in cross-border agreements and location in GMS.

- Lao PDR should give high priority to human resource development in logistics and related sectors to spread benefits of logistics business promotion over logistics related and supporting businesses.

Vientiane Logistics Park (VLP) is a key facility in realizing above basic strategies of LNLS.

(2) Position of VLP in Vientiane Social and Economic Development Context

As the capital of Lao PDR, the 6^{th} Social and Economic Plan of Vientiane (hereinafter referred to as “the 6^{th} Plan”) aims at building up Vientiane Capital to strengthen central functions of administration, economy and culture of the country. The 6^{th} Plan, for this purpose, emphasizes change in economic structure in a progressive way by strongly promoting industrial production and services. The 6^{th} Plan expects that industry and service sectors will become the leading economic sectors in Vientiane Capital, such that the Plan targets annual growth rates of 12.5 % and 11.28% in industrial and service sectors respectively. As a result, Vientiane will take on an important role as a national and regional hub. This will attributed to increase in various goods generated, delivered, stocked and consumed. Logistics improvement is thus of great importance in order to support such demands.

(3) Position of VLP from Current Problems on Logistics in Vientiane Point of View

In order to improve logistics in Vientiane, it is essential to take it into consideration how to encourage accumulation of more cargo to generate scale merits. However, total volume of cargo remains limited in spite of anticipated economic and population growth in the future; hence, it is important to concentrate cargo in a designated place in Vientiane as much as possible. This is beneficial not only for Vientiane but also for region and nation.

In accordance with upgrade in customer’s demand and increase in cargo volume, logistics facility is strongly required to offer modern and sophisticated services. However, the existing Thanaleng Public Warehouse (hereinafter referred to as “the existing terminal”) has the following shortcomings, which will soon be obstacles/ constraints to further expansion of logistics.

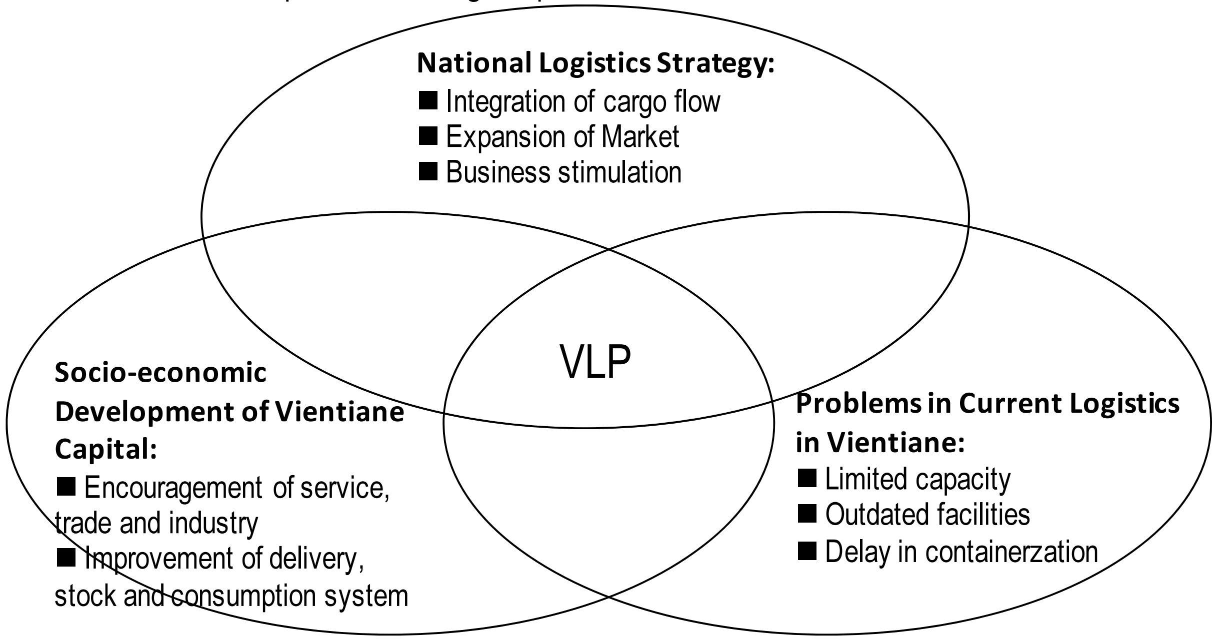
- outdated and less functional facilities
- No more room for expansion
- Inefficient access to Railway

Firstly, the existing terminal will become outdated in terms of its capacity, facilities and service. It does not have enough space and facilities to handle increased volume of cargo and wide-spread demands on services. In particular, there is no appropriate facility to handle containers. Secondly, the existing terminal does not have adequate area for expansion since surrounding areas are built-up. Many services required from customers, in particular container depot, parking spaces and stock yard for imported cars, cannot be provided.

The existing terminal was developed along the Mekong River before the opening of Friendship Bridge to handle cargo from both river crossing boats and trucks. It was previously a multi-modal facility. However, multi-modality of the terminal was lost due to abolishment of river-crossing boat transport. As regards promotion of modern multimodality, rail transport is given special attention to vary modal choice in cargo transport as well as to reduce energy consumption. It is almost impossible for the existing terminal to get rail service due to its location, despite the fact that the railway is connected with Thailand.

VLP is in suitable location to connect international and domestic transport, to realize multimodal transport with road transport (truck) and rail transport.

It is one of the reasons why the proposed facility development is an emergency issue for Vientiane. In cognizance of the above, many Japanese private investors and entrepreneurs, through the Japan-Lao PDR Public Private Dialogue, pointed out the necessity of new logistics facilities since it is one of the serious problems facing the private sector in Lao PDR.



Source: JICA Study Team

Figure 4.1.1 Justification of VLP

4.1.2 Roles of VLP

VLP is a core logistics facility in realizing the logistics functions of Vientiane expected in national logistics development strategy. VLP is also a facility to solve constraints of current logistics in Vientiane. In this sense, VLP upgrades logistics of Vientiane in the following aspects:

- Interface for international trade,
- Provision of various transport options
- Support to further industrialization of Vientiane; in particular, through provision of support to Vientiane Industrial Park (VIP),
- Incubation of logistics businesses in Lao PDR, and
- Efficiency as domestic transport Hub

(1) Interface for International Trade

VLP would provide efficient cross-border procedure service; through provision of CIQ consonant with harmonized CBTA procedure as well as improved services for customers' convenience and satisfaction in a short period. In accordance with improvement of cross-border procedures such as introduction of E-customs, NSW and ASW, VLP shall be a pilot/demonstration facility.

(2) Provision of Various Transport Options

VLP is a typical multi-modal transport facility with road transport and rail transport. VLP contributes to expansion of transport options by combining them.

(3) Support to further Industrialization

VLP contributes to industrialisation of Vientiane through offering stable and reliable transport, logistics services and one-stop service of CIQ.

(4) Incubation of Logistics Businesses in Lao PDR

VLP is a facility to incubate new logistics business in Vientiane through engaging higher standards of logistics services with foreign companies.

(5) Efficiency as Domestics Transport Hub

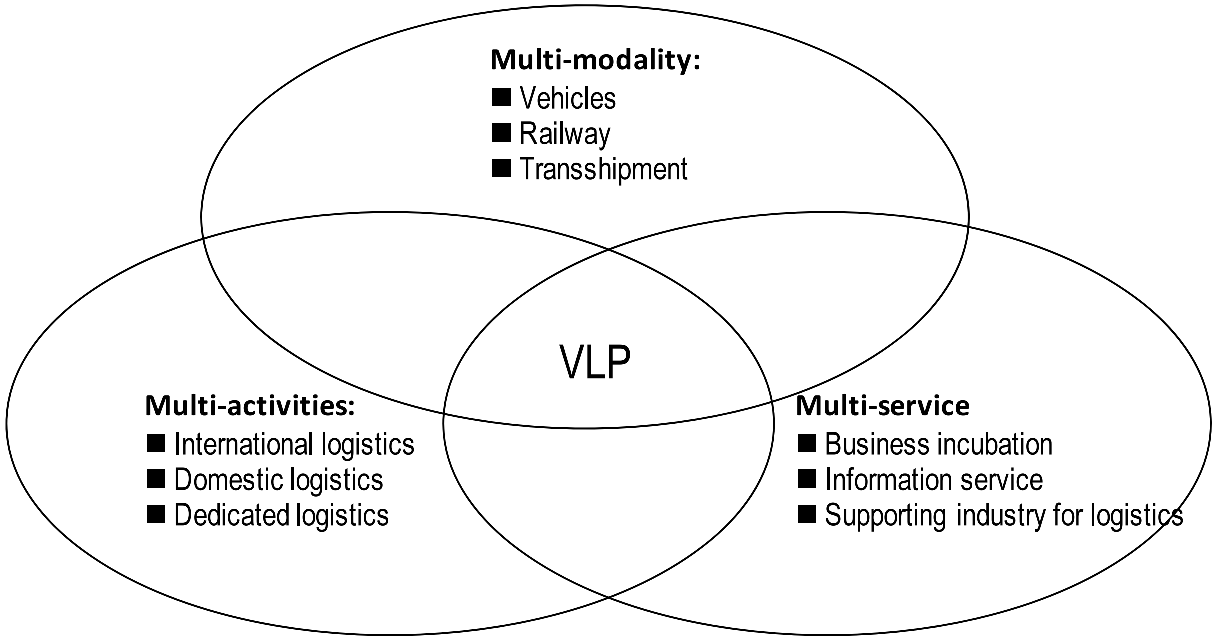
VLP performs as a center of domestic distribution in Lao PDR, which is expected to distribute goods to regional cities, with more capacity, more stability and more reliability in response to the expansion of demand on goods caused by economic and population growth.

4.2 Development Concept

4.2.1 Overall Concept

VLP is the principle facility in materializing Lao National Logistics Strategy; in contributing to local development potential of Vientiane in terms of industrialisation and urbanization; and in improving on current deficits in logistics. VLP is required to perform several functions and activities. VLP should meet requirements through providing qualified comprehensive logistics services. This is not only effective for customers' benefits, but also provides incentives for logistics providers since accumulated volume of cargo can be attractive for their business as well.

In this regard, "Triple-Multi" is the key concept in VLP development. Accordingly, VLP needs to offer various services with high quality



Source: JICA Study Team

Figure 4.2.1 Triple "Multi" Development of VLP

(1) Multi-Modality

VLP will be the only logistics facility in Lao PDR with full accessibility to both toad transport and rail transport; hence, one of the key services for VLP is to render effective coordination between rail and trucks, so as to realize cost effective, environmental-friendly, door-to-door delivery service. In particular, railway development can make it easy to establish CY, by providing effective and inexpensive empty container delivery/back haul between mother ports.

The key essence of multimodal transport is collaboration of different transport modes; rail and trucks in the case of VLP. VLP plans to have cooperative CY and warehouse function for connecting rail and CY, which may engender the following benefits;

- Reasonable cost transportation
- Environment-friendly transportation
- Expansion of customer's choice in selection of transportation modes

It is particularly important that railway development is realized so as expand the potential of realizing CY since rails can carry containers more cheaply than trucks. This is an incentive for container owners to set up empty container depot.

(2) Multi-Activity

1) International Logistics Service

One of the primary roles of VPL is to provide international logistics service as an alternative to the existing Thanaleng terminal. VLP should provide more qualified and customer-friendly service at reasonable cost and punctuality. Reasonable cost may be achieved through scale-merits and increased competition in VLP resulting from increase in volume of cargo handled and businesses involved. Among the various service menus to be provided in VLP, the 2 mentioned menus (domestic & international logistics services) are cited as being very important, given that they aren't adequately provided at the current Thanaleng terminal.

VLP's CY will focus not only on import/export stuffed containers but empty ones as well. This will be one of the practical solutions for problem of high logistics costs that Lao logistics has been facing for a long time.

2) Domestic Service

Besides the international service, it is important for VLP to provide domestic logistics service as the hub for municipal, region and national delivery. In order to achieve this purpose, warehouse service will be crucial. Warehouse operations should be upgraded ranging from simple storage function to qualified inventory control in order to provide sophisticated service delivery, such as punctual Just-In-Time (JIT) delivery. This collaborative scheme of transport and inventory contributes to realization of efficient inventory management as well as response to current SCM concept. Benefits from this collaboration would be:

- Avoiding road and municipal congestion
- Realizing consumers' satisfaction
- Visibility of inventory control
- Minimizing inventory
- Cash flow improvement
- Business opportunity expansion (resulting from easy accessibility to domestic regions)

The benefits above will foster competitiveness in Lao industry and customer satisfaction.

3) Dedicated Service (Tailor-made service to customer demand)

In order to activate Lao economy, Lao has been making efforts to strengthen competitiveness in Lao industry, especially the export-oriented industry. Among various potential projects being taken it into consideration, Vientiane Industrial Park (VIP) is the most important project: this particular project is currently under study with Japanese assistance. Special and sophisticated logistics services are critical for the success of VIP, such that VLP will play an important role in supporting the VIP as well as export-oriented customers located outside VIP. In spite of the possibility that the VIP would have its own facility, the VLP would still be necessary for it.

Studying the experience in advanced counties, it is certain that customers in EPZ or Industrial Zones have changed their perceptions as regards logistics operations. They are wont to shifting their logistics operations from in-house-operations toward outsourcing. This is because logistics operations have become complex in accordance with their business developments; such as expansion of the number of counterparts, expansion of covered area and increase in transactions. Such trends inevitably lead to complex logistics operations. Therefore, those logistics issues are likely to be outsourced such that customers focus their resources on their core competence such as marketing, planning, manufacturing or sales. Such inclinations imply that the business opportunities will certainly be generated for VLP to provide 'order made' logistics services. Of course, it is necessary for logistics providers to provide higher quality services than if they were undertaken directly by the customers.

It is difficult to see such a trend taking foot in Lao PDR currently; however, it is certain to emerge. VLP should prepare for such foreseeable trend.

(3) Multi-Service

One of important objectives of VLP is to provide favourable business environment for logistics businesses to stimulate logistics industry in Lao PDR as a sort of incentive. VLP is the designated area to provide integrated incentives for new logistics businesses in Lao PDR such as:

- Business incubation
- Information services
- Support and Related business provision

VLP should be designated as a Specific Economic Zone (SPEZ) so as to receive tax incentives for business incubation as well as promotion of foreign investment. Information services on return cargo and cargo monitoring will also be provided in VLP to increase cargo volume by creating value-added service in VLP. Support and related industries are also important not only for customers' convenience and satisfaction but also for generating new job opportunities in Vientiane.

4.2.2 Functions under Multi-Modality

Multi-modality can be secured with efficient trans-shipment between Trucks and Railway as well as efficient operation of both modes in VLP. In this regard, the following 3 functions are essential functions of multi-modality of VLP:

- Rail transport
- Road transport
- Transfer between rail and truck

4.2.3 Functions under Multi-Activity

(1) International Logistics Function

1) Import Function

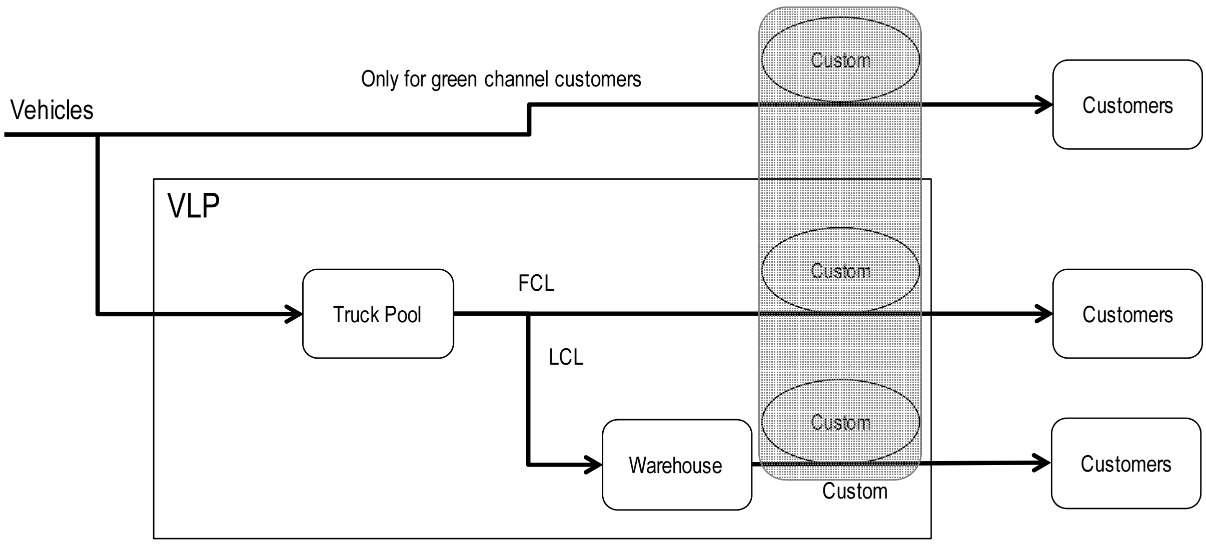
There are 2 transport modes provided by VLP: truck and rail. In terms of trucks, the main import flow is and will be conducted by full truck load basis. Although it is principally regulated in Thanaleng terminal that import cargo should be unloaded, this regulation has been deregulated and direct delivery is possible to a certain extent. VLP should follow and promote this deregulated process.

VLP plans to have a customs office in VLP such that it becomes the norm that trucks associate the VLP with customs procedure, allowing customs procedures to be implemented on cargo-on-truck basis (avoiding unloading obligation).

This will be a standard flow, but it is hopeful for customs to allow for high-compliance shippers to deliver cargo directly.

This new system aims to promote direct delivery without unloading such that the truck parking or waiting area in VLP should be equipped for customs clearance. If longer time is required for customs procedure, switching tractor/trailer becomes unavoidable. Such inconvenience would diminish customer attraction to VLP because long transit time would be required. Therefore, the customs as well as logistics providers should jointly make efforts to provide more speedy procedures than the existing Thanaleng terminal.

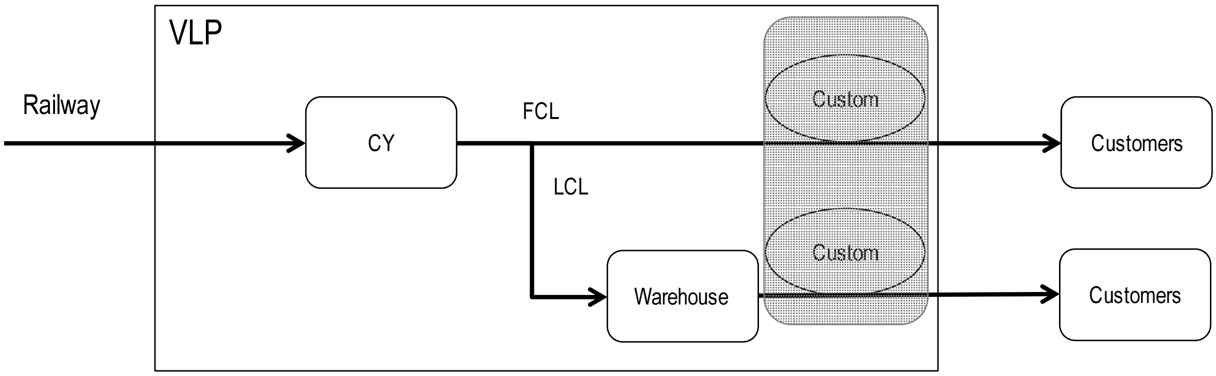
It is certain that direct delivery will be the convention in VLP and cargo unloading shunned, resulting in the possibility of eliminating the necessity of warehouses. However, it is planned that the VLP is equipped with advanced warehouse facility and function. It is intended that this facility is not merely used for simple storage operations but also for provision of value added services, resulting from qualified inventory and warehouse management services; the details of which are explained in (5), (6) and (7).



Source: JICA Study Team

Figure 4.2.2 Import Function (Truck)

On the contrary, it is unavoidable for railway containers to be unloaded at CY in order to acquire permission for customs clearance. After customs clearance at CY yard, it is possible for importers to receive clearance for containers.

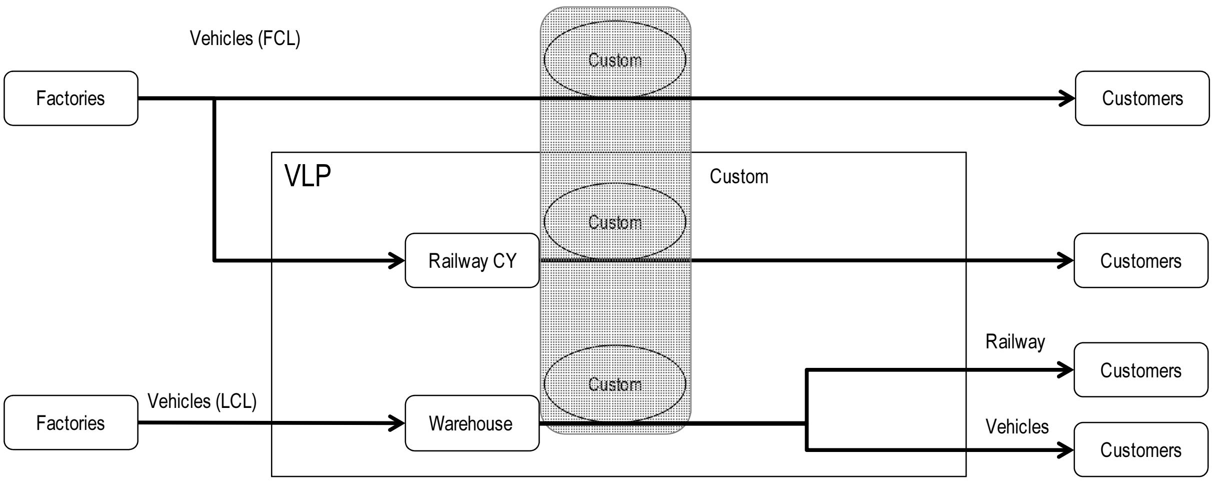


Source: JICA Study Team

Figure 4.2.3 Import Function (Rail)

2) Export Function

Export procedures have been facilitated and the factory vanning system has become the norm in Lao PDR. Therefore, such facilitated practices should be maintained even at VLP. However, the necessity for physical attachment of export cargo at VLP is expected to diminish with customs operations provided by VLP office. Similarly with import function as described above (1), VLP plans to have the warehouse facilities, with the aim of providing LCL service and value added services, resulting from qualified inventory and warehouse management operation in order to meet high demand of foreign customers.



Source: JICA Study Team

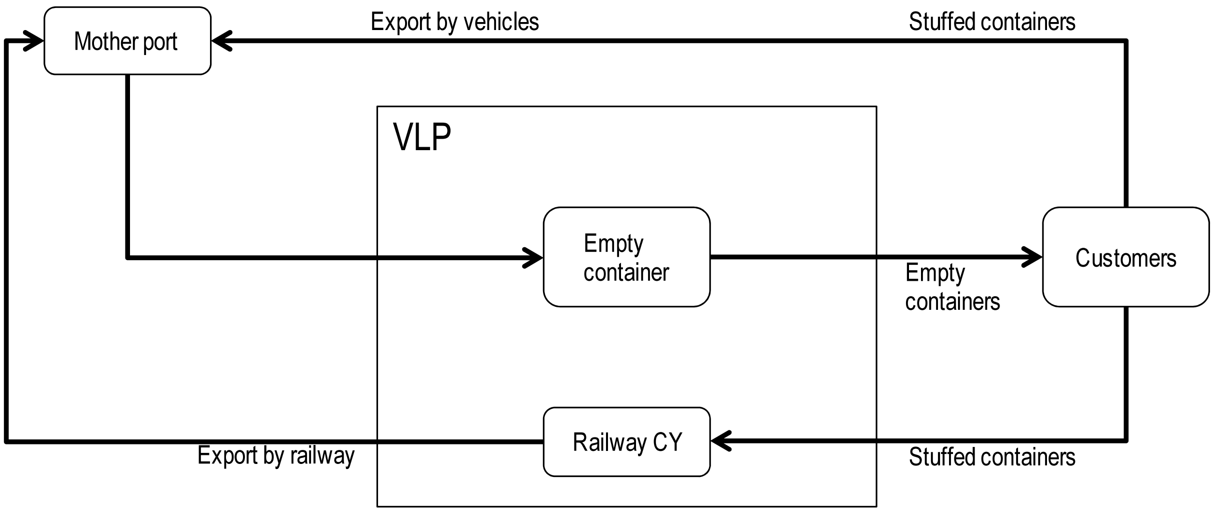
Figure 4.2.4 Export Function

3) CY Function

The Container yard (CY) is the place to dispatch and receive containers of either bonded or non-bonded status. VLP plans to provide CY for both rail and trucks. Lao PDR has been eager to establish CY for a long time, however, the container owners, such as shipping lines, have been negative to these aspirations mainly because of absolute low cargo volumes (little attraction for business) and low quality inventory control (no-returning containers, uncertainty of identifying container location, unreliable return schedule ,etc). Such a situation is likely to cause lowering of container turnaround and loss of business profits for container owners.

In addition to the potential of cargo volume expansion by the collaboration of VLP and VIP, this collaborative scheme implies the improvement of container turnaround by generating export cargo, which is an incentive for container owners to set up CY. Despite such efforts, the possibility of hesitancy to provide containers by container owners upon realization of CY in Vientiane cannot be ruled out. In such a case, empty container depots are effective as the alternative or interim target towards final goal.

An empty container depot is rather practical and it can help in the attainment of inexpensive container transport. This is because transporting distances will be shortened significantly. Furthermore, the railway service in VLP can increase the possibility of setting up empty van depot; hence, realizing cheaper empty container delivery between mother ports in Thailand. Considering current situation where empty containers are delivered from/to Thailand, the cost reduction effect of an empty container depot is remarkable. Eventually, establishment of empty container depot should be prioritized and fortunately, the initial investment cost is not prohibitive if railway is available.



Source: JICA Study Team

Figure 4.2.5 CY function

4) Services

Under the international logistics function, VLP provides several services as shown in Table 4.2.1..

Table 4.2.1 Services under International Logistics Functions

Functions	Detailed service
Rail export and import	**Scheduled delivery and its management**
	Loading/unloading
	Customs (CIQ)
	Cargo receipt/dispatch
	Storage (Small lot, bonded,)
	Sales and marketing for railway service
	Consolidation
Truck export and import	Trans-shipment
	Customs (CIQ)
	Truck arrival and dispatch
	Temporary cargo storage (Stop-over)
	Warehouse (Storage, bonded)
	LCL service
	Consolidation
CY	**Empty van depot**
	Stuffed container yard (depot)
	Container arrival/dispatch
	Inventory control for empty van
	Returning empty container to origin port
Multimodal	Trans-shipment
	Trans-loading
	Tracing the operation
	Document arrangement upon transferring modes

Note: Detailed services in gothic letters represent key services.

Source: JICA Study Team

(2) Domestic-Domestic Transport Function

The focal areas of improvement of domestic functions are summarized into 2 categories: one is the improvement of domestic/domestic relations; the other is the improvement of import/export relations. Although warehouse facility and inventory management will be key points in the facilitation of domestic cargo flow, the focal area of facilitation consists of the following 3 components as shown in Figure 4.2.6.

1) Inbound function improvement

Facilitation of inbound material operation should be realized, making it profitable for both vendors and customers by providing advanced technology such as consolidation, milk-run method, and scheduled pick-up operation.

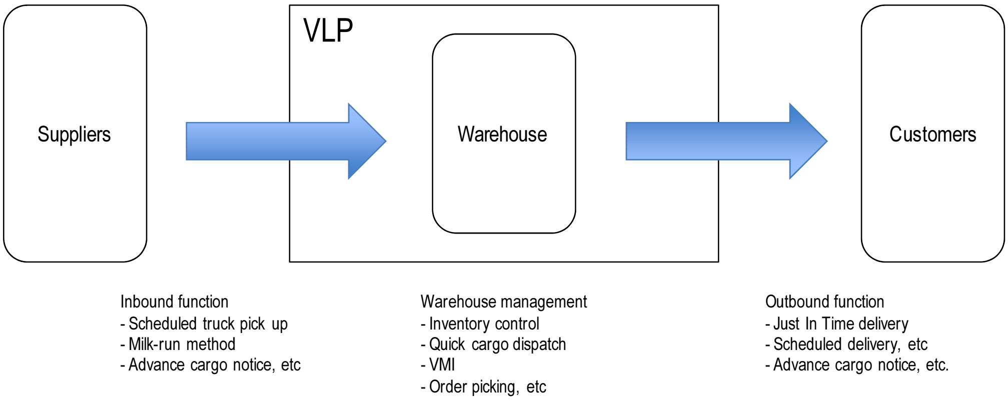
2) Warehouse management improvement

Qualified warehouse management will allow smooth physical distribution, resulting in minimum inventory while avoiding out-of-stock risk.

3) Delivery function

The delivery towards customers should realize JIT delivery, transporting only designated item and quantity, while avoiding unnecessary shipment that is likely to become excess inventory.

The above-mentioned inventory/transport collaborative/comprehensive solution is effective for low-volume inventory management, resulting in meeting SCM demand which customers are currently focusing on.



Source: JICA Study Team

Figure 4.2.6 Domestic/domestic function

4) Services

Under the international logistics function, VLP practices several services as shown in Table 4.2.2.

Table 4.2.2 Services under Domestic Logistics Function

Functions	Service	Detailed service
Domestic/domestic	Inbound	Smooth and short transit cargo receipt
		Scheduled pick-up planning and implementation
		Scheduled truck operation for cargo pick up
		Route planning for efficient route operation
		Milk run cargo pick up
		Quantity and item check upon cargo receipt
		Advanced cargo arrival notice(contents and quantity)
	Warehouse	**Inventory control and management**
		Speedy picking and packing
		Sorting
		Accurate and quick picking
		Order picking
		Re-packing
		Quick dispatch
		Schedule controlling
		Processing
		VMI (Vendor Management Inventory)
		Cross-dock
		Package material control
		Return cargo inventory and shipment
	Outbound	**JIT delivery**

Functions	Service	Detailed service
		Returnable package pick-up
		Scheduling and planning delivery route/operation
Import/domestic	Inbound	In addition to domestic
		Transit procedure
		Bonded cargo transport
	Warehouse	In addition to domestic/domestic
		Bonded cargo inventory
		Customs procedure (import, partial shipment)
		Duty payment and cash control
		Record of bonded cargo inventory/shipment
	Outbound	-ditto domestic/domestic-

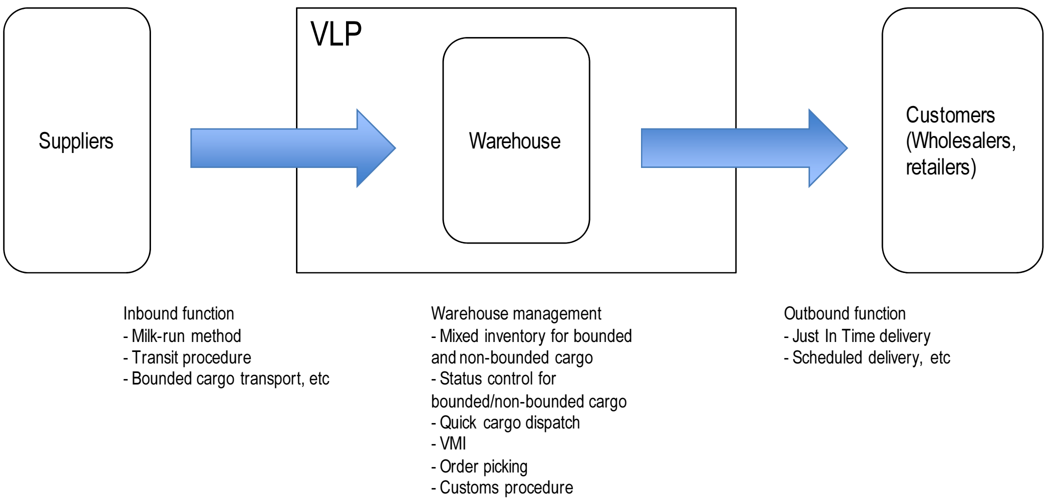
Note: Detailed services in gothic letters represent key services.

Source: JICA Study Team

5) Import-Domestic Transport Function

Domestic goods largely depend on import goods in Lao PDR. Consumer goods are a typical example. In accordance with the economic growth, urbanization and upgrading of customers' demand, the facilitation of connection of import/domestic function will be more important. Similarly with above (5) 'Domestic/domestic', it is necessary to improve entire cargo flow in terms of import/domestic function, i.e., improvement of in-bound, warehouse and outbound functions.

The significant point is that warehouse management is more complex because the majority of cargo is controlled under the bonded status. Therefore, facilitated procedures are very critical because speedy and timely dispatch will be highly demanded, leading to the risk of complexity and difficulty in tax payment control.

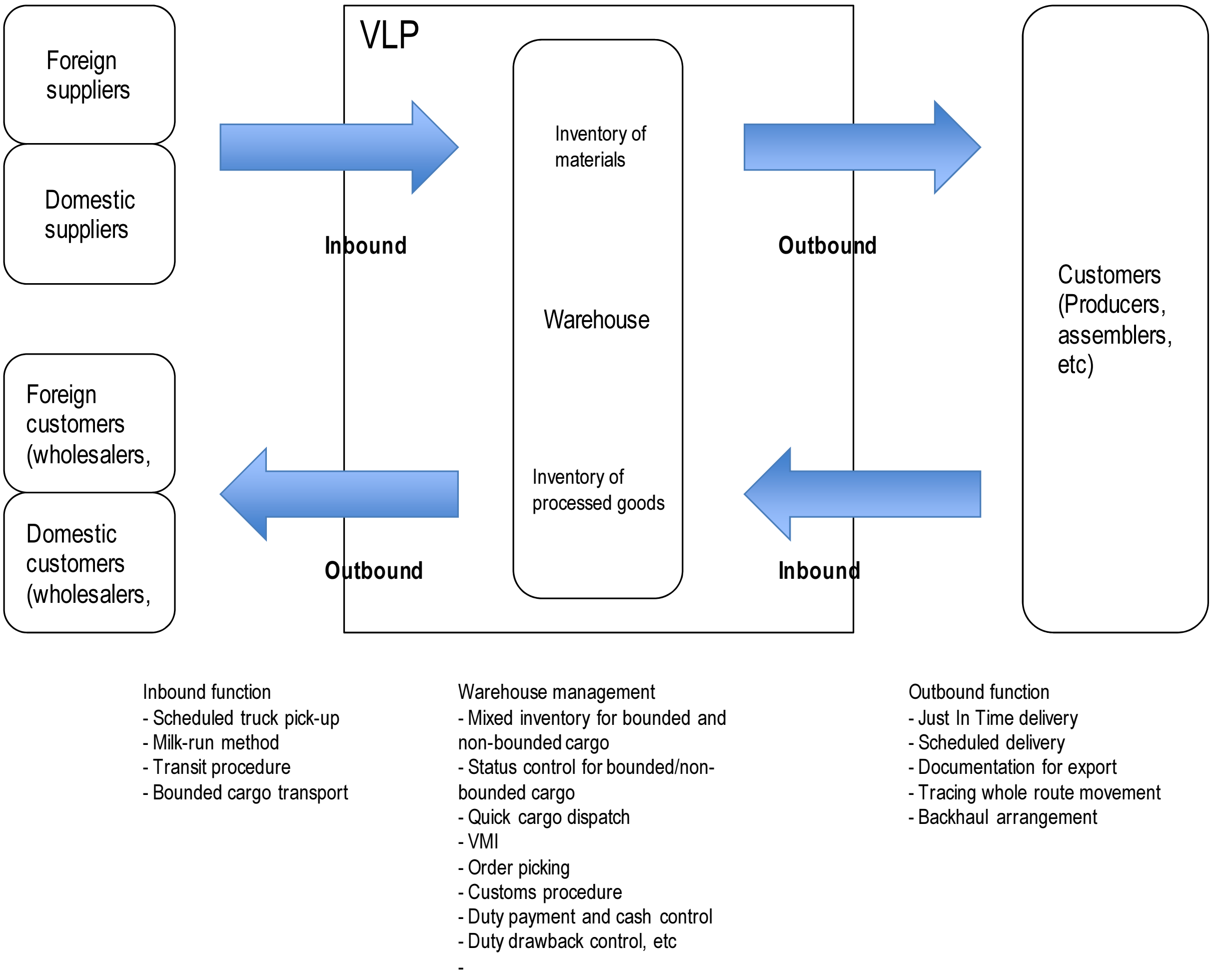


Source: JICA Study Team

Figure 4.2.7 Import/Domestic Function

(3) Dedicated Service

Observing past experience in advanced counties, it is deducible that the trend of out-sourcing non-core competence operations will be prominent, especially for customers serving a global market or facing global competition. For instance, it is certain that the export-oriented shippers who are likely to be located in VIP will expand their procurement or sales into the domestic market if the regulations allow it. As a result, cargo flow will become complex and it will be difficult to implement total control. This is because the number of participants will increase; the delivery area will become widespread encompassing both foreign and domestic markets; and the transactions will also become complicated for respective customers/vendors. This situation is likely to cause complex transactions that require accurate cargo handling operations while distinguishing bonded and un-bonded cargo status. Additionally, it is desirable to control total movement ranging from inbound to outbound movement as one stop solution in line with seeking optimal practical solution. Such measures aim to provide comprehensive and tailor-made services for designated customers with specific background; the quality of which is largely dependent on logistics provider's quality.



Source: JICA Study Team

Figure 4.2.8 Dedicated Service Model

Under the international logistics function, VLP provides several services as shown in Table 4.2.3.

Table 4.2.3 Service under Dedicated Logistics Function

Service	Detailed service
Inbound	In addition to domestic
	Alarm function for emergency/delay
	Alternative arrangement for emergency
Warehouse	In addition to domestic
	Collaborative management for foreign/domestic cargo
	Status change for foreign/domestic cargo
	Keep recording foreign/domestic inventory
	Duty drawback procedure
	Tax calculation for vendors
Outbound	In addition to domestic
	Documentation for export
	Monitoring tracing whole route movement even in foreign
	Backhaul arrangement

Note: Detailed services in gothic letters represent key services.

Source: JICA Study Team

4.2.4 Services Provided by VLP Pertinent to Target Goods

The services mentioned in previous section are roughly divided into 5 types of typical services, namely:

- CIQ
- Storage
- Inventory management
- Trans-shipment
- Multi-modal transport

ON the other hand, VLP does not target all goods passing through Friendship Bridge, but concentrates on certain goods under the current situation of customs system. In this regards, VLP will concentrate on:

- Import products to small industries and others by trucks
- Import products by railway
- Export products from small industries and others by trucks
- Export products by railway
- Domestic Distribution

The typical services by type of target goods are shown in the Table 4.2.4.

Table 4.2.4 Services by Type of Target Goods

Direction	Mode	Origin / Destination	Destination / Origin		Service				
			Large Industry	Small Industry	CIQ	Storage	Inventory	Transship	Multi-modal
Import from Thailand	By Truck	To VIP							
		Other		General Cargo	✔	✔	✔	✔	
	By Rail	To VIP	General Cargo (Industrial Material)		✔	✔		✔	✔
		Other	Petroleum, Heavy Bulk, General Cargo	General Cargo (Consolidated)	✔	✔	✔	✔	✔
Export to Thailand	By Truck	From VIP							
		Other		General Cargo (Consolidated)	✔	✔		✔	
	By Rail	From VIP	General Cargo (Industrial Products)		✔			✔	✔
		Other	Heavy Bulk, General Cargo		✔			✔	✔
Domestic	By Truck	-	General Cargo	General Cargo (Consolidated)		✔	✔	✔	

Source: JICA Study Team

4.2.5 Necessary Facilities in VLP

VLP needs various facilities to offer the services mentioned above. Several logistics facilities are separately required contingent upon the type of goods handled and upon type of service provided. VLP also needs some common facilities and management facility to work VLP as one designated area/facility.

Table 4.2.5 shows necessary facilities of VLP.

Table 4.2.5 Necessary Facilities in VLP

<table>
<tr><th></th><th>Function</th><th>Service</th><th>Facilities</th></tr>
<tr><td>Multi-modality</td><td>Rail transport
Road transport
Transfer between them</td><td>Railway transport
(container, non-container)
Road transport
Trans-shipment</td><td>Truck (truck terminal, parking lots etc.)
Railway siding line and coupling/decoupling yard</td></tr>
<tr><td rowspan="3">Multi-Activity</td><td>International Logistics</td><td>Cross-Border Service</td><td>CIQ office
CY</td></tr>
<tr><td>Domestic Logistics</td><td>Inbound transport service
Warehouse management
Delivery</td><td rowspan="2">CY and CFY for Heavy Bulk storage
CY and CFY for General storage

Customs Clearance on Chassis
Truck terminal
Imported car Storage</td></tr>
<tr><td>Dedicated Logistics</td><td>Inbound transport service
Warehouse management
Outbound</td></tr>
<tr><td rowspan="3">Multi-Service</td><td>Business Incubation</td><td></td><td rowspan="2">Administration office</td></tr>
<tr><td>Information Service</td><td></td></tr>
<tr><td>Support & related business</td><td></td><td>Maintenance shop
Office
Container Washing</td></tr>
<tr><td>VLP Operation & Management</td><td></td><td></td><td>Administration office
Temporary parking lots
Gate
Buffer
Road (in VLP and access road)</td></tr>
</table>

Source: JICA Study Team

4.3 Handling Cargo Volume

4.3.1 Methodology of Freight Demand Forecast at VLP

The freight demand forecast model, built for the export and import cargo, was originally developed for the national analysis to determine the national logistics strategy. It will also provide essential guidance in forecasting the freight demand at the micro level, such as cargo handled in the VLP. Adopting the comprehensive demand forecast model, the methodology of the freight demand forecast for the VLP is summarized below.

- The VLP, once developed, will replace the existing Thanaleng Warehouse, which currently handles only import cargo from Thailand. However, considering extension of the railway line between Thanaleng and Vientiane Station and use of the railway for both export and import cargo, the future demand was estimated for both import and export cargo.
- Compared to export and import cargo, the volume of transit cargo was observed as being minimal, especially that through Vientiane Capital. Accordingly, the future demand of the transit cargo was not counted during the demand forecasting exercise.
- The Vientiane Industrial Park (VIP), which is currently at its planning stage, is expected to generate a considerable amount of import and export cargo. The future freight demand in the VIP was separately estimated and some of it was added to the future handling volume in the VLP.

- Containerization is a worldwide trend. Thus, the commodity-wise future freight demand was categorized by packing type; container, general cargo, heavy bulk and petroleum, and the volume of the container cargo was separately estimated.
- As mentioned earlier, the extension project of the railway line is ongoing with the full support of the Thai Government and is expected to link the Thanaleng and Vientiane Station. In terms of the logistics, railway transport will significantly reduce the transport costs in case cargo is transported for long distances. Accordingly, the modal share between rail and truck was also estimated in this analysis.

4.3.2 Pre-conditions of Freight Demand Forecast

Using the comprehensive freight demand forecast model, built for the national analysis, the freight demand in the VLP was forecasted based on the following pre-conditions.

- The target year was set as Year 2025 with Year 2015 set as the intermediate year.
- Adopting the same socio-economic framework, annual GDP growth of 7.5% (from 2011 to 2020) and 7.0% p.a. (from 2021 to 2025) and population growth of 1.7% p.a. (from 2008 to 2025) were applied to the demand forecast model.
- The volume of VLP cargo estimated in this model consisted of (i) export and import cargo through Friendship Bridge and (ii) cargo generated from VIP.

4.3.3 Freight Generation/Distribution

As discussed above, the expansion factor was estimated by import/export and commodity. Using the same expansion factor, the import and export volumes to/from Thailand were estimated, which provided the control total for estimation of the cargo to be handled in the VLP. Table 4.3.1 shows the future import and export volumes in Year 2015 and 2025, indicating that export volume is relatively small compared to the import volume and that both import and export volumes would increase by 3 times by 2025.

Table 4.3.1 Forecasted Annual Import Volumes (Friendship Bridge)

Commodity Type	Forecasted Import Volumes (000 tons)			Expansion Factor	
	2009	2015	2025	2015/2009	2025/2009
1) Rice & Cereals	39	57	114	1.45	2.92
2) Animal Products	41	57	109	1.36	2.63
3) Sugar & Sugar Confectionary	17	16	21	0.96	1.28
4) Fruits & Vegetables	10	18	39	1.78	3.87
5) Animal Feed & Fertilizers	28	45	95	1.59	3.36
6) Minerals & Construction Materials	152	239	495	1.58	3.26
7) Chemical & Plastic & Industrial Materials	172	301	653	1.75	3.79
8) Manufactured Goods	169	270	553	1.59	3.26
9) Petroleum	271	449	945	1.66	3.49
10) Woods Products	16	26	56	1.62	3.46
Total	917	1,477	3,080		

Note: The figures show import volumes from Thailand.

Source: JICA Study Team

Table 4.3.1 Forecasted Annual Export Volumes (Friendship Bridge)

Commodity Type	Forecasted Export Volumes (000 tons)			Expansion Factor	
	2009	2015	2025	2015/2009	2025/2009
1) Rice & Cereals	1	1	1	1.08	1.26
2) Animal Products	0	0	1	1.24	2.13
3) Sugar & Sugar Confectionary	0	0	0	1.00	1.00
4) Fruits & Vegetables	3	5	9	1.57	2.89
5) Animal Feed & Fertilizers	1	1	1	1.18	1.68
6) Minerals & Construction Materials	48	78	157	1.61	3.24
7) Chemical & Plastic & Industrial Materials	1	2	4	1.67	3.21
8) Manufactured Goods	12	18	34	1.60	2.97
9) Petroleum	0	0	0	1.00	1.00
10) Woods Products	43	53	81	1.23	1.88
Total	109	159	289		

Note: The figures show export volumes to Thailand.

Source: JICA Study Team

4.3.4 Containerization Ratio

The tendency of container traffic is by and large determined by the global economic activities and tends to follow development trend of the developed countries. Thus, container throughput in Lao PDR was estimated by cross country analysis, which incorporates GDP and population (see the following equation).

$$CONT = 3.07^{-6} \times GDP + 0.0343 \times Pop \; (\mathrm{r2} = 0.93)$$

where, CONT: Annual container throughputs (million TEU), GDP: Nominal Gross Domestic Products (million USD), Pop: Population (million)

Table 4.3.2 Container Traffic and Socio-economic Indicators in Selected Countries

Country	2002 Container Throughput (million TEU)	Nominal 2002 GDP (million USD)	2002 Population (million)
Bangladesh	0.57	47,195	132.9
Pakistan	0.94	73,701	144.9
Viet Nam	2.28	35,063	79.7
Indonesia	5.75	200,111	211.4
Philippines	3.77	75,250	79.5
Egypt	1.86	84,200	66.6
Thailand	4.17	126,769	63.5
South Africa	2.76	110,518	45.5
Brazil	3.41	460,811	174.6
Turkey	1.88	184,165	70
Mexico	1.56	648,627	103.0
Italy	7.95	1,186,335	57.2

Country	2002 Container Throughput (million TEU)	Nominal 2002 GDP (million USD)	2002 Population (million)
Australia	3.82	399,358	19.6
Canada	3.30	735,965	31.4
Germany	9.48	2,022,210	82.5
France	3.28	1,457,369	59.5
U.K.	7.59	1,574,028	59.3
Japan	14.04	3,915,450	127.5
U.S.	30.81	10,469,600	288.4

Note: China (Container: 31.89 million TEU, GDP: 1,303 billion USD, Population: 1,3 billion) is excluded from analysis.

Source: Economic and Research Institute, Cabinet Office, Government of Japan

Applying the annual GDP growth of 7.5% (from 2011 to 2020) and 7.0% p.a. (from 2021 to 2025) and population growth of 1.7% p.a. (from 2008 to 2025), the container traffic in Lao PDR was estimated to reach 0.08 million TEUs, equivalent to 953,000 tons, by 2025. Excluding minerals and petroleum, the trade volume will reach 2,968,000 tons by 2025; meaning that 32% of the general cargo will be transported by containers. Table 4.3.3 shows containerization ratio up to 2025.

Table 4.3.3 Containerization Ratio

Year	2009	2015	2025
Import	9.9%	18.3%	32.1%
Export	5.9%	15.8%	32.1%

Note: Containerization ratio in 2009 was estimated based on the trip generation survey at Thanaleng Warehouse conducted by the Study Team.

Source: JICA Study Team

4.3.5 Packing Type

Commodities to be handled at the VLP can be categorized into the following 4 packing types: container, general cargo, heavy bulk and petroleum.

(1) Petroleum

VLP offers transfer service of petroleum from railway to trucks for transportation to existing oil depots in the short term: the oil depots function will be incorporated at the VLP when demand increases significantly in the medium to long term.

(2) Heavy Bulk Cargo and General Cargo

Heavy bulk cargo and general cargo are currently partially transported to private bonded warehouse or Thanaleng Warehouse by Thai trucks. Imported heavy bulk cargo such as construction materials and general cargo such as general merchandise and food products can be transferred from the railway or from Thai trucks to Lao trucks in the VLP.

(3) Container

Containerization is observed here in Lao PDR and the VLP will be equipped to handle the container cargo. The following tables define the packing types by commodity and show annual export and import volumes by packing type.

Table 4.3.4 Commodity and Packing Type

Commodity Type	Packing Type
1) Rice & Cereals	Container, General Cargo
2) Animal Products	ditto
3) Sugar & Sugar Confectionary	ditto
4) Fruits & Vegetables	ditto
5) Animal Feed & Fertilizers	ditto
6) Minerals & Construction Materials	Heavy Bulk
7) Chemical & Plastic & Industrial Materials	Container, General Cargo
8) Manufactured Goods	ditto
9) Petroleum	Liquid Cargo
10) Woods Products	Heavy Bulk

Source: JICA Study Team

Table 4.3.5 Annual Import Volumes by Packing Type (Friendship Bridge, Unit: 1,000 tons)

Packing Type	2009	2015	2025
Petroleum Freight	271	449	945
Heavy Bulk	168	266	550
General Cargo	430	624	1,076
Container	47	139	509
Total	917	1,477	3,080

Source: JICA Study Team

Table 4.3.6 Annual Export Volumes by Packing Type (Friendship Bridge, Unit: 1,000 tons)

Packing Type	2009	2015	2025
Petroleum Freight	0	0	0
Heavy Bulk	92	131	238
General Cargo	17	23	34
Container	1	4	16
Total	109	159	289

Source: JICA Study Team

4.3.6 Modal Share

The important feature of the VLP is the use of the railway transport, which could minimize the transport costs and hence the logistics costs to/from Lao PDR. Since the most of the import and export cargo is to/from Thailand and the VLP is to be directly or indirectly linked to the major ports in Thailand, a considerable portion of the cargo handled in the VLP would be transported by the railway. Taking an example of cargo volume in Thailand, the railway transports 17% of the fuel and 13% of the cement in terms of the tonnage-km. Generally, railway transports less value cargo or heavy cargo; hence the modal share can be explained by the unit value of the commodity (see the following formula).

$$RailShare(\%) = 0.42 + ln(UC)\,(r2 = 0.67)$$

where, UC: Unit cost of the commodity (USD/ton)

Table 4.3.7 2003 Cargo Volume by Transport Mode in Thailand (Unit: 1000 tons)

Commodity	Truck		Rail	
Fuel	31,301	(83.1%)	3,180	(16.9%)
Cement	24,665	(87.2%)	1,810	(12.8%)
Rice	26,436	(99.0%)	140	(1.0%)
Others	90,968	(99.5%)	220	(0.5%)

Note: The share is estimated by tonnage-km assuming that railway transports cargo for twice the distance of truck transport.
Source: JICA Study Team

Using the above formula, rail share is estimated by commodity type and by packing type as tabulated below.

Table 4.3.8 Commodity and Packing Type

Commodity Type	Unit Cost (USD/ton)	Rail Share
1) Rice & Cereals	216	10.8%
2) Animal Products	334	8.2%
3) Sugar & Sugar Confectionary	307	8.7%
4) Fruits & Vegetables	667	4.2%
5) Animal Feed & Fertilizers	241	10.1%
6) Minerals & Construction Materials	180	11.8%
7) Chemical & Plastic & Industrial Materials	2,325	0.0%
8) Manufactured Goods	2,143	0.0%
9) Petroleum	416	16.9%
10) Woods Products	268	9.5%

Note: Unit cost of each commodity is estimated based on C2000 data in 2007/08. The share of petroleum is assumed to be the same as that of Thailand.

Source: JICA Study Team

For the container cargo, the rail share can be estimated by referring to the empirical studies. One of the studies by JICA (Dedicated Multimodal High-axle Load Freight Corridors with Computerized train control system on Mumbai-Delhi and Delhi-Howrah, 2006) revealed the relationship between rail share and the level of service between railway and trucks (see the following formula).

$$RailShare(\%) = \frac{e^{f(x)}}{1+e^{f(x)}}$$

$$f(x) = 3.43 - 2.19 \times \frac{Trail}{Troad} - 1.55 \times \frac{Crail}{Croad}\,(r2 = 0.98)$$

where, T: Haulage and dwell time (hour), C: Haulage cost (USD/FEU)

Using this formula, the rail share of the container cargo was estimated to increase to 34.8% by 2025. Table 4.3.9 summarizes the estimated rail share by packing type.

Table 4.3.9 Estimated Rail Share by Packing Type

Packing Type	2009	2015	2025
Petroleum Freight	0%	6.3%	16.9%
Heavy Bulk	0%	4.4%	11.6%
General Cargo	0%	3.4%	9.1%
Container	0%	13.0%	34.8%

Note: The share of petroleum was assumed to be the same as that of Thailand.

Source: JICA Study Team

4.3.7 Freight Demand at VIP

The VIP is scheduled to be implemented in 3 phases. During Phase 1 (by 2015), 96 ha of factory lots will be constructed together with other facilities and 8.7 ha of the factory floor area will be in actual operation, assuming the floor area amounts to 30% of the total factory lots. During Phase 2 (by 2025), the factory floor area will be fully utilized and increase to 150 ha.

Table 4.3.10 Development Phases of VIP

Year	Phase 1	Phase 2	Phase 3
	2015	2025	after 2025
Development Area			
Factory Lot (ha)	96.4	483.0	1,078.0
Residential Lot (ha)	5.0	50.0	140.0
Commercial Lot (ha)	0.0	10.0	37.5
Logistic Lot (ha)	0.0	7.0	21.0
Factory Floor Area			
Floor %	30%	30%	30%
Ave. floor	1	1	1
% of Operation	30%	100%	100%
Factory Floor Area in Operation (ha)	8.7	144.9	323.4

Source: JICA Study Team

The trip generation survey was conducted by selecting 10 manufacturing companies and counting the number of vehicles and the volume of cargo generated from those companies. The results of the survey show that the average volume of cargo generated from the company reaches 51.0 ton per floor ha (see the details in Appendix). Accordingly, the VIP will generate 137,000 tons and 2,290,000 tons of cargo by 2015 and 2025, respectively; with 96,000 tons of export cargo and 1,604,000 tons of import cargo, assuming that imports and exports take up a 70% share of all the products.

Assuming that the VLP would handle export and import cargo transported by railway and consolidated cargo generated from the VIP, 2,000 and 179,000 tons of cargo (EXIM cargo by railway) and 10,000 and 46,000 tons of cargo (consolidated cargo) are expected to be cleared through the VLP.

Freight demand derived from the VIP is potential demand and this causes a controversy as to whether the freight demand derived from the VIP should or shouldn't be included in the freight demand exercise since the realization of the VIP is still uncertain. Looking at the progress of the industrial park in Vientiane (Development of the industrial park is currently ongoing, implemented by Taiwan company in/near the planned site of the VIP. According to the local newspaper, 50ha will be developed for the industrial park in the initial stage with an additional 100ha developed in the next phase.)

Table 4.3.11 Cargo Demand Generated from VIP

Year	Stage 1	Stage 2	Note
	2015	2025	
Freight Demand			
Factory Floor Area in Operation (ha)	8.7	144.9	A
Freight Volume Generated (1000 tons/year)	137	2,291	B: A* 51 ton/ha* 310 days
EXIM Cargo Generated (1000 tons/year)	96	1,604	C: B* 70%
Cargo Demand in VLP (by Rail)			
Containerized Ratio (%)	18.3	32.1	D
Rail Share (%)	13.0	34.8	E
Container Cargo Demand in VLP (1000 tons/year)	2	179	F: C*D*E
Cargo Demand in VLP (Consolidated)			
Consolidation Ratio (%)	10.0	20.0	G
Consolidated Cargo Demand in VLP (1000 tons/year)	10	46*	H: C*G

Note: * Consolidated cargo volume was estimated assuming that a logistics park is built in the VIP with only 1/7 of the demand handled in the VLP.

Source: JICA Study Team

4.3.8 Summary of the Results of Freight Demand Forecast at VLP

Table 4.3.12 shows the future freight demand at the VLP. The results of the demand forecast for the VLP cargo are summarized below.

- Using cross country analysis, 32% of the general cargo in Lao PDR was estimated to be transported by containers by 2025.
- Adopting a liner and regression formula to estimate the share of the railway, the share of railway for the EXIM cargos to/from Thailand was estimated at 17% (petroleum), 12% (heavy bulk), 9% (general cargo) and 32% (container) by 2025.
- The handling volume at the VLP would double the volume handled at the current warehouse by 2015 (1,297 tons/day by truck and 288 tons/day by rail) and would increase to six times the volume handled at the warehouse by 2025 (2,559 tons/day by truck and 2,412 tons/day by rail).
- The share of the railway for the VLP cargo will reach 18% by 2015 and 49% by 2025.
- The share of VIP related cargo handled in the VLP will reach 3% by 2015 and 17% by 2025.

Table 4.3.12 Daily Cargo Demand in VIP (Unit: tons/day)

Mode of Transport	Truck			Rail		
Year	2009	2015	2025	2009	2015	2025
Import Cargo						
Petroleum Freight	0	0	0	0	92	515
Heavy Bulk	250	396	759	0	37	206
General Cargo	469	700	1,137	0	68	315
Container	99	141	386	0	59	571
Export Cargo						
Petroleum Freight	0	0	0	0	0	0
Heavy Bulk	0	18	81	0	18	89
General Cargo	0	3	12	0	3	10
Container	0	1	8	0	2	18
VIP cargo						
Container	0	37	176	0	9	689
Total	818	1,297	2,559	0	288	2,412

Daily cargo demand was estimated assuming 260 working days for trucks and 310 working days for railway, and

Source: JICA Study Team

4.3.9 Traffic Volume at VLP

The previous discussion revealed how tonnage of the future cargo handled at the VLP was estimated. Next topic discussed in this section is how the traffic demand to transport the estimated cargo demand at the VLP was estimated. Firstly, the analysis enabled estimation of the number of trucks necessary to transport the cargo to/from the VLP. The analysis continued with discussion of the number of trains to/from the VLP.

(1) Number of Trucks for VLP Cargo

1) Average Loading Weight by Truck

Table 4.3.13 summarizes the average loading weight by truck type, prepared from the results of the trip generation survey at the Thanaleng Warehouse. Considering tonnage of the future freight demand at the VLP, the truck-wise average loading weight was estimated as tabulated in Table 4.3.13. It should be noted that average loading weight of the container truck was separately estimated at 24 tons per 40 feet equivalent unit (FEU) from the trip generation survey conducted at the Thanaleng Warehouse.

Table 4.3.13 Average Loading Weight by Truck Type (Unit: tons/truck)

Type of Package	2 Axles Bed/Roof Truck	3 Axles Bed/Roof Truck	4 Axles Bed/Roof Truck	Articulated Truck	Tanker	Trailer	Total
(1) Empty							0
(2) Less than 1/4 (25%)							0
(3) 1/4 (25%)		8.0					8.0
(4) 1/2 (50%)	7.2	0.7		15.0			6.6
(5) 3/4 (75%)	10.0	3.3				25.0	18.5

Type of Package	2 Axles Bed/Roof Truck	3 Axles Bed/Roof Truck	4 Axles Bed/Roof Truck	Articulated Truck	Tanker	Trailer	Total
(6) Full (100%)	7.0	8.9	16.2	23.0	23.3	23.4	17.1
Average	7.2	8.5	16.2	22.9	23.3	23.6	16.8

Source: JICA Study Team

Table 4.3.14 Average Loading Weight by Truck Type

Packing Type	3 and more axles	Trailer
Petroleum Freight	12.0	12.0
Heavy Bulk	12.0	24.0
General Cargo	12.0	24.0
Container (40 FEU)		24.0

Source: JICA Study Team

2) Number of International Trucks at VLP

There are 2 types of transport generated from the VLP, namely: domestic and international transport. The following analysis reveals the volume of the international transport (trucks), mainly to/from Thailand, at the VLP.

The number of international trucks at the VLP was estimated by dividing the daily future freight demand by the average loading weight. For export and import cargo, average loading weight of the trailer was adopted for estimation of international trucks delivering to/from the VLP. Table 4.3.15 summarizes the estimated number of international trucks and indicates that 56 and 103 international trucks will use the VLP to transport export and import cargo in 2015 and 2025, respectively.

Table 4.3.15 Number of International Trucks at VLP (Unit: trucks/day)

Packing Type	2015		2025	
	Import	Export	Import	Export
Heavy Bulk	17	1	32	4
General Cargo	30	1	48	1
Container	6	1	17	1
Sub-total	53	3	97	6
Grand Total	56		103	

Source: JICA Study Team

3) Number of Domestic Trucks at VLP

For estimation of the trucks delivering export and imported cargo to the domestic market in Lao PDR, average loading weights of both truck (for mixed loading cargo) and trailer (for full loading cargo and cargo by railway) were adopted for estimation of the number of domestic trucks at the VLP. Table 4.3.16 summarizes the estimated number of domestic trucks and shows that 81 and 214 domestic trucks will use the VLP to transport export and import cargo to the local market in 2015 and 2025, respectively.

Table 4.3.16 Number of Domestic Trucks at VLP (Unit: trucks/day)

Packing Type	2015		2025	
	Import	Export	Import	Export
Full Loading				
Heavy Bulk	16	0	29	0
General Cargo	29	0	43	0
Container	6	0	13	0
Sub-total	51	0	85	0
Mixed Loading				
Heavy Bulk	2	2	7	7
General Cargo	3	1	10	1
Container	2	1	7	1
Sub-total	7	4	24	9
Railway				
Petroleum Freight	8	0	43	0
Heavy Bulk	2	1	9	4
General Cargo	3	1	14	1
Container	3	1	24	1
Sub-total	16	3	90	6
Grand Total	81		214	

Note: Mixed loading cargo was assumed to reach 10% of all the cargo handled at the VLP by 2015 and 20% by 2025.

Source: JICA Study Team

(2) Number of Railways for VLP Cargo

Railway transport will provide means to minimize the transport costs and hence the logistics costs in Lao PDR. A significant proportion of the cargo handled at the VLP will be transported by railway. The previous discussion estimated that around 10% of the general and heavy bulk cargo, 17% of the petroleum and 35% of the containers would be transported by railway.

Using the same methodology for estimation of the volume of the trucks at the VLP, adopting average loading weight, the number of trains required to transport export and import cargo at the VLP can be estimated. The number of trains required for VLP cargo and its operations was estimated in Section 5.1.3 Railway in Chapter 5.

4.4 Location

4.4.1 Selection of Project Site

Location is one of the important factors for VLP to perform well. Candidate locations of VLP were chosen, considering following criteria,

- Less urbanized and less populated area
- An area with easy access to the trunk road and railway

- An area where the freight vehicles have less adverse impact on urban activities and urban transport
- An area with no future development plan
- An area where infrastructure can be easily developed
- An area with less environmental adverse impact

Accordingly, following 4 alternative project sites were identified as meeting the above-mentioned criteria.

- Alternative A: South-west side of Thanaleng Station
- Alternative B: Around Thanaleng Station
- Alternative C: Vientiane Station (planned)
- Alternative D: Inside planned Industrial Park

These alternatives were compared from the following points of view:

- Topographic features
- Current land use
- Land ownership
- Accessibility (road, railway)
- Linkage with Industrial Estate
- Consistency with the existing urban plan of the Vientiane City
- Readiness for Implementation
- Flexibility for future expansion
- Environment impact (natural, social, resettlement)
- Cost (land acquisition cost, construction cost, O&M cost)

The detailed comparison of all alternatives is summarized in Table 4.4.1, and its evaluation results are summarized in Table 4.4.2. From these two tables, it can be said that Alternative B was deemed to be more suitable as the location of VLP since it was more advantageous in terms of accessibility, flexibility for future expansion and project cost. Thus, Alternative B was selected as the most suitable location of VLP.

Source: JICA Study Team

Figure 4.4.1 Alternative Sites for Development of Vientiane Logistics Park

Table 4.4.1 Comparison of Proposed VLP Sites in the Vientiane Capital

No	Item	A: South-west side of the Thanaleng Sta.	B: Around the Thanaleng Sta. (Xaysetha)	C: Vientiane Sta. Present status: Planned (Xaysetha)	D: Inside the planned Industrial Park (Xaysetha)
1	Topography (Topographic features)	Bad The area is very rough with a large hole (former borrow pit).	Fair Flat, hilly land with a gentle slope to the east.	Good The area is a rice paddy field.	Fair The area is flat with a gentle slope.
2	Current land use	Good Several aquaculture ponds exist. Partially bush and secondary forest area.	Good Partially bush and secondary forest area. Crop land such as fruits and vegetable fields exists.	Bad Scattered local residential area surrounded with rice paddy fields.	Fair There are some houses and paddy fields.
3	Land ownership	Bad The areas are part of the Dongphosy Protected Area under the Vientiane Capital. It was agreed that some part of the area around Thanaleng Sta. would be transferred from the Vientiane Capital to the Railway Authority. However, the detailed schedule of the transfer is not clear yet (see Section 7.3 for more detailed information about future land use plan of Dongphosy Forest Reserve).		Bad The present land ownership of the area is not clear. However the area is located in residential area. Therefore, compensation and resettlement for those people should be taken into consideration.	Fair It is observed in the land register that some of the land in the area belongs to individuals.
4 Accessibility					
	4-1 Road*	Good Access road needed with length of about 700 m from current CIQ office at Friendship Bridge.	Good Access road needed with length of about 500 m from 450 years road or 5 Km from NR-1. Current approach road to Thanaleng Station can be substituted.	Bad Access road is needed with length of about 5 km from 450 Years Road.	Good Approach road to 450 Years Road is available. Road improvement will be required in future.
	4-2 Linkage to Railway** (to realize multi-modality)	Fair Nearest station is Thanaleng Station. Feeder rail line is needed to use railway.	Good Nearest station is Thanaleng Station. Site is along the railway line without feeder rail line.	Good Nearest station is Vientiane Station (planned). Site is along the railway line without feeder line.	Bad Nearest station is Vientiane Station It is necessary to construct feeder rail line, if railway is needed.
	4-3 Linkage to Industrial Estate	Fair It is necessary to newly construct access road to 450 years road, approximately 1 km for short-cut. Otherwise, NR-1 may be used to connect to 450 Years road (approximately 15 km of distance).	Fair It is necessary to newly construct access road to 450 years road, approximately 1 km for short-cut. Otherwise, NR-1 may be used to connect to 450 Years road (approximately 15 km of distance).	Fair It is necessary to newly construct access road to 450 years road, approximately 5 km distance.	Good The area is located inside the Industrial Park.
5	Consistency with the existing urban plan of Vientiane City***	Bad The area is categorized as Provincial Protected Area of Vientiane Capital.	Fair The area is categorized as Provincial Protected Area of Vientiane Capital.	Bad The area is categorized as Urban Expansion Area.	Good The area is categorized as Industrial Area.
6	Readiness for Implementation	Bad The implementation of the project	Bad The implementation of the project needs	Bad Should be constructed after railway	Fair It is necessary to construct it as a part

No	Item	A: South-west side of the Thanaleng Sta.	B: Around the Thanaleng Sta. (Xaysetha)	C: Vientiane Sta. Present status: Planned (Xaysetha)	D: Inside the planned Industrial Park (Xaysetha)
		needs official approval since the project site is located in reserved area.	official approval since the project site is located in reserved area.	extension project. There is uncertainty as to when the VLP project can start. Implementation schedule is uncertain depending on implementation of railway project.	of industrial estate, resulting in waiting until implementation of industrial estate. Implementation schedule is uncertain depending on implementation of railway project.
7	Flexibility for future expansion	Bad Land may be available but more land preparation (filling) is needed: which is very costly.	Fair More public land is available behind the site.	Bad Approximately 50 ha of private land is designated as Vientiane station area including logistics park, but it is necessary for future expansion to carry out another designation process and land acquisition with resettlement.	Fair Industrial estate plan designates enough logistics area with land reserved for future expansion of logistics. However, land acquisition with resettlement will be needed.
8 Environment					
	8-1 Social	Bad **Resettlement:** 4 houses exist. Also, rice paddy fields exist around feeder railway line, so additional land take for construction of feeder railway line will be required (A= 4 ha: 500 m x 80 m). No land-take occurs for construction of access road to this candidate site. **Land Use:** According to future land use plan of Dongphosy Forest Reserve, this candidate site is categorized as border market.	Bad **Resettlement:** Approximately 30 houses exist. No land-take occurs for construction of access road. "Slush-and-burn"-based agricultural activities are common. Fish ponds and rice paddy fields exist at lowland part of this candidate site. **Land use:** According to future land use plan of Dongphosy Forest Reserve, this candidate site is categorized as land for railway authority.	Bad **Resettlement:** One house exists, but expropriation of private lands (agricultural) would be inevitable. Current access roads to this VLP site are local feeder roads, not wide enough. So, certain amounts of road widening and relevant set-back would be required. **Land use:** Alternative site C, including Vientiane Station (planned), is mainly used as agricultural land. Besides, some parts of them are used as residential areas.	Bad **Resettlement:** No house exists, but expropriation of certain amounts of private lands would be inevitable. Also, land take for construction of feeder railway line will be required (A = 16 ha: 2000 m x 80 m). No land take will be required for construction of access road. **Land Use:** Local land use of VLP project site of this option is mainly classified as agricultural and sparse forest lands.
	8-2 Natural	Bad **Flora/fauna:** Located within Dongphosy Forest Reserve. **Topography:** Significant topographic change due to large-scale landfill and relevant earthwork. Also, embankment of feeder railway line (L ≈ 500 m, H = 7 m) will appear. **Local Hydrology:** Need	Bad **Flora/fauna:** Located at hilly place of Dongphosy Forest Reserve. Most flora is classified as secondary-type, with shrubs and remnants of big trees such as Dipterocarpus. Many rice fields or crop-lands exist around these secondary forests. **Topography:** Large-scale earthwork (e.g., open-cut) will be required for VLP	Fair **Topography and land use:** Located in the middle of rice paddy field, outside of Dongphosy Forest Reserve. **Local Hydrology:** Candidate site was flooded during 2008 flood events.	Bad **Topography and land use:** Classified as sparse forest and agricultural lands (located outside of Dongphosy Forest Reserve). Significant topographic change due to construction of feeder railway embankment (L≈ 2000 m, H = 7 m) will appear. **Local Hydrology:** Feeder railway

No	Item	A: South-west side of the Thanaleng Sta.	B: Around the Thanaleng Sta. (Xaysetha)	C: Vientiane Sta. Present status: Planned (Xaysetha)	D: Inside the planned Industrial Park (Xaysetha)
		consideration for change of regional drainage, caused by existing railway, proposed feeder railway lines and hilly terrain of Dongphosy Area.	construction **Local Hydrology:** Irrigation channels and ponds exist around lowland part of candidate site.		line (L≈ 2000 m, H = 7 m) is to be extended from Vientiane Station (planned) to this candidate site, passing through flood-prone wetland around Houay Makhiao River.
	8-3 Pollution	Bad **Waste:** Need waste treatment of vegetation, by-products of ground clearance activities for VLP construction. **Water Quality:** Need proper treatment of turbid water during construction period to avoid accidental discharge of construction effluents. **Noise/Vibration and Air Quality:** Worsened roadside noise/vibration and air quality environment during construction period. **Ground Subsidence:** Risk of ground subsidence due to landfill. May need additional environmental considerations for borrow pit site, used for landfill for VLP construction.	Fair **Waste:** Need waste treatment of vegetation, by-products of ground clearance activities for VLP construction. Need enough soil dump site for excavated soil. **Water Quality:** Need proper treatment of turbid water during construction period to avoid accidental discharge of construction effluents. **Noise/Vibration and Air Quality:** Worsened roadside noise/vibration and air quality environment during construction period.	Bad **Waste:** Need proper treatment of construction waste. **Water Quality:** Need proper treatment of turbid water during construction period to avoid accidental discharge of construction effluents. **Noise/Vibration and Air Quality:** Worsened roadside noise/vibration and air quality environment during construction period. **Ground Subsidence:** Risk of ground subsidence by landfill and/or embankment. May need additional environmental considerations for borrow pit site, used for landfill for VLP construction.	Bad **Waste:** Need proper treatment of construction waste. **Water Quality:** Need proper treatment of turbid water during construction period to avoid accidental discharge of construction effluents. **Noise/Vibration and Air Quality:** Worsened roadside noise/vibration and air quality environment during construction period. **Ground Subsidence:** Risk of ground subsidence by embankment construction of feeder railway line (L≈ 2000 m, H = 7 m). May need additional environmental considerations for borrow pit site, used for landfill for VLP construction.
9 Cost					
	9-1 Land Acquisition Cost	Fair VLP site is categorized as government land. Land acquisition cost is required for feeder railway line connecting VLP and existing railway line.	Fair VLP site is categorized as government land. However, agricultural land exists, so that land acquisition cost is required as well as RAP.	Bad VLP site is categorized as agricultural land, so that land acquisition cost is required.	Bad VLP site is categorized as agricultural land, so that land acquisition cost is required. Also, another land acquisition cost is required for feeder railway line connecting VLP and Vientiane Station (planned).
	9-2 Construction Cost	Bad High land preparation costs are incurred.	Good Construction cost can be minimized with limited volume of land preparation.	Bad Construction costs of access road are additionally incurred.	Bad Construction of feeder rail line is additionally needed.
	9-3 Operation &	-	-	-	-

No	Item	A: South-west side of the Thanaleng Sta.	B: Around the Thanaleng Sta. (Xaysetha)	C: Vientiane Sta. Present status: Planned (Xaysetha)	D: Inside the planned Industrial Park (Xaysetha)
	Maintenance Cost	More or less the same	More or less the same	More or less the same	More or less the same
10	Overall Evaluation and Major Constraints	3rd Priority	1st Priority	4th Priority	2nd Priority
	Technical Constraints	Less flexibility for future expansion	Least constraints	Implementation schedule dependent on railway project	Implementation schedule dependent on industrial park project Inconvenience of railway connection
	Environmental Constraints	-Large-scale landfill of swamp and/or lowland areas -Impacts on Dongphosy Forest Reserve（VLP） -Water quality degradation of nearby surface/sub-surface water. -Ground subsidence at VLP -Land acquisition for feeder railway line.	-Impacts on Dongphosy Forest Reserve（VLP） -Treatment of construction waste during construction period. -Water quality degradation of nearby surface/sub-surface water. - Land acquisition for VLP.	-Ground subsidence at VLP -Land acquisition for VLP and access road -Worsened regional drainage due to construction of VLP foundation and long-distance embankment for access roads and/or railway extension.	-land acquisition for feeder railway line extension -Worsened regional drainage due to construction of long-distance embankment for feeder railway line extension. -Soil erosion due to railway extension -Large-scale landfill of swamp and/or lowland areas
	Cost	Higher cost	Least cost	Higher cost	Higher cost

Note:

* The distance is measured as the shortest on the map between the approximate center of each site and the road described as the nearest main road.

** The distance is measured as the shortest on the map between the approximate center of each site and the train station described as the nearest existing station.

*** Categories described in the table are referred to in the existing urban plan of the Vientiane City, The Vientiane Development Plan for 2000 – 2010, prepared by the Public Transport Institute (PTI) in the MPWT.

Table 4.4.2 Summary of Alternative Evaluation

	Alternative A	Alternative B	Alternative C	Alternative D
Good	2	4	2	3
Fair	4	6	2	5
Bad	8	4	10	6

Source: JICA Study Team

4.5 Layout Concept

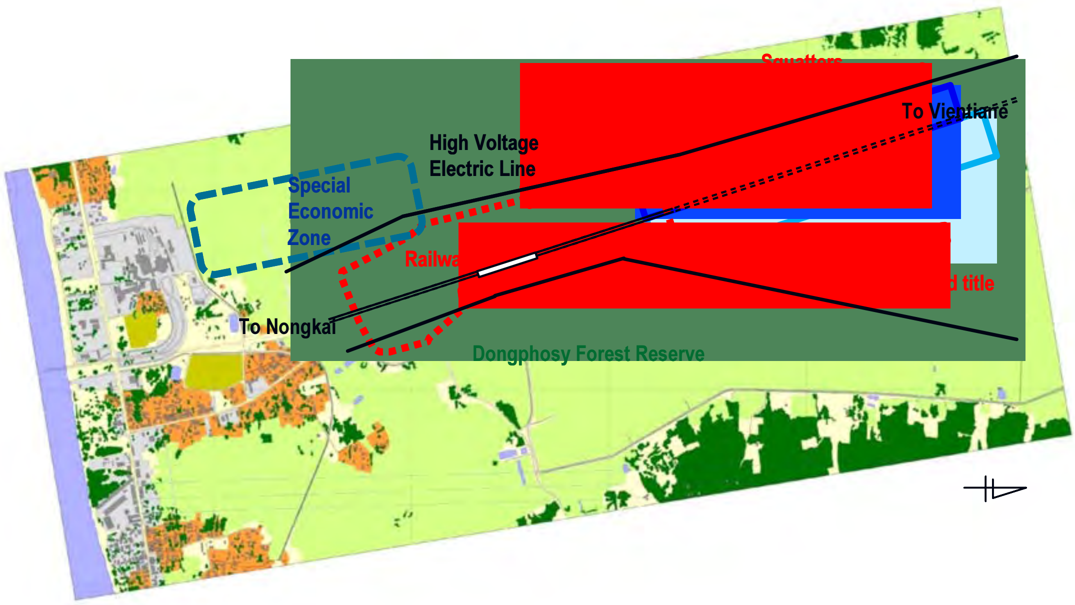
4.5.1 Preconditions

(1) Physical Conditions

The area around Thanaleng Station is shown in Figure 4.5.1. The area is designated as Dongphosy Forest Reserve area. The area surrounding the forest is low-land utilized as paddy fields. The center of Dongphosy Village is located south of the forest along the NR-1 or Mekong River. Friendship Bridge and CIQ office are located south of the forest. Some residents are scattered at the edge of the forest on the eastern side.

The forest and surrounding area have several facilities and development projects, which were used as control points in the physical planning. They are:

- High voltage electric line west of the railway in the forest
- Thanaleng Station and railway extension project
- 450 Years Road south of the forest
- Dongphosy Commercial SEZ.



Source: JICA Study Team

Figure 4.5.1 Preconditions of VLP Site

The area outside Dongphosy forest is private land used for cultivation: to mitigate negative impacts on social environment, in particular resettlement, VLP should be located within Dongphosy Forest Reserve. In addition, railway area (red-color dotted area) should be reserved for future rail development to accommodate coupling/decoupling tracks and pool lines and access roads to VLP. This results in limiting the available land to the north of the station area.

Considering the current site conditions above, available land for VLP can be:

- 150 X 1,500m in the western side (blue color area) and,
- 250 X 1,700m in the eastern side (light-blue color area).

(2) Railway Design Conditions

Prior to delineation of layout plan of VLP, it is necessary to roughly examine railway design conditions since railway development has less flexibility in terms of gradients, radius of curve and length. The following items are the design conditions of railway in Thanaleng:

- Height of rail track is about 160.5 m at connection to existing Thanaleng Station.
- Main line between Thanaleng Sta. and VLP will be straight.
- Coupling/decoupling function is served at Thanaleng Station.
- Maximum train length: 286m
- Effective length:
  - 321m for container train (equivalent to one train)
  - 188m for other trains (equivalent to half train).
  - Decoupling is not considered for container train due to mainly block train.
- No. of coupling/decoupling tracks: 2 lines are installed for coupling and decoupling for one train.
- No. of pool lines: 1 line in 2015 and 3 lines in 2025. (for pooling waiting trains and/or broken-down trains).
- Turnout No: No. 10 (for pool lines, turnout No. 8 to be used).
- Distance between tracks:
  - Main line and siding: 4.5m between main line and the first western siding; with 8.5m to allow for future expansion.
  - Siding and siding: 4.0m

It was established that it is better to position the coupling/decoupling yard on the western side since the Thanaleng Station facilities exist on the east side, with the application of the above conditions to the location of the VLP in the Thanaleng area and given the following considerations:

- If the VLP placed on the east side, the yard would have to placed behind the station, resulting in failure to get adequate land due to high voltage line running behind the station.
- The placement of the VLP north of the station is possible but some land outside the forest would be required: hence land acquisition from local people, and the subsequent resettlement and compensation. Project costs would be much higher due to increased land reclamation costs.

4.5.2 Preliminary Layout Plan

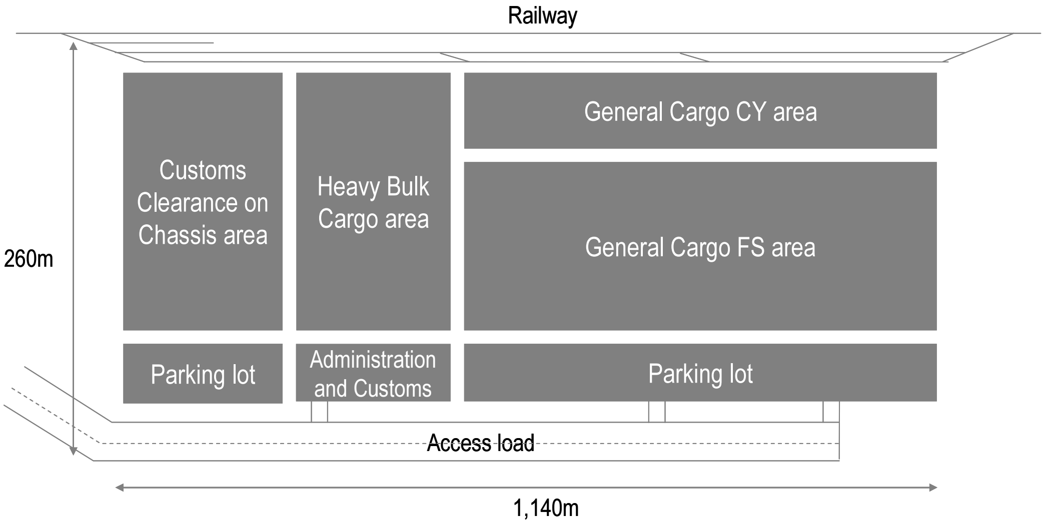
Preliminary layout plan aims at determining rough layout plan. As regards the VLP site, there are 2 alternatives in terms of arrangement of facilities around railway line, namely:

- Alternative A: one-side development
- Alternative B: 2-side development

(1) Alternative A

This is the plan for VLP arranged on the eastern side of railway line. There is a high-voltage line to the west about 160m from main line, such that land area would not suffice if all necessary facilities were distributed on western side of railway line. For arrangement of facilities on the eastern side, it is possible to extend park 260m from the railway line. The eastern side development allows more flexibility in terms of distribution of all necessary facilities and future expansion. The necessary area for VLP is a rectangular area of 260m width and 1,140 m length, for a total area of 29.6 ha.

Layout plan of the alternative A is illustrated in Figure 4.5.2.

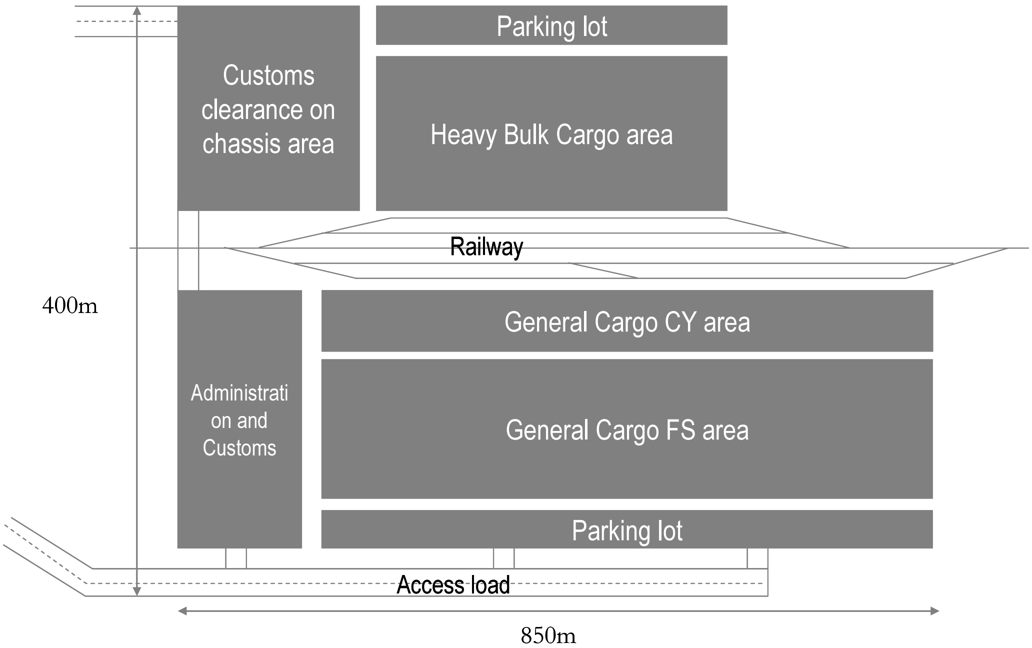


Source: JICA Study Team

Figure 4.5.2 Layout Plan of Alternative A

(2) Alternative B

Alternative B plans to distribute all necessary facilities both sides of the railway. VLP is roughly divided into 2 zones. The container and general cargo terminal are distributed on the eastern side, while trans-shipment, import car space and bulk terminal are located on the western side. As a result, the VLP would cover 400 m width on both sides. The total area of VLP would be 29.4 ha. This alternative has the disadvantage of generating traffic across the railway line. The layout plan of alternative B is illustrated in Figure 4.5.3.



Source: JICA Study Team

Figure 4.5.3 Layout Plan of Alternative B

(3) Comparison and Results

Comparison study is made to clarify advantages and disadvantages of both alternatives. Table 4.5.1 shows results of comparison.

Alternative A has generally no critical disadvantages except for future expansion, while Alternative B has some critical disadvantages that include higher construction costs and negative impacts on railway operations. As a result, Alternative A is recommended as preferable layout for the development of VLP.

Table 4.5.1 Comparison between Alternative A and Alternative B

Item	Alternative A	Alternative B
Characteristics	East side of railway	Both sides of railway
Area	29.6 ha	29.4 ha
Traffic Flow in VLP	Fair Trip length, in particular communication with CIQ office, will be less favorable due to long rectangular shape of layout. Some traffic flow may be duplicated, resulting in risk of traffic congestion	Good Trip length, in particular communication with CIQ office, will be more favorable due to roughly square shape of layout. Duplication of traffic flow is minimal.
Effects on Railway operations	Good No traffic across railway main line	Poor Lots of traffic across railway main line
Road Access	Good: One access road is enough to connect to NR-1.	Poor Two access roads are necessary to connect to NR-1.
Cost	Good Land reclamation cost is minimal.	Poor Land reclamation cost is higher due to more cut and filling.
Future Expansion	Poor Need to use west side.	Good Available northern part of west side
Total	Good Economical and upholds function of VLP and railway operations	Fair Higher costs and negative impacts on railway operation

Source: JICA Study Team

4.5.3 Layout Plan

(1) Layout Policy

It is important for VLP to provide functional and smooth operation for customers on the land designated above. Since VLP has several different types of activities and facilities, it is essential for VLP to be developed with functional layout plan. In this regard, the following considerations are the important layout policy for VLP:

- Minimum collision of the traffic flow between rail cargo and truck cargo in VLP
- Minimum distance in both traffic/freight flow and flow of the custom procedure
- Location of CY and CFS to keep good connectivity between rail and truck
- Attention to avoid negative impacts from other commodities
- Functional location of bonded warehouses for supplying stocks to, e.g., VIP and SME.
- Functional location of truck terminals serving inner VLP and intercity delivery
- Consideration to avoid traffic congestion around VLP to select good location of parking lots
- Consideration of future expansion (even after 2025)
- Consideration of location of storage space for petroleum products to maximize safety

(2) Layout Planning Process

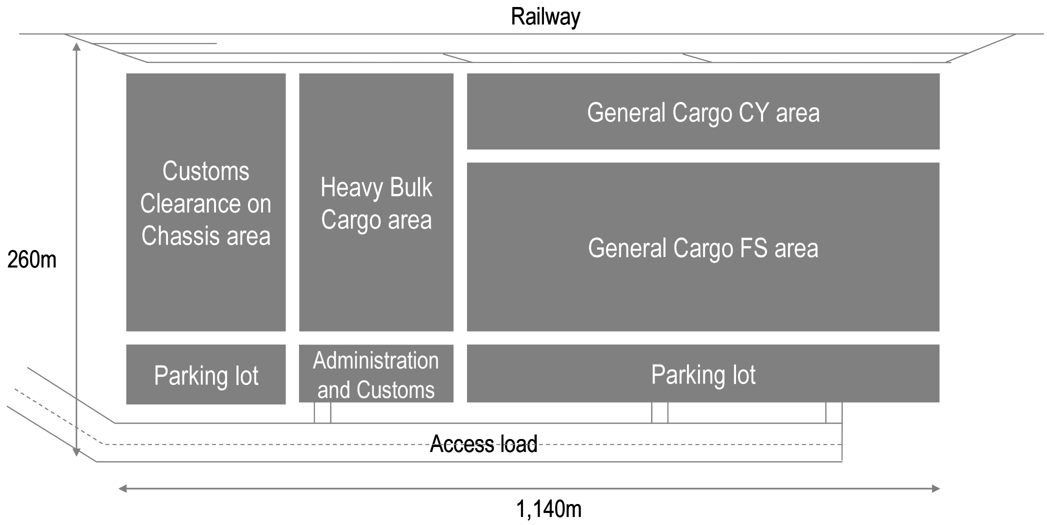
Locations of CY and CFS are decided based on the railway alignment. Locations of administration and customs office, customs clearance on chassis, imported vehicle storage area, truck terminal, and container washing area and maintenance shop are flexible in relation to the railway, but follow the layout policy.

As the first step of layout planning, the locations of CY and CFS are designated. The designation of locations of CY and CFS is followed by designation of locations of heavy bulk and general cargo areas so as to avoid negative impacts on CY and CFS. Then, location of parking lots is designated in relation to the location of CY and CFS. Location of administration and customs office is then selected to ensure good accessibility for frequent customers of CY and CFS. Designation of locations of customs clearance on chassis, imported vehicle storage area, and truck terminal then follows. Finally, maintenance shop and employee’s parking lot are allocated to the remaining spaces.

(3) Layout Plan

Based on the layout planning process above, layout plan of VLP was made as shown in Figure 4.5.4.

Truck terminal was placed at the northern end of the site to maintain good accessibility to both the outside of the VLP and the CFS of general cargo. The customs clearance on chassis and imported vehicle storage area were then placed at the southern end of the site. The central area of the VLP was assigned to the administration and customs office, for convenience of operators.



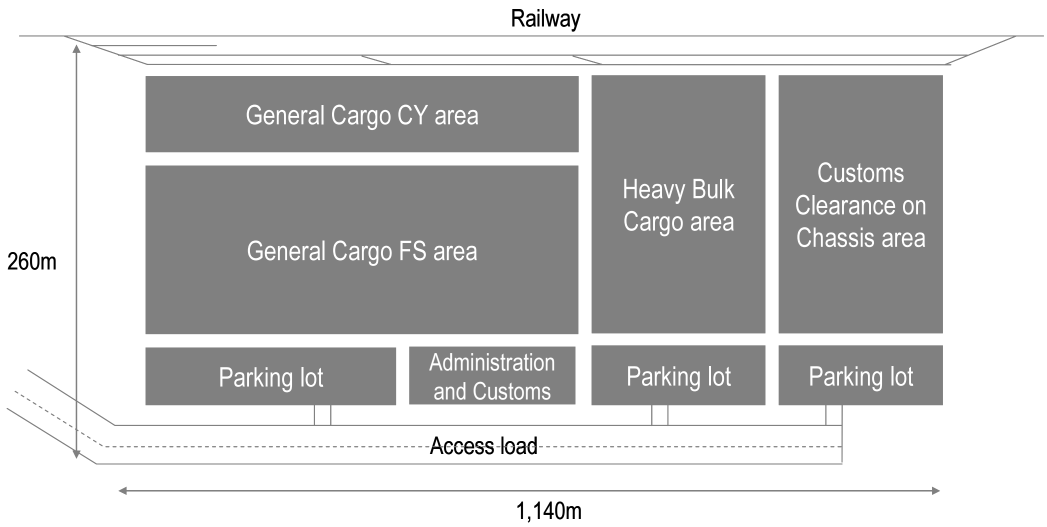
Source: JICA Study Team

Figure 4.5.4 Layout Plan of VLP (Alternative A-1)

(4) Comparative Layout Plan (Alternative A-2)

Layout plan of Alternative A-2 was prepared to examine efficiency of the layout plan above (hereinafter referred to as "Alternative A-1"). Alternative A-2 plan is a plan to emphasize workability of the truck terminal. Its basic layout is the reverse of that of Alternative A-1, as shown in Figure 4.5.5.

Comparison was made between layout plans A-1 and A-2. It was established that the layout plans do not exhibit significant differences expect in terms of traffic flow. Alternative A-1 designates the south-end as an area for customs clearance on chassis and imported vehicle storage while Alternative A-2 designates that location as a truck terminal. The customs clearance on chassis and imported vehicle storage areas may generate more traffic than the truck terminal due to large handling volume as established by demand forecast. A-1 may thus have less impact on traffic flow in VLP and access road. Given this consideration, Alternative A-1 was selected as preferable layout.



Source: JICA Study Team

Figure 4.5.5 Layout Plan of VLP (Alternative A-2)

4.5.4 Considerations on Further Expansion

(1) Expansion of Petroleum Facility

Petroleum products are currently one of the largest category of goods transported through Friendship Bridge, and it is expected that import volumes of these products will increase significantly in accordance with economic and population growth. Currently, petroleum products are transported by tank lorry to Lao PDR and transferred to storage tanks at Thanaleng. Each petroleum company has its own tanks. These petroleum products are a potential good to be handled in the VLP. However, it is difficult to confirm petroleum facility at the VLP at the moment due to absence of clear investment plan. Petroleum companies have great interest in utilizing VLP. However, petroleum needs specific transfer system due to safety considerations: it cannot be transferred directly from tank on train to tank lorry. Accordingly, it is necessary to construct pipeline to connect VLP and tanks or to construct petroleum tanks beside the VLP. Petroleum companies are reluctant as regards early investment at the moment: hence, VLP has no designated space for petroleum products. However, there is great potential of dealing with petroleum products in the VLP in the near future.

If the petroleum companies decide to invest in a new facility, VLP should then respond by designating appropriate space for the petroleum facility, which is expected to be 5 ha. Accordingly, VLP will be 35 ha if the petroleum facility is attached.

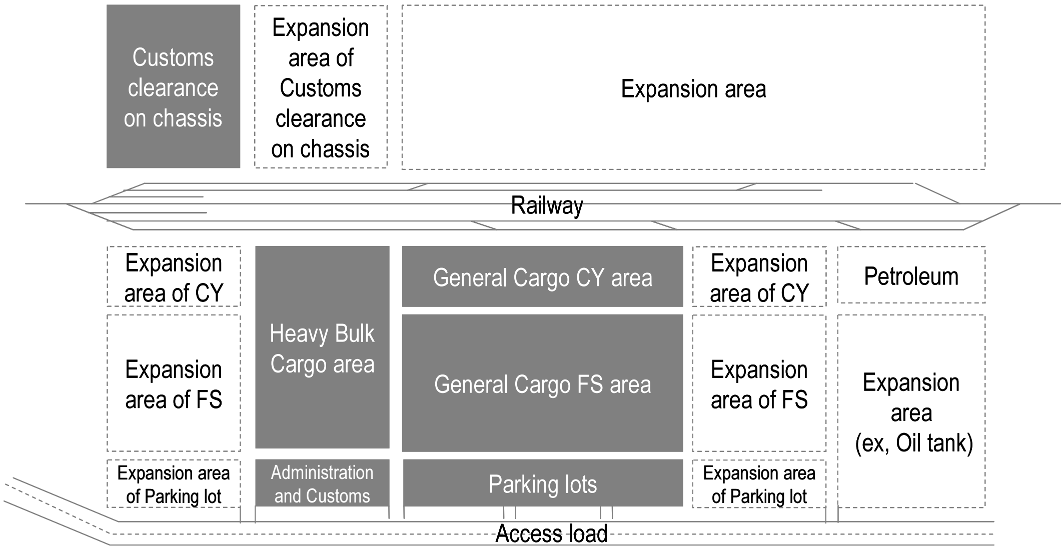
VLP needs to pay special attention to future development of petroleum products. In this regard, there are 2 alternatives for location of petroleum facility, namely:

- Northern side of VLP
- Opposite (western) side of VLP

In consideration of future expansion of VLP (as mentioned below) as well as costs and security and safety concerns, the northern side of VLP was preferred as location of petroleum terminal in VLP.

(2) Expansion of VLP

VLP's capacity corresponds to cargo volumes in 2025, such that the capacity of VLP will fall short after 2025, despite the fact that logistics handling efficiency will be much improved in the VLP in the future. It is accordingly necessary to consider how to deal with future cargo volume through Vientiane. In this sense, expansion of VLP is one of the potential alternatives because accumulation of cargo and integration of functions and businesses will generate more scale merits of VLP. For future expansion, the opposite side of VLP or west side of the railway area is available. Relocation of some facilities to the opposite side to harmonize functions and operations in the VLP may be necessary. Figure 4.5.6 illustrates future expansion of VLP.



Source: JICA Study Team

Figure 4.5.6 Illustration of Future Expansion of VLP

CHAPTER 5 PHYSICAL DEVELOPMENT PLAN

5.1 Physical and Spatial Conditions

5.1.1 Topography and Geography

As discussed in Chapter 6 of the Progress Report of this Study, the alternative locations of the VLP were studied and an optimum location for development of the VLP was proposed along the alignment of the new railway line (between Thanaleng and Vientiane Station) next to the Thanaleng Station. The topography and geography around the project site of the VLP is summarized below.

- The proposed project site of the VLP is located at Hadxaifong District in the eastern part of the Vientiane Capital and part of Dongphosy Forest Reserve, a protected area managed by Vientiane Capital.
- It is proposed to be located in a hilly place with the highest elevation of 178m and lowest elevation of 165m whereas the average elevation of the Vientiane Capital is 159m.
- The area along the Mekong River, where proposed project site is located, is an alluvial plain consisting of a sandy gravel layer covered with clayey soil.

Topographic and geo-technical surveys were conducted to understand the natural conditions at the proposed project site and the detailed results of these surveys are attached to the Appendix.

5.1.2 Road Network

As described above, the proposed project site of the VLP is located in part of Dongphosy Forest Reserve and therefore its surrounding area is less populated and access to the area is very limited. Figure 5.1.1 shows the existing roads around VLP site and Dongphosy Forest Reserve. Features of the existing road network are summarized below describing topography, natural/social environment and road condition.

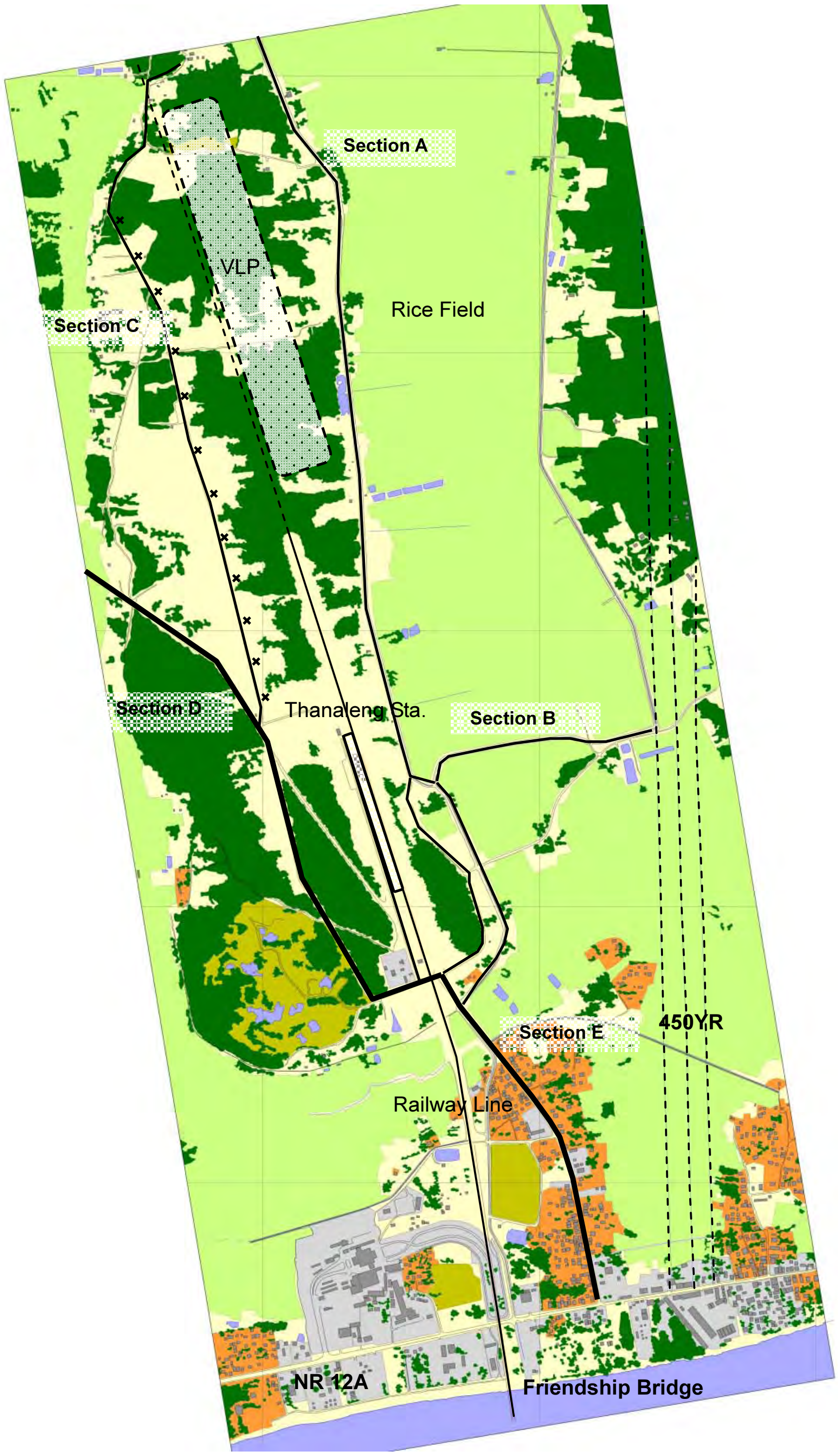


Figure 5.1.1 Existing Road Network around VLP

Source: JICA Study Team

1) Section A

Location: The alignment of the road runs along the outskirt of Dongphosy Forest Reserve.

Topography: It is flat area along the alignment with gentle slope in the north-south direction and a partially steep slope close to the VLP site to the west.

Natural and Social Environment: Some bushes and forest are observed along the west side and are partially seen at the east side of the alignment. The rice fields are spread along the east side. The existing houses and living facilities including temples, schools and electric leading-wires are observed along the alignment.

Road Condition: It is summarized below;

- Number of lanes: 2
- Lane width: approx. 3 – 3.5m
- Shoulders: Do not exist
- Surface type: Earth
- Others: Irrigation ditch at median

2) Section B

Topography: It is flat and open area along the alignment.

Natural and Social Environment: Some bushes and forest are observed near the Dongphosy Forest Reserve. The rice fields and trees are observed on both sides along the alignment. Some existing houses were observed in the bushes near the Dongphosy Forest Reserve. The eastern edge of the road is connected to the 450 Years Road which is currently under construction.

Road Condition: It is summarized below;

- Number of lanes: 1
- Lane width: approx. 3.5m
- Shoulders: Do not exist
- Surface type: Earth
- Others: Irrigation ditch along the alignment on the south side

3) Section C

Location: The alignment is located inside the Dongphosy Forest Reserve and on the outskirts of the protected area under the control of the Railway Authority.

Topography: It is flat area with a gentle slope around the project site of the VLP.

Natural and Social Environment: Bushes and forest exist on both sides of the alignment. A certain number of houses and farm fields are observed along and near the alignment on both sides. The road of the Section C is an alley for local residents and is composed of quite narrow road surface with bumps surrounded by bushes and forests. There are high voltage cables and towers along the west side and electric cables and poles along the alignment.

Road Condition: It is summarized below;

- Number of lanes: 1
- Lane width: approx. 1 – 2m
- Shoulders: Do not exist
- Surface type: Earth

4) Section D

It is an earth/gravel-paved provincial road, Road No.0109, with the total road length of 9km. It connects the Dongphosy Forest Reserve with Xaysetha District through Xiengda village in the west.

Topography: It is a flat area.

Natural and Social Environment: Bushes and forest are observed on both sides. A small number of houses is observed in the area of Dongphosy Forest Reserve and there exist living facilities and farm fields along the alignment outside of Dongphosy Forest Reserve. The high voltage cable crosses the road at the junction with the road of Section C.

Road Condition: It is summarized below;

- Number of lanes: 1 - 2
- Lane width: approx. 3.5 – 4m
- Shoulders: Partly exist
- Surface type: Gravel and Earth

5) Section E

Section E is a DBST-paved provincial road which is a part of the provincial road No. 0109 with a length of 1.4km, connecting the NR-12 A beside the Friendship Bridge with Thanaleng Station. It was upgraded to paved road in 2008 as an access road to the station.

Topography: It is a flat and open area.

Natural and Social Environment: The alignment is located in the residential area and several alleys connect with the road. There exist considerable number of houses, electric cables and poles along the alignment. The road functions as a residential road for surrounding community as well as an access road from the NR-12A to the Thanaleng Station.

Road Condition: It is summarized below;

- Number of lanes: 2
- Lane width: approx. 4m
- Shoulders: Partly exist
- Surface type: DBST

(2) Existing Plan of Road Construction around VLP

On the east side of the Dongphosy Forest Reserve, the construction of 450-Years Road is currently underway. It connects the NR-12A on the east side of the Friendship Bridge and the NR-13 South in the north. It is scheduled to be completed by October 2010. The details on the construction project of 450-Years Road are described in the Chapter 2 (Section 2.3.3) of this Report.

The Study of Master Plan on Comprehensive Urban Transport in Vientiane in Lao PDR (2008) proposes the construction of the bypass to the north of the VLP site. It proposes connecting the existing provincial road (No. 0109) in Xiengda Village to the 450-Years Road in Dongphosy Forest Reserve by 2025. The bypass may provide a shortcut route from the Dongphosy Forest Reserve to the center of Vientiane Capital through inner ring road. The alignments of the 450-Years Road and proposed bypass are illustrated in Figure 5.1.2.

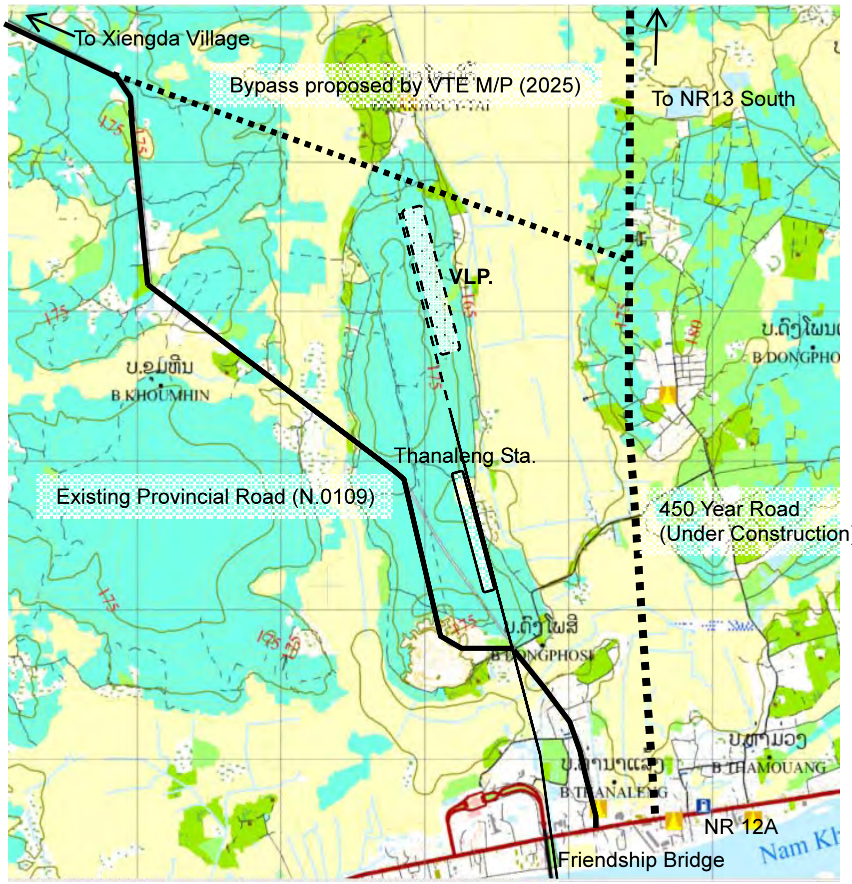


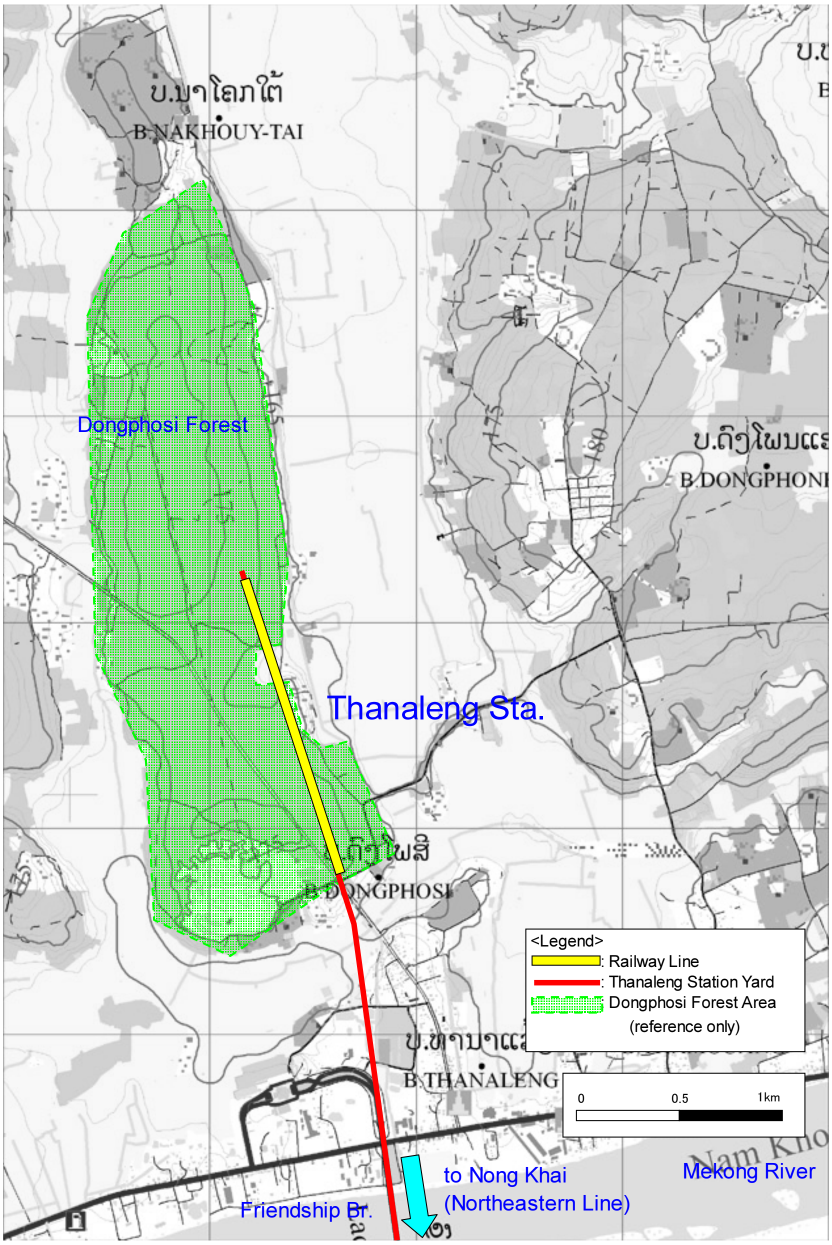
Figure 5.1.2 Existing Plan of Road Construction around VLP

Source: Prepared by JICA Study Team

5.1.3 Railway

(1) Existing Railway in Lao PDR

Lao PDR has 3.5km of railway line connecting Friendship Bridge and Thanaleng Station which started operations of passenger trains in March 2009 (see Figure 5.1.3). The detailed alignment of the railway line is shown in the Appendix. Since the railway line is connected with the Northeastern Line of the SRT, the design criteria basically follows Thai standard and the train operation schedule is prepared consistently considering Northeastern Line's operation schedule.



Source: Prepared by JICA Study Team

Figure 5.1.3 Schematic Map of Existing Railway Line

1) Design Criteria

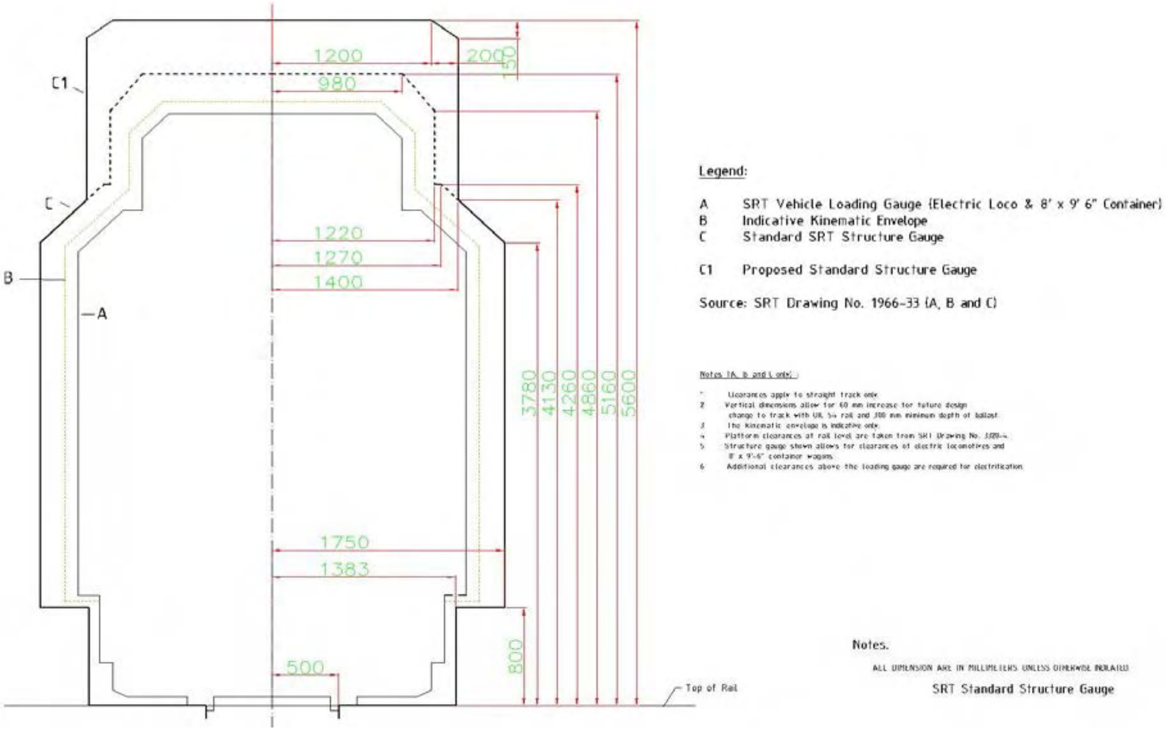
Design criteria for the railway in Lao PDR are summarized in Table 5.1.1.

Table 5.1.1 Design Criteria of Railway in Lao PDR

Item		Criteria
Basic	Design Max. Speed	120 km/h
	Design Standard Load	UIC - 25
	Gauge (G)	1,000 mm (Minimum distance between rails)
	Loading Profile	General: W2920 x H5650, At platform level: W2920 (V <= 120 km/h) : W2860 mm (V>120km/h)
	Structural Profile	General: W3700 x H5900 , At platform: W3060
Alignment	Single/Double Track	Single Track
	Horizontal Min. Curve Radius (R)	1. Main line: 1,000m 2. Depot and Siding track: 200 m
	Secure straight distance between curves	60m
	Longitudinal Curve	More than 4% difference between gradients
	Vertical Curve Radius	Main line: 5,000 m (V_{max} <= 120 km/h)
	Max. Gradient	Main Line: 10% (12% in special), Station: 2%
	Cant	C = 8.4 V^2/R
	Max. Cant	Cmax = 90 mm
	Max.Cant Deficiency	Cdmax = 50 mm
	Max.Cant Excess	Cexmax = 65 mm
	Transition Curve Length	1,000C
	Min. Distance between Track Centers	5.0m
Track Structure	Rail Profile	BS80A
	Min. Depth of Ballast	Min 270mm below bottom of sleepers
	Min. Depth of Roadbed Concrete	100 mm (Minimum depth of concrete roadbed at rail position will be around 100 ~ 150 mm)
	Usual size of Turnout	Main Line: 1: 12 Siding Line: 1:10
	Sleeper	PC, Plastic for main line and siding line Timber sleeper for turnout
Station	Platform Depth	230 mm from rail level
	Distance from track center	1,383 mm
Signal & Telecom.	Block System	Tablet Token
	Communication System	IP telephone between Thanaleng and Nong Khai

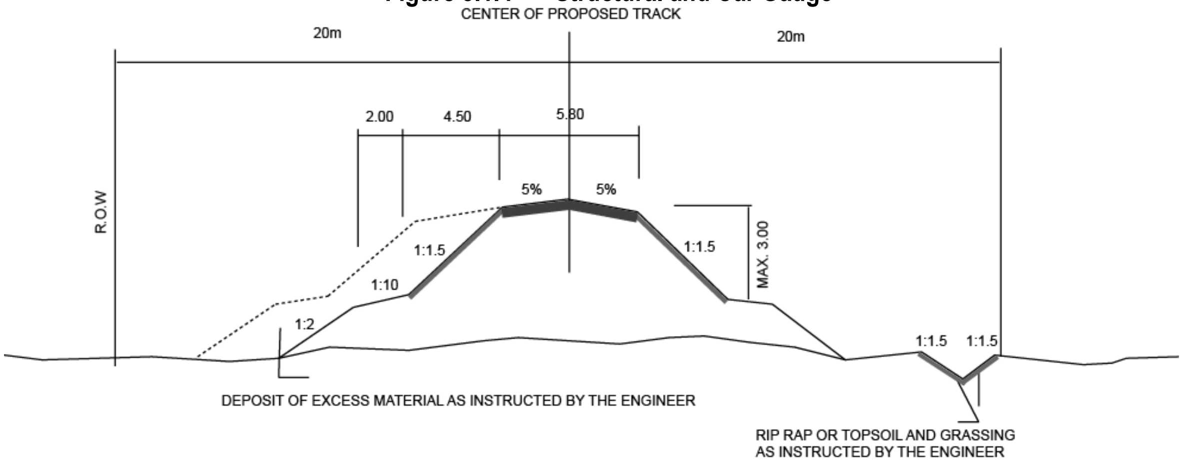
Source: Prepared by JICA Study Team based on the design criteria of Korean F/S and STS, interview survey with LRA., and As-built drawing of Friendship Bridge to Thanaleng Station.

The structural gauge/car gauge are illustrated in Figure 5.1.4 and typical cross-section is shown in Figure 5.1.5.



Source: JICA Study Team

Figure 5.1.4 Structural and Car Gauge



Source: JICA Study Team

Figure 5.1.5 Typical Cross-Section of Railway Line In Lao PDR

2) Current Train Operation

After opening of the railway to public in 2009, passenger trains operated between Nong Khai and Thanaleng. However, no freight trains operate as yet. The train is DMU composed of 3 cars as shown in Figure 5.1.6.

Source: JICA Study Team

Figure 5.1.6 DMU operated between Nong Khai and Thanaleng (at Thanaleng Station)

As of September 2009, the passenger trains operate 2 roundtrips per day, in the morning and in the evening as seen in Table 5.1.2.

Table 5.1.2 Time Table of Passenger Train between Nong Khai and Thanaleng

Nong Khai	10:00 Dep.	11:00 Arr.	16:00 Dep.	17:15 Arr.
Thanaleng	10:15 Arr.	10:45 Dep.	16:15 Arr.	17:00 Dep.

Source: SRT

Both Nong Khai and Thanaleng stations have immigration control offices and passengers carry out procedures to enter/leave countries at these offices. The number of train passengers from March 2009 to August 2009 is shown in Table 5.1.3. Although it is too early to evaluate, the number of passengers, both to/from Lao PDR, is sharply decreasing.

Table 5.1.3 Number of Passengers between Nong Khai and Thanaleng (Mar. – Aug. 2009)

Month/Year	From Nong Khai to Thanaleng	From Thanaleng to Nong Khai	Total
Mar. 2009	880	642	1522
Apr. 2009	1338	752	2090
May 2009	1443	805	2248
Jun. 2009	1423	908	2331
Jul. 2009	1783	1716	3499
Aug. 2009	1597	1338	2935
Total	8464	6161	14625

Source: MPWT

Both railway tracks and road lanes share the carriageway on the Friendship Bridge. Accordingly, when the train runs on the Friendship Bridge, the bridge is impassable for road traffic.

(2) Current Condition of Northeastern Line in SRT

The railway line between Friendship Bridge and Thanaleng Station operates as part of Northeastern Line of the SRT and most cargo handled at the VLP would be transported to/from Thailand. Accordingly, the following discussion reveals the track condition and train operation condition of the Northeastern Line and provides essential input for planning the railway in the VLP.

1) Track Condition

Track conditions between Bangkok and Nong Khai Station (namely Northeastern Line) are described as follows:

- At-grade and non-electrified between Bangkok and Nong Khai Station (621.10km)
- Double track between Bangkok and Khen Khoi Station (125.10km)
- Branching into 2 lines from Khen Khoi Station to Bua Yai Station (220.40km)
- Double track in the south route (Khen Khoi – Nakhorn Ratchashima – Bua Yai), Single track in the north route (Khen Koi – Bua Yai)
- Passing mountain area in the south route between Khen Koi and Nakhorn Ratchashima (138.55km). Continuing curvature with short radius (say 200m) as well as steep slope (say 1.4 – 1.7%) between Map Kabao and Pak Chong Station. Similar conditions in north route
- Double track between Bua Yai and Udon Thani (223.34km)
- Single track between Udon Thani and Nong Khai (52.26km)

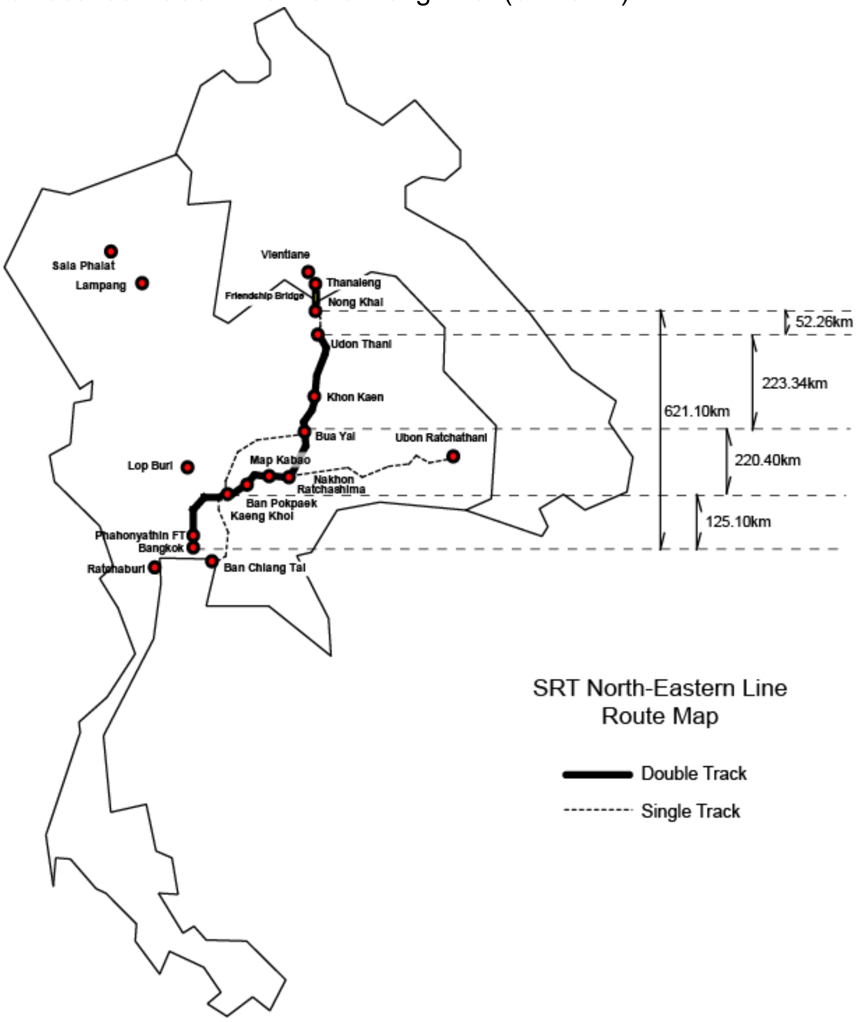
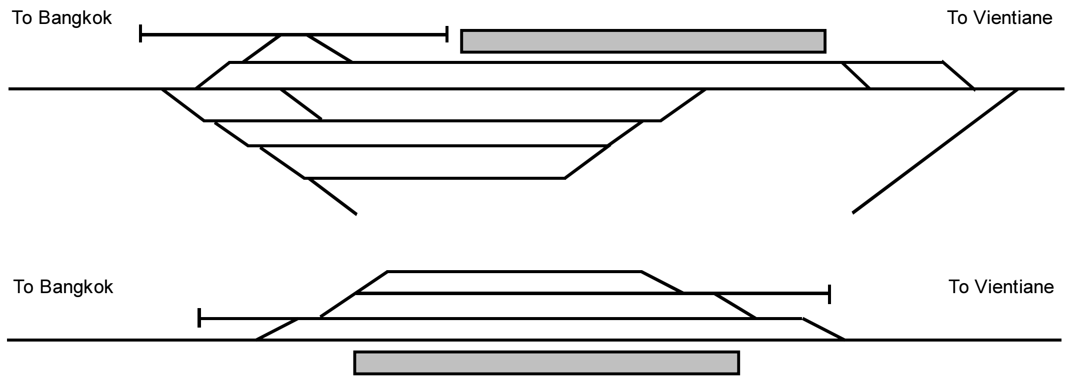


Figure 5.1.7 Track Conditions of North Eastern Line, SRT

Source: JETRO (2007) A Study on Integrated Distribution Center in Savannakhet and Vientiane in Lao PDR

2) Shunting Works at Terminal Stations

Figure 5.1.8 shows the track layout of Udon Thani and Nong Khai Station. As the track layout in the figure describes, shunting works can be done in each station.



Source: JICA Study Team

Figure 5.1.8 Track Layout of Udon Thani and Nong Khai

3) Signaling System

According to the interview survey with SRT, the current signaling system in Northeastern Line is summarized as seen in Table 5.1.4.

Table 5.1.4 Current Signaling System of Northeastern Line

Section	Type
Beginning to Chira JCT	Color light signal
Chira JCT to Khon Kaen Station	Mechanical signal
Khon Kaen Station to Nong Khai Station	Mixed Color light signal and Mechanical signal
Nong Khai Station to Thanaleng Station	Tablet Token. Communicated by optical fiber and copper line.

Source: Prepared by JICA Study Team based on the interview survey to SRT

4) Train Composition

According to the interviews with SRT, the composition of the freight trains of Northeastern Line is as follows.

- At present, freight trains operate between Bangkok and Khon Kaen. No exclusive freight train currently operates beyond Khon Kean, although freight trains operated in the past[1].
- The type of freight wagons between Bangkok and Khon Kaen are container, LPG tank wagon, and oil tank wagon.
- As regards the container train, one container dedicated train makes a round trip each day between Laem Chabang and Thaphra CY in Khon Kaen, in order to transport sugar and malt. The number of container wagons is 15 to 20 per train[2].

1 According to the interview with Nong Khai station, 2 passenger trains with 1 post coach are operated between Nong Khai and Udon Thani per day. The main treated goods are foods and daily necessities put into parcel. However, the amount is quite small (1 to 2 tons per day).

2 According to the interview with Khon Kaen CY, a train with 18 cars is operated to treat approximately 620 tons per day.

- As for LPG and oil, according to the interview survey with Khon Kaen Oil Terminal and Sumran Gas Station, trains operate to Khon Kaen Oil Terminal or Sumran Gas Station in Khon Kaen.
- In regard to LPG, 1 train with 18 wagons makes a round trip every 2 days between Laem Chabang and Khon Kaen[3].
- As regards oil, 1 train with 18 to 20 wagons makes a round trip every 2 days between Laem Chabang and Khon Kaen.
- These trains are basically hauled by single locomotive. However, there is a hilly place at about 130km section between Kaen Khoi and Nakhorn Ratchashima, where the trains are hauled by double locomotives, when necessary.

5) Types and Performance of Locomotives, Wagons, and Tanks

Based on the interviews with SRT, types and performance of locomotives, wagons and tanks are summarized in Table 5.1.5.

Table 5.1.5 Performance Data of Locomotive

Name (Manufacturer)	GE-A	Hitachi	Alstom	Low-power loco.
Hauling Power	2500HP	2500HP	2400HP	1370HP
Owned Number	48	21	103	37

Source: Prepared by JICA Study Team based on the interview survey to SRT

Table 5.1.6 Performance Data of Oil Tank and Cement Wagon (example)

Name	Container Flat Wagon	Heavy Flat Wagon	Oil Tank Wagon	LPG Tank Wagon
Manufacturer	Makkasan	Belgium	Makkasan	Hyundai, Korea
Year of Manufacturing	1973	1958	1967	1985
Size (Length: between automatic couplers)	WHL: 2.4m x 3.6m x 12.5m	WHL: 2.45m x 1.323m x 12.8m	WHL: 2.286m x 3.2m x 11.8m	WHL: 2.35m x 3.332m x 16.55m
Tare Weight	13.5 tons	16.4 tons	17 tons	28.4 tons
Pay Load	39 tons	24 tons	25 tons	25.5 tons
Max. Axel Load	13 tons	10.5 tons	10.5 tons	15 tons
Maximum Speed	70km/hr	70km/hr	70km/hr	80km/hr

Note: Many types of wagon are owned by SRT. The table is the example of these wagons.

Source: Prepared by JICA Study Team based on the interviews with SRT and Leading Particulars of Rolling Stock, SRT

6) Operational Conditions of Locomotive and Wagons

The SRT currently faces difficulties in securing a sufficient number of locomotives for operation of the freight train. In order to improve the current situation, the SRT requested Thai government to purchase 27 locomotives: the purchase of 7 locomotives has so far been officially approved. As regards freight wagons, there are 2 types of ownership; SRT owned and private company owned. The ratio of ownership is shown in Table 5.1.7.

[3] According to the interview with Sumran Gas Station, 1 train with 16 wagons makes a round trip per day between Chin Buri and Khon Kaen.

Table 5.1.7 Ratio of Ownership of Wagon

Item	Owned by Private	Owned by SRT
Container Wagon (car)	0	1,100
Cement Hopper Wagon (car)	480	176
Oil/LPG Tank Wagon (car)	All	0

Source: Prepared by JICA Study Team based on interviews with SRT

7) Maintenance Activity

Maintenance for rolling stocks of Northeastern Line is done in Nakhorn Ratchashima workshop, Bang Sue workshop and Kaen Khoi depot. Nakhorn Ratchashima workshop is capable of maintaining 1 car per month, and mainly provides regular maintenance for DEU. It can also maintain locomotives. Bang Sue workshop can maintain both locomotives and wagons. Kean Khoi depot maintains only wagons. Major maintenance works for locomotives are outsourced to private companies.

8) Transported Goods and Amount

The operation of Northeastern Line, especially that in the section of single tracks between Khon Kaen and Nong Khai and beyond that section, affects the freight train operations to/from VLP. The origin/destination and volume of goods transported through Northeastern Line is summarized in Table 5.1.8. As seen in the table, LPG and petroleum accounted for 70% of all the transported goods on a tonnage basis, while cement and container goods accounted for 19% and 12%, respectively.

Table 5.1.8 Quantity of Freight Transportation: Northeastern Line (Nong Khai Route) in 2008

Type of Commodity (PFC Code)	Origin	Destination	Amount (Tons)	Freight Cost (Baht)	Ton.Km (Tons)
Domestic Containers (3)			85,969	15,723,824	42,931,727
	Udon Thani	Mae Nam	132	23,700	75,636
	Udon Thani	Lat Krabang ICD	132	24,696	78,936
	Lat Krabang ICD	Udon Thani	24	29,628	12,840
	Map Kabao	Thapra	272	16,280	83,232
	Thapra	Laem Chabang	57,672	7,328,090	28,893,672
	Laem Chabang	Thapra	11,017	5,370,400	5,519,517
	Thung Song Junction	Bua Yai Junction	416	72,930	465,088
	Bua Yai Junction	Laem Chabang	11,612	1,224,090	4,726,064
	Laem Chabang	Bua Yai Junction	846	763,515	344,322
	Bua Yai Junction	Laem Chabang	2,029	205,020	825,600
	Bua Yai Junction	Ban Thung Pho Junction	27	5,850	26,635
	Bua Yai Junction	Thung Song Junction	1,480	344,880	1,635,511
	Laem Chabang	Bua Yai Junction	144	122,740	58,608
	Ban Thung Pho Junction	Bua Yai Junction	3	3,495	3,274
	Thung Song Junction	Bua Yai Junction	164	188,510	182,793
Bagged Cement-TPI Polene Public Company (8)	Hinlub	Nong Khon Kwang	27,440	6,047,090	11,552,240
Bulk Cement-TPI Polene Public Company (14)	Hinlub	Nong Khon Kwang	110,646	27,617,595	46,581,967
LPG-PTT (18)	Banglamung	Samran	350,442	122,138,829	184,332,492
Petroleum Product-Shell Public Company (20)			133,890	49,877,505	75,276,038
	Ban Pok Pak	Khon Kaen	6,073	1,469,455	2,265,266
	Khon Kaen	Ban Pok Pak	117	28,360	40,200
	Map Ta Phut	Khon Kaen	127,601	48,355,800	72,860,114
	Thung Song Junction	Bua Yai Junction	99	23,900	110,458
Petroleum Product-PTT (21)			22,543	5,540,990	8,548,407
	Ban Pok Pak	Khon Kaen	21,368	5,170,680	7,970,283
	Ban Pok Pak	Udon Thani	1,175	370,310	578,125
Petroleum Product-Carltex Inc.	Ban Pok Pak	Khon Kaen	9,826	2,377,560	3,665,098
Bunker Oil	Mae Nam	Khon Kaen	2,990	1,224,750	1,360,450
Other Industrial Product-Whole car (33)			226	84,655	73,670
	Office for delivery Phaholyothin	Khon Kaen	22	7,135	10,406
	Office for delivery Phaholyothin	Udon Thani	12	4,835	7,104
	Udon Thani	Nakhon Ratchasima	180	42,000	54,900
	Laem Chabang	Bua Yai Junction	-	30,685	-
	Bua Yai Junction	Kok Khli	12	-	1,260
Military & Police Effects (38)			1,090	354,290	515,436
	Office for delivery Phaholyothin	Khon Kaen	371	120,530	175,672
	Office for delivery Phaholyothin	Udon Thani	407	164,005	240,944
	Lop Buri	Udon Thani	12	4,545	6,456
	Nakhon Ratchasima	Khon Kaen	108	16,335	20,088
	Nakhon Ratchasima	Udon Thani	168	39,200	51,240
	Nakhon Sawan	Udon Thani	12	5,275	7,620
	Thung Song Junction	Bua Yai Junction	12	4,400	13,416
Miscellaneous (44)	Sap Muang	Thapra	72	14,370	18,144
Other Oil (48)			94	34,420	50,412
	Office for delivery Phaholyothin	Khon Kaen	44	14,270	20,812
	Office for delivery Phaholyothin	Udon Thani	50	20,150	29,600
Total			**745,229**	**231,035,878**	**374,906,081**
Grand Total 2008			**13,507,998**	**1,950,210,427**	**3,252,291,945**

Source: SRT

9) Transport Schedule (Freight/Passenger Train)

According to the timetable for freight trains obtained from SRT, scheduled freight trains bound for Khon Kaen are shown in Table 5.1.9.

Table 5.1.9 Scheduled Freight Train Bound for Khon Kean

Commodity Type	Train	Origin	From	Destination	To	Remarks
Regular Commodity	535	Map Ta Phut	13.10	Khon Kaen	3.30	Oil
Commodity by Request	2001	Map Ta Phut	18.00	Khon Kaen	7.35	Oil

Source : SRT

It should be noted that there are some discrepancies between the details in the table and the revelations from interviews with SRT. According to the interview survey, 3 types of train (for oil, for

LPG, and for container) operate currently. On the other hand, only the oil train is shown in the time table obtained from SRT. Since the interviews are more reliable than the time table shown above, the information shown in the table is used only for reference.

Looking at the train operations of the SRT, freight trains operate between the intervals of passenger train operation. Table 5.1.10 shows the train schedule of the SRT as of October 2009.

Table 5.1.10 Operation Schedule for Passenger Train in SRT

NORTHEASTERN LINE

FROM BANGKOK

TRAINS / STATIONS		SP EXP DRC	RAP	EXP DRC	EXP DRC	ORD	RAP	EXP DRC	RAP	RAP	EXP	EXP	EXP DRC	RAP	RAP
		21	135	75	71	233	145	77	133	139	67	69	73	141	143
		2	2-3	2	2	3	2-3	2	2-3	2-3	1-2-3	1-2-3	2	2-3	2-3
Bangkok	dep	05.45	06.40	08.20	10.05	11.40	15.20	18.30	18.40	18.55	20.30	20.00	21.50	22.25	23.40
Bang Sue Jn.	dep	06.06	07.12	08.40	10.27	12.05	15.44	18.53	19.01	19.17	20.48	20.23	22.11	22.47	23.59
Don Mueang	dep	06.29	07.39	09.05	10.51	12.25	16.09	19.13	19.27	19.42	21.09	20.50	22.35	23.10	00.25
Ayutthaya	arr	06.58	08.25	09.39	11.24	13.06	16.56	19.47	20.12	20.25	21.50	21.40	23.08	23.50	01.12
Ban Phachi Jn.	arr	·	08.47	·	·	13.24	17.24	·	20.34	20.47	·	·	·	·	01.35
Saraburi	arr	07.33	09.09	10.17	12.03	13.52	18.00	20.23	20.58	21.09	22.31	22.23	23.44	00.31	01.57
Kaeng Khoi Jn.	arr	07.44	09.22	10.28	12.14	14.05	18.13	20.34	21.11	21.22	22.44	22.37	23.54	00.44	02.10
Muak Lek	arr	·	10.13		·	14.46	19.06	·		·	·		·	01.38	03.25
Pak Chong	arr	08.55	10.52		13.25	15.22	19.44	21.37		22.46	00.18		01.01	02.19	04.04
Nakhon Ratchasima	arr	10.02	12.12		14.27	16.50	21.15	22.48		00.07	01.33		02.00	03.34	05.25
Thanon Chira Jn.	arr	10.16	12.30		14.47	17.10	21.31	23.04		00.32	01.52		02.18	03.49	05.40
Lam Plai Mat	arr	·	13.47		15.50	18.37	23.04			01.47	·		03.38	05.25	06.57
Buri Ram	arr	11.34	14.19		16.14	19.16	23.38			02.22	03.40		04.12	06.02	07.27
Surin	arr	12.14	15.07		17.08	20.00	00.30			03.15	04.30		05.04	06.58	08.27
Sikhoraphum	arr	12.40	15.40		17.38		01.07			03.53	05.07		05.50	07.41	09.06
Uthumphon Phisai	arr	13.10	16.34		18.18		01.52			04.44	05.54			08.26	10.07
Si Sa Ket	arr	13.27	17.00		18.40		02.19			05.07	06.16			08.53	10.41
Ubon Ratchathani	arr	14.20	18.20	↓			03.35	↓	↓	06.15	07.25	↓		10.20	11.50
Bua Yai Jn.	arr			14.42				00.21	02.04			03.10			
Ban Phai	arr			15.48				01.34	03.31			04.23			
Khon Kaen	arr			16.20				02.10	04.15			05.05			
Udon Thani	arr			18.10				04.11	06.34			07.14			
Nong Khai	arr							05.05	07.35			08.25			
Thanaleng	arr														

TO BANGKOK

TRAINS / STATIONS		RAP	RAP	SP EXP DRC	EXP	RAP	ORD	EXP DRC	RAP	RAP	SP EXP DRC	EXP DRC	EXP	RAP	EXP DRC
		144	142	74	68	140	234	72	136	146	22	78	70	134	76
		2-3	2-3	2-3	1-2-3	2-3	3	2	2-3	2-3	2	2-3	1-2-3	2-3	2-3
Thanaleng	dep														
Nong Khai	dep												18.20	19.15	06.00
Udon Thani	dep											18.40	19.20	20.10	06.54
Khon Kaen	dep											20.11	21.05	22.16	08.39
Ban Phai	dep											20.41	21.44	22.56	09.10
Bua Yai Jn.	dep											21.28	22.56	00.12	10.25
Ubon Ratchathani	dep	15.05	16.50		18.30	19.30			07.00	08.45	14.50				
Si Sa Ket	dep	16.08	17.50	19.05	19.30	20.28			08.04	09.51	15.31				
Uthumphon Phisai	dep	16.36	18.20	19.22	19.49	20.46			08.28	10.14	15.48				
Sikhoraphum	dep	17.18	19.00	19.57	20.26	21.30		07.20	09.06	10.59	16.16				
Surin	dep	17.59	19.31	20.25	20.59	22.02	05.10	07.55	09.39	11.30	16.41				
Buri Ram	dep	18.48	20.28	21.10	21.43	22.50	06.06	08.35	10.27	12.26	17.15				
Lam Plai Mat	dep	19.17	20.55	21.32	·	23.26	06.38	08.57	10.55	13.02	·	↓			
Thanon Chira Jn.	dep	20.32	22.16	22.39	23.17	00.35	08.06	09.56	12.17	14.31	18.31	22.28			
Nakhon Ratchasima	dep	20.46	22.32	22.54	23.37	00.51	08.22	10.18	12.33	14.50	18.47	23.06			
Pak Chong	dep	22.29	00.03	00.26	01.27	02.24	10.09	11.27	14.00	16.35	19.48	00.43			
Muak Lek	dep	23.12	·	·	·	·	10.56	·	14.48	17.11	·	·	↓	↓	↓
Kaeng Khoi Jn.	dep	23.50	01.32	01.58	02.46	03.52	11.36	12.28	15.30	17.50	20.53	02.22	03.04	04.34	14.42
Saraburi	dep	00.19	01.48	02.10	03.04	04.13	11.51	12.41	15.45	18.05	21.06	02.35	03.22	04.51	14.54
Ban Phachi Jn.	dep	00.48	02.13	·	03.32	04.59	12.19	·	16.09	18.39	·	·	·	05.18	·
Ayutthaya	dep	01.14	02.37	02.54	03.55	05.25	12.40	13.17	16.37	19.05	21.46	03.15	04.23	05.50	15.30
Don Mueang	arr	02.09	03.27	03.40	04.49	06.25	13.24	13.55	17.38	19.55	22.27	03.58	05.22	06.52	16.12
Bang Sue Jn.	arr	02.42	03.56	04.07	05.21	06.59	13.52	14.21	18.12	20.25	22.53	04.31	05.51	07.26	16.42
Bangkok	arr	03.15	04.25	04.35	05.50	07.30	14.15	14.50	18.40	21.00	23.15	05.00	06.25	08.00	17.10

	NOTES:
Before Travelling, please check timetable at Station Masters or the Information Unit in Bangkok Station	ORD = ORDINARY TRAIN
	DRC = DIESEL RAILCAR
Tel. 1690 (24 hrs)	RAP = RAPID TRAIN
	EXP = EXPRESS TRAIN
* Please purchase ticket at main stations or SRT Ticket Agency only.	SP EXP = SPECIAL EXPRESS TRAIN
	SP EXP DRC = SPECIAL EXPRESS DIESEL RAILCAR

STATIONS	1st CLASS SLEEPER	2nd CLASS SEAT		2nd CLASS SLEEPER				3rd CLASS
		AC	FAN	UP	LOW	AC / UP	AC / LOW	FAN
Nakhon Ratchasima	1,010	325	265	365	415	545	615	200
Surin	1,146	389	319	419	469	619	689	223
Ubon Ratchathani	1,280	551	371	471	521	691	761	245
Khon Kaen	1,168	399	329	429	479	629	699	227
Udon Thani	1,277	479	369	469	519	689	759	245
Nong Khai	1,317	498	388	488	538	708	778	258

Source: SRT

5.1.4 Water Supply

Nam Papa Nakhoneluang (NKL), a state-owned water supply enterprise, supplies water in Vientiane Capital. Its service area is around 2,650 km^2. There are 5 water treatment plants that belong to NKL. Of these 5, Chinaimo Water Treatment Plant with treatment capacity of 80,000m^3/day supplies water to the area comprising the existing Thanaleng Warehouse and its surroundings from the Salakham Reservoir by the water pipes of φ300 under Road No. 1, and φ150 and φ75 installed underneath the access road from the NR-1 to the Thanaleng Station.

Vientiane Logistic Park (VLP) will be supplied with water from the valve installed at the side of the access road to the station.

5.1.5 Electricity

Enterprise D'Electricite du Laos (EDL) supplies electricity and a medium voltage line of 22kV runs along the existing narrow road running from south to north on the hill in the Dongphosy Forest Reserve. Thanaleng Railway Station, located near the VLP project site, is supplied with electricity from this 22kV line through a newly constructed line between the existing electric line and the station. A transformer was also installed at the station to decrease the voltage from 22kV to 400/200V. Therefore, the VLP will also be supplied with electricity from the existing 22kV line directly through the connecting line.

5.1.6 Telecommunications

Enterprise of Telecommunications Lao (ETL) started its service of providing fixed (wire) and mobile (wireless) telephones in the area comprising the existing Thanaleng Warehouse and its surroundings in July 2009. ETL currently has 50 telephone circuits (or lines) and will increase the number of circuits as customers increase. ETL also renders the service of internet connections under ADSL.

Existing Thanaleng Warehouse and Thanaleng Station are supplied telephone and the internet services by ETL.

5.1.7 Drainage

An irrigation channel runs south to north on the outskirts on the eastern side of Dongphosy Forest Reserve and distributes water to the agricultural land from the Mekong River. The channel cross-section is a trapezoid with approximately 1m to 4m width and 1m depth. The channel is made of concrete.

Rainfall and treated water in the VLP will be discharged to this channel through installed drains.

5.2 Land Preparation Plan

A railway will be extended northwards from the existing Thanaleng Railway Station. The VLP is planned at 2.25m east of the centerline of and parallel to the railway alignment. The project site of the VLP is located 3+550km from the station. The length and width of the VLP is 1,400m parallel to the railway and 260m respectively. Elevation of the VLP is determined based on elevation of rail tracks. Elevation of rail tracks is 170.0m while elevation of the sub grade of the railway is 0.868m lower than the elevation of rail tracks. Therefore, elevation of sub grade of the railway is 169.132m. Heavily loaded vehicles used for loading/unloading will call for pavement thickness of 30cm (25cm of concrete and 5cm of sand) for development of the VLP. Therefore, elevation of the VLP is expected to be 169.432cm, which is practically 169.5cm.

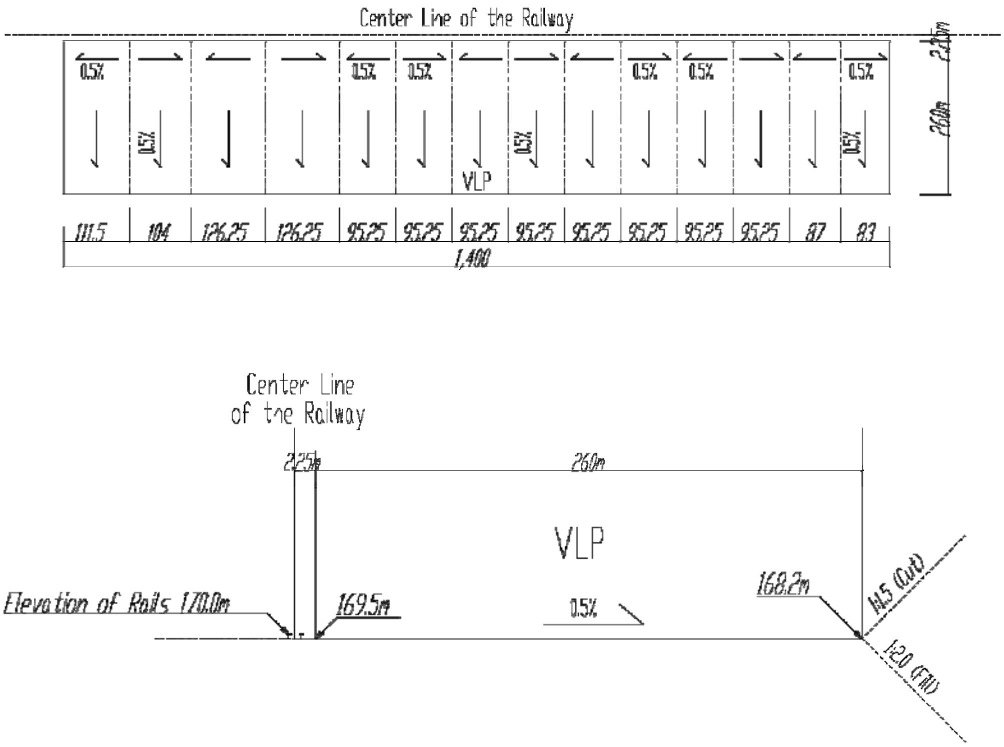
The VLP is designed with a slope of 0.5% from the railway side (west) to the east so as to discharge rainfall in VLP. Therefore, the area with the lowest elevation is on the east edge of the VLP and elevation at that point is between 167.6m and 168.2m. High water levels around the VLP are summarized in Table 5.2.1.

Table 5.2.1 High Water Level of Water Bodies around VLP

Water Bodies	High Water Level (m MSL)	Remarks
Culvert No.1 of 450-Years Road	167.42	*1
Culvert No.2 of 450 -Years Road	167.57	*1
Mak Hiao River upstream of Na Khay Marsh	165.5	*2
Mak Hiao River at confluence with Mekong	165.4	*2

Source: *1 450-Years Road project, *2 F/S on Improvement of Drainage System in Vientiane, JICA 1990

The lowest elevation of the VLP is slightly higher than the highest water level of the culvert No.2 of the 450-Years Road. Figure 5.2.1 shows plan and section of land preparation for development of the VLP.



Source: JICA Study Team

Figure 5.2.1 Plan and Section of Land Preparation

Table 5.2.2 shows volume of earthworks (both cut and fill). Volumes of cut and fill are about 1,278,000m^3 and 11,000m^3 respectively. Nearly 1.3 million m^3 of soil excavation is necessary for development of the VLP. The soil excavated for the VLP can be utilized as construction material of the new railway line or the SEZ project planned near the VLP by Malaysian private company, which will be further discussed and confirmed with the relevant authorities. Also, it should be noted that the project cost, discussed in the latter section, includes the costs of transportation of excavated soil (assuming 5 km from the project site).

Table 5.2.2 Volume of Earthworks

Earth Work	Unit	Volume
Cut	m^3	1,278,000
Fill	m^3	11,000

Source: JICA Study Team

5.3 Facility Plan

As discussed in Chapter 4 of this Report, alternative layout concepts were tested and the VLP was proposed to be located east of and parallel to the alignment of new railway line.

This section deals with the facility plan of the VLP, estimating the area required for the facilities installed. These facilities include custom clearance area, heavy bulk storage area, general cargo CY area, general cargo warehouse area, container pool area, chassis pool area, parking lot, container washing area, administration and customs office, operator's office and maintenance workshop. The major determinant of these facilities is the future cargo volume handled in the VLP (see the details in Chapter 4 of this Report). It should be noted that the annual average daily cargo volume, estimated in Chapter 4, was converted to the monthly average daily cargo volume in the peak month, by adding 20% to the annual average daily cargo volume. The average daily cargo volume in the peak month was used to estimate the size and design of the facilities of the VLP.

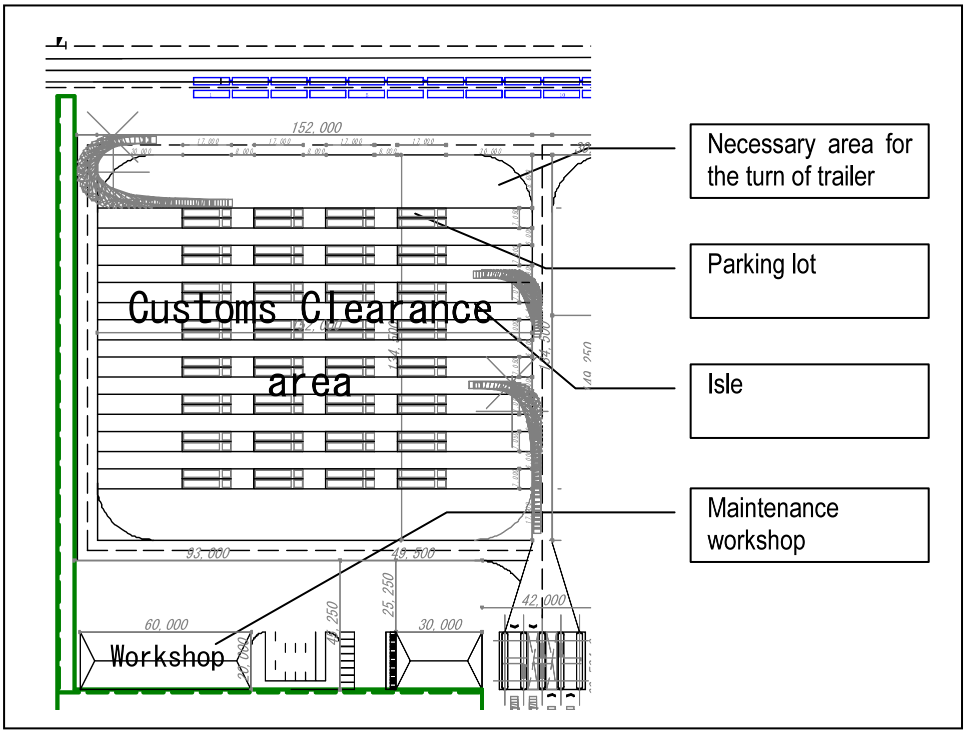
5.3.1 Custom Clearance Area

The floor area for the customs clearance area was estimated based on the number of fully-loaded import vehicles. The precondition for estimation of customs clearance area is 2 times per day as turnover ratio. As a result, the floor area required for customs clearance area was estimated to be 3,700 m^2 in 2025. A layout of customs clearance area is illustrated in Figure 5.3.1.

Table 5.3.1 Floor Area required for Customs Clearance

Item		Unit	Figures in 2025	Note
Fully-loaded vehicles	Import	No	85	A
	Export	No	0	B
Fluctuation		-	1.2	C
Turnover ratio		-	2	D
Safety factor		-	1.2	E
Subtotal		No	62	F:(A+B)*C/D*E
Trailer parking lot / m^2		m^2	59.5	G
Customs Clearance area		m^2	3,700	H:F*G

Source: JICA Study Team



Source: JICA Study Team

Figure 5.3.1 Layout of Customs Clearance on Chassis Area

5.3.2 Heavy Bulk Cargo area

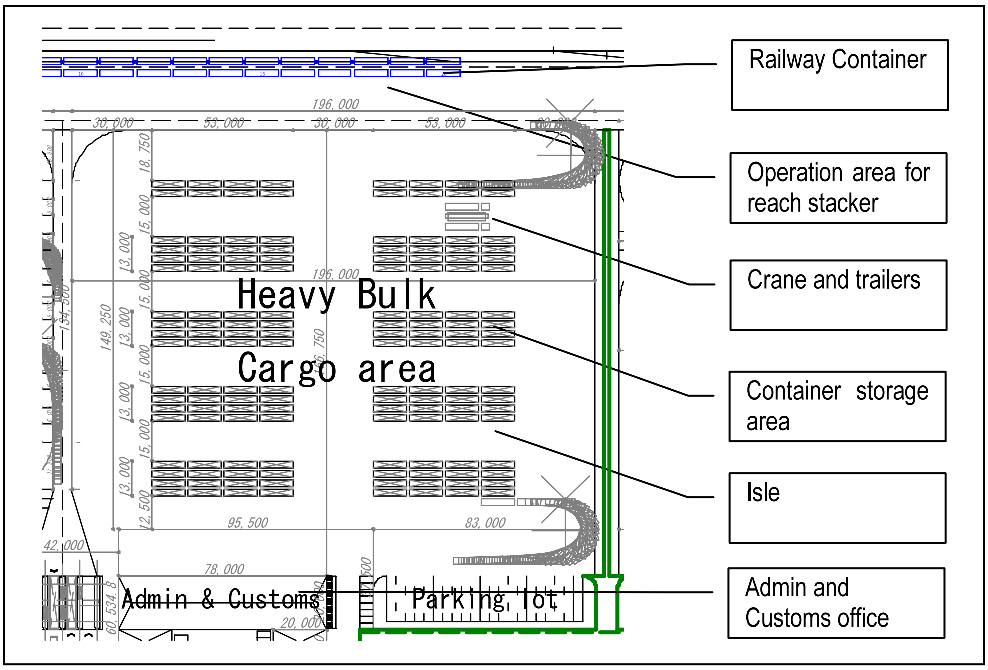
The floor area required for the heavy bulk cargo area was estimated based on the volume of mix-loading cargo by both trailer and rail. The precondition for estimation of heavy bulk cargo area is 3 days of temporary stock.

As a consequence, the floor area for heavy bulk cargo was estimated to be 7,000m^2 in 2025. A layout of heavy bulk cargo area is illustrated in Figure 5.3.2.

Table 5.3.2 Floor Area required for Heavy Bulk Cargo area

		Unit	Figures in 2025	Note
Trailer	Import	No	10	A
	Export	No	11	B
Rail	Import	No	9	C
	Export	No	4	D
Fluctuation		-	1.2	E
Temporary stock days		Day	3	F
Safety factor		-	1.2	G
Subtotal		No	147	H:(A+B+C+D)*E*F*G
Container position		m^2	47.3	I
Heavy Bulk Cargo area		m^2	7,000	J:H*I

Source: JICA Study Team



Source: JICA Study Team

Figure 5.3.2 Layout of Heavy Bulk Cargo Area

5.3.3 General Cargo CY Area

The area for general cargo CY area consists of the general cargo CY, container pool and chassis pool area.

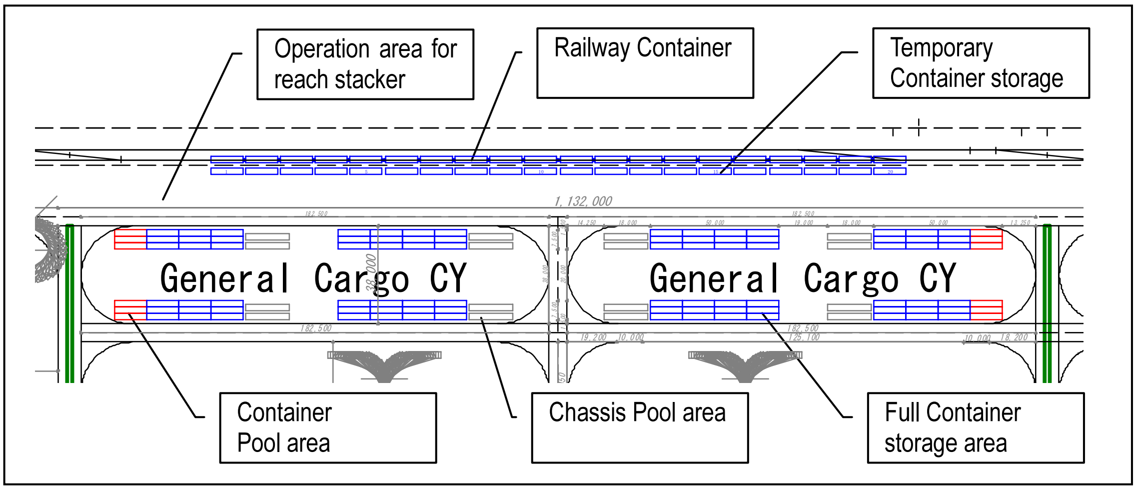
(1) General Cargo CY (Full Container)

The floor area for the general cargo CY (full container) was estimated based on the volume of trailer cargo (import/export and mix-loading of general cargo and container cargo), the rail cargo (import/export and full-loading of general cargo and container cargo) and VIP container cargo. As is the case for other types of cargo, the precondition for estimation of general cargo CY (full container) area is 3 days of temporary stock. As a result, the floor area for general cargo CY (full container) was estimated to be 4,100 m^2 in 2025. A layout of general cargo CY area (full container) is illustrated in Figure 5.3.3.

Table 5.3.3 Floor Area required for General Cargo CY (Full Container)

		Unit	Figures in 2025	Note	Remarks
Trailer (Including VIP)	Import	No	17	A	
	Export	No	0	B	
Rail (Including VIP)	Import	No	53	C	
	Export	No	16	D	
Fluctuation		-	1.2	E	
Temporary stock days		Day	3	F	
Safety factor		-	1.2	G	
Subtotal		No	372	H:(A+B+C+D)*E*F*G	
Container position		m^2	11	I	3 stacks
General Cargo CY area		m^2	4,100	J:H*I	

Source: JICA Study Team



Source: JICA Study Team

Figure 5.3.3 Layout of General Cargo CY Area

(2) Container Pool Area

The floor area for the container pool was estimated based on the volume of export containers. As is the case with the general cargo warehouse, the precondition for estimation of container pool area is 5 days of temporary stock. As a result, the floor area for general cargo CY was estimated to be 1,000 m^2 in 2025.

Table 5.3.4 Floor Area required for Container Pool

		Unit	Figures in 2025	Remarks
Trailer and container(EXIM)	Import	No	-	A
	Export	No	2	B
Rail	Import	No	-	C
	Export	No	16	D
Fluctuation		-	1.2	E
Temporary stock days		Day	5	F
Safety factor		-	1.2	G
Subtotal		No	129.6	H:(B+D)*E*F*G
Container position		m^2	7	I
Container Pool area		m^2	1,000	J:H*I

Source: JICA Study Team

(3) Chassis Pool Area

The floor area for the chassis pool was estimated based on the turnover ratio of the containers. The precondition for estimation of chassis pool area is a turnover ratio of 3. As a result, the floor area for chassis pool area was estimated to be 1,800 m^2 in 2025.

Table 5.3.5 Floor Area required for Chassis Pool

		Unit	Figures in 2025	Note
Trailer of mix-loading	Import	No	17	A
	Export	No		B
Rail	Import	No	53	C
	Export	No	16	D
Fluctuation		-	1.2	E
Turnover ratio		-	3	F
Safety factor		-	1.2	G
Subtotal		No	34	H:(A+B+C+D)*E/F*G
Container position		m^2	51.0	I
Chassis Pool area		m^2	1,800	J:H*I

Source: JICA Study Team

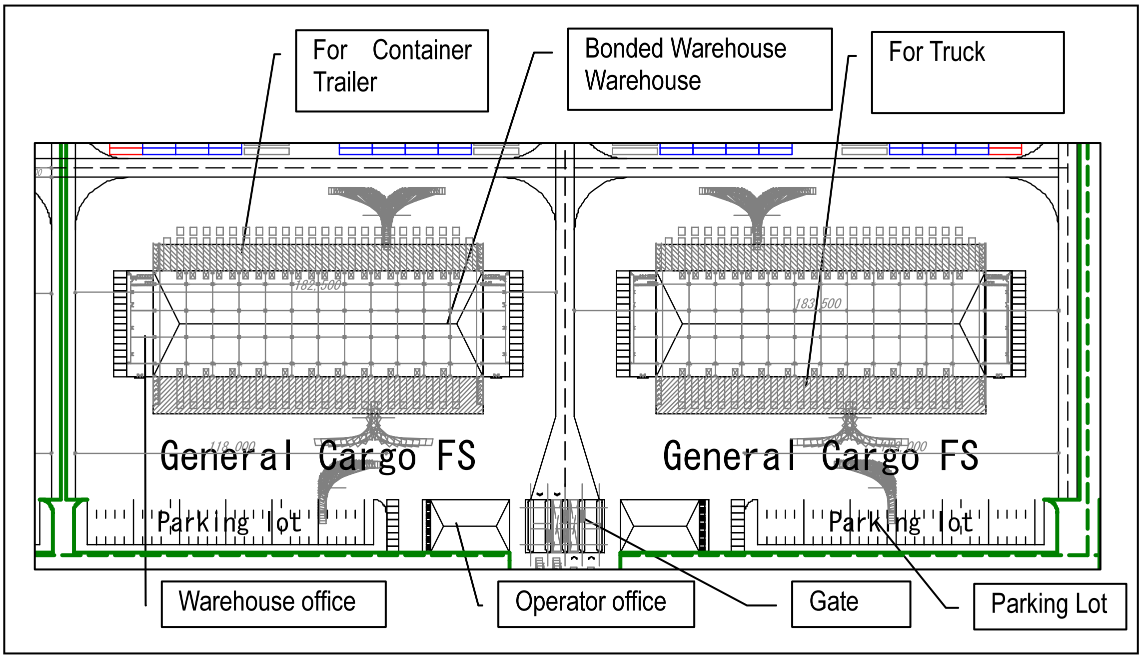
5.3.4 General Cargo Warehouse Area

The floor area for the general cargo warehouse was estimated based on the volume of trailer cargo (import/export and mix-loading), rail cargo (import/export and mix-loading). Unlike other types of cargo, the precondition for estimation of general cargo warehouse area is 5 days of temporary stock. As a result, the floor area for general cargo warehouse was estimated to be 18,700 m^2 in 2025. A layout of general cargo warehouse area is illustrated in Figure 5.3.4.

Table 5.3.6 Floor Area required for General Cargo Warehouse

		Unit	Figures in 2025	Note
Truck (Including VIP)	Import	t	214	A
	Export	t	43	B
Rail (Including VIP)	Import	t	1,174	C
	Export	t	317	D
	LCL	t	298	E:(C+D)*0.2
Fluctuation		-	1.2	F
Subtotal		t	666	G:E*F
Temporary stock days		Day	5	H
Storage unit		m^2/t	2.6	I
Sorting unit		m^2/t	2.6	J
Safety factor		-	1.8	K
General cargo warehouse area		m^2	18,700	L:(G*H*I+G*J)*K

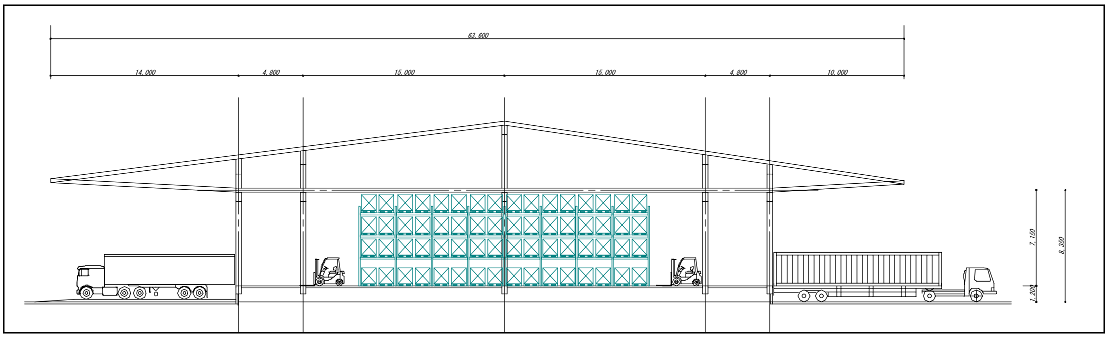
Source: JICA Study Team



Source: JICA Study Team

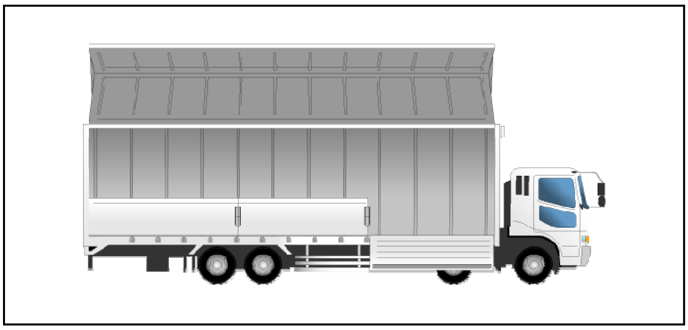
Figure 5.3.4 Layout of General Cargo Warehouse

Cross section of the freight station is illustrated in Figure 5.3.5 while Figure 5.3.6 gives an illustration of the wing-type truck, commonly observed in Lao PDR. In consideration of the wet season, the length of warehouse roof should be at least 14 meters.



Source: JICA Study Team

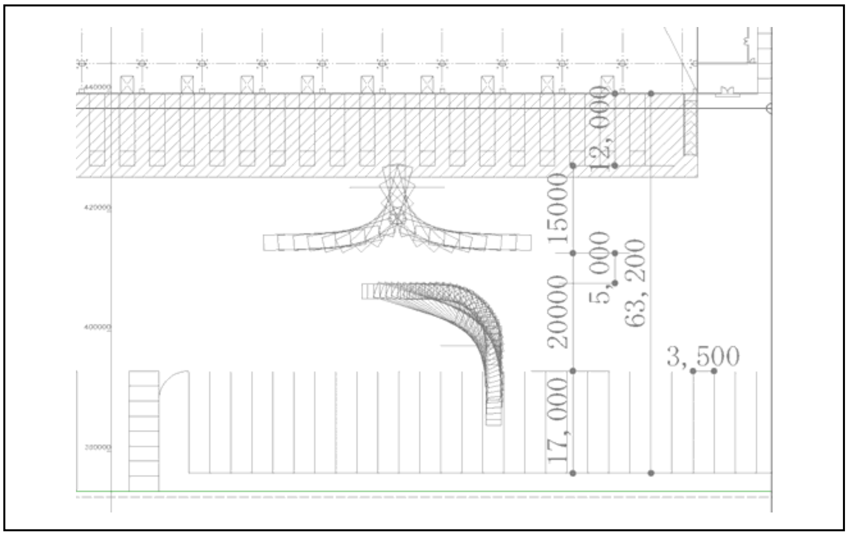
Figure 5.3.5 Cross-Section of Warehouse



Source: JICA Study Team

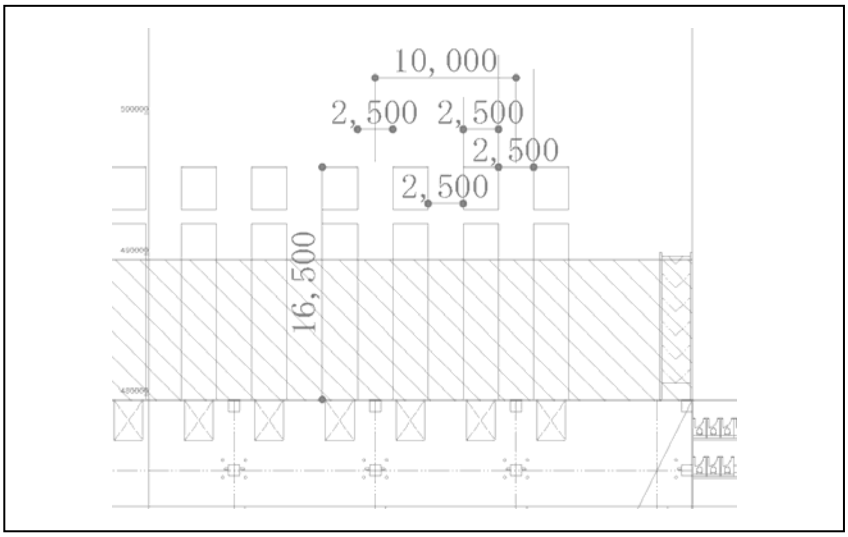
Figure 5.3.6 Illustration of Wing-Type Truck

The turning radius of the container trailer and pickup/delivery truck and the berth size of the container trailer are illustrated in the Figures 5.3.7 and 5.3.8 respectively.



Source: JICA Study Team

Figure 5.3.7 Turning Radius of Line-haul Truck



Source: JICA Study Team

Figure 5.3.8 Berth Size of Container Trailer

5.3.5 Parking Lot Area

The floor area for the parking lots was estimated based on the number of import/export, transit and domestic vehicles. The precondition for estimation of parking lots is a turnover ratio of 3. As a result, the floor area for the parking lots was estimated to be 9,200 m^2 in 2025.

Table 5.3.7 Floor Area required for Parking Lot

Item	Unit	Figures in 2025	Note
Truck	No	202	A
Trailer	No	116	B
Fluctuation	-	1.2	C
Turnover rate	-	3	D
Safety factor	-	1.2	E
Subtotal	No	153	F:(A+B)*C/D*E
Parking lot per Trailer or Truck	m^2	59.5	G
Parking area	m^2	9,200	H:F*G

Source: JICA Study Team

5.3.6 Container Washing Area

The floor area for the container washing area was estimated based on the number of containers. The precondition for estimation of container washing area is based on postulation that 10% of containers require washing and cleaning at a particular time. Accordingly, the number of washing containers will be 17 FEU per day in 2015 and 37 FEU per day in 2025. Assuming 2 times a day as turnover ratio, the floor area for container washing area was estimated to be 720 m^2 in 2025.

5.6h＝{0.52km×2(round trip)÷20km/h＋3minite/container×2(O/D)÷60minite/h}×37container

720 m^2＝37container÷2raitio×31.25m^2/container×safety factor 1.2

5.3.7 Administration and Customs

The area for administration and customs office of Thanaleng Warehouse was calculated to be about 750 m^2: a staff of 100 personnel currently works in that area. Assuming that 200 staff would work at the administration office of the new VLP, the necessary area for new administration and customs office would be about 1,500 m^2 in 2025.

5.3.8 Operator Office

The area for operator office of Thanaleng Warehouse was calculated to be about 1,150 m^2. The area necessary for new operator office at VLP would be about 3,000 m^2 in 2025, considering an increase in cargo volume.

5.3.9 Maintenance Workshop

The floor area for maintenance workshop of Thanaleng Warehouse was calculated at about 300m^2. The area necessary for new maintenance workshop would be about 1,200 m^2 in 2025, considering an increase in cargo volume.

5.3.10 Gate and Weight Station

3 gates will be installed in the VLP. A weight station is also installed at the gates to measure cargo weight.

5.3.11 Oil Terminal area

Oil terminal will be installed in the VLP, and oil will be imported from Thailand by use of rail in the future. In this section, the layout of oil terminal is examined to calculate its area. In reality, an oil company will construct the facility when it enters the VLP.

(1) Function

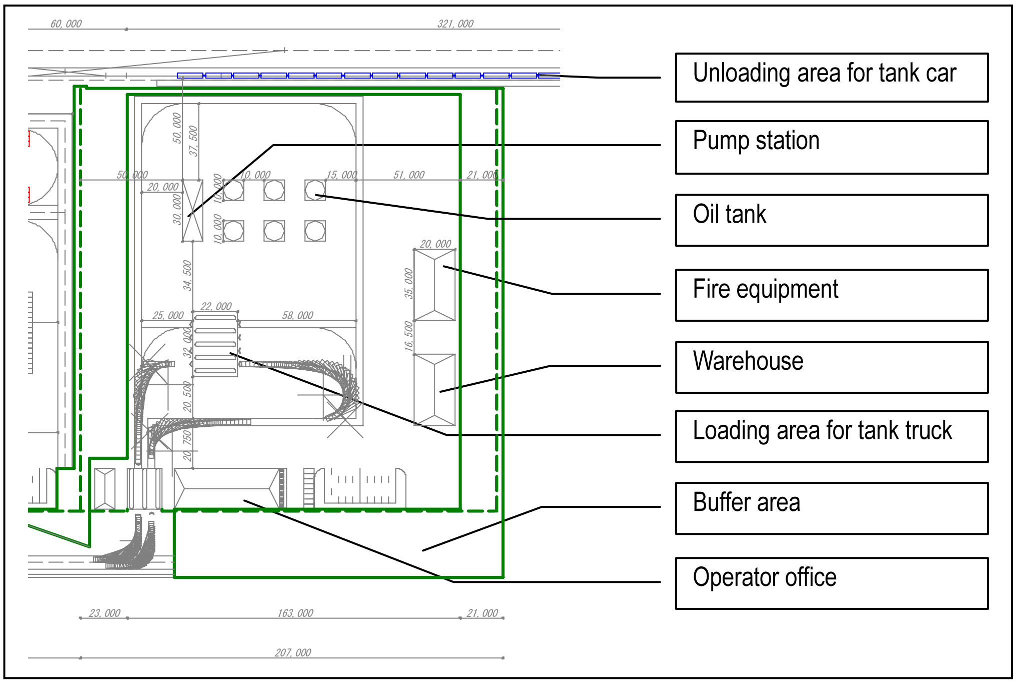
The oil terminal has the following functions: (a) unloading tank cars from Thailand, (2) temporary storage to avoid shortage of petroleum, and (3) loading from oil tanks to tank trucks for domestic distribution.

(2) Facility Plan

The facility plan of the oil terminal is examined, and area required for it was estimated. The facilities include unloading spot for tank car, oil tank, pump station, pipeline from unloading tank car to oil tanks, loading spot for tank truck, warehouse, fire equipment, gate, operator office and buffer area. One company will operate these facilities according to this examination.

The floor area required for oil terminal was estimated based on the volume of imported railway cargo. The precondition for estimation of oil terminal area is that temporary stocks constitute 10% of monthly imports. As consequence, the floor area for oil terminal was estimated to be 53,600 m^2 in 2025. The layout is illustrated in Figure 5.3.9.

In addition to that, the floor area for Lao State Fuel Company near Thanaleng Warehouse was calculated to be about 22,400 m^2 while that for Shell is about 22,000 m^2.



Source: JICA Study Team

Figure 5.3.9 Layout of Oil Terminal

1) Oil Tank & Pump Station

According to Lao State Fuel Company, its stock accounts for 10% of the monthly volume of import. For that reason, the necessary volume for the oil tank is 1,120t. In addition to that, Lao State Fuel Company imports 3 types of petroleum. They are 91 & 95 of gasoline and diesel. The volumes of stocks are estimated based on distribution ratio of volume of imports of Lao State Fuel Company. As a result, the numbers of necessary tanks are 3 for diesel, 1 for 91 gasoline, and 1 for 95 gasoline. In addition to that, one pump station shall be installed at oil terminal.

Table 5.3.8 Oil tanks required at the Oil Terminal

Item	Unit	Figures in 2025			Remark
Type of oil	-	Gasoline 91	Gasoline 95	Diesel	
Import volume	kg/day	515,000			
Stock volume	kg	1,115,833			10% of monthly import volume
Share	%	30.0	1.0	69.0	It is referenced in volume of imports of Lao company in September, 2009
Conversion factor	ℓ/kg	0.75	0.75	0.75	
Safety factor	-	1.44	1.44	1.44	Peak month factor1.2 × safety factor 1.2
Volume	Kℓ	642,720	21,424	1,478,256	
Tank capacity	Kℓ/No	549,779	549,779	549,779	The facility is assumed to have radius of 5m and height of 7m.
The number of necessary tanks	No	2	1	3	

Source: JICA Study Team

2) Unloading Spot for Tank Cars

Unloading spot for tank cars takes in oil from a railway tank car to oil tanks and the pump station. Therefore it is necessary for it to be arranged along railway.

Source: JICA Study Team

Figure 5.3.10 Snapshot of Unloading Tank Car Area at Khon Kaen train station

3) Loading Spot for Tank Trucks

Loading spot for tank trucks trans-ships petroleum from oil tanks to tank trucks. It was necessary to prepare a space to accommodate 7 trucks at a single time: the area was estimated to be 1,000 m^2 in 2025. The area was determined from the following formulae.

7 tank trucks＝64 tank trucks /day x safety factor 1.2 / 1.4 hour/tank truck[4] / 8hour/day

1,000 m^2＝7 tank truck × (6.5m × 22m) / tank truck parking lot

4) Warehouse

The warehouse keeps oil equipment, spare parts, lubricant and others. Floor area of the existing Warehouse of Lao State Fuel Company at Thanaleng is around 861 m^2. The floor area of the warehouse at VLP was estimated based on the floor Area of the existing warehouse, considering future increase of petroleum imports, modal share and safety factor. The floor area for the warehouse at VLP was estimated to be 610 m^2 in 2025 from the following formula.

610 m^2 =861 m^2 x expansion factor 3.49 x modal share 16.9% x safety factor 1.2

5) Buffer area

In order to secure safety, it is necessary to prepare buffer area which is 50m wide from oil tanks to the edge of railway line and road.

5.3.12 Overall Layout of VLP

Based on the above discussion, the total area required for development of the VLP was summarized as shown in Table 5.3.9. An overall layout of the VLP is also illustrated in Figure 5.3.11.

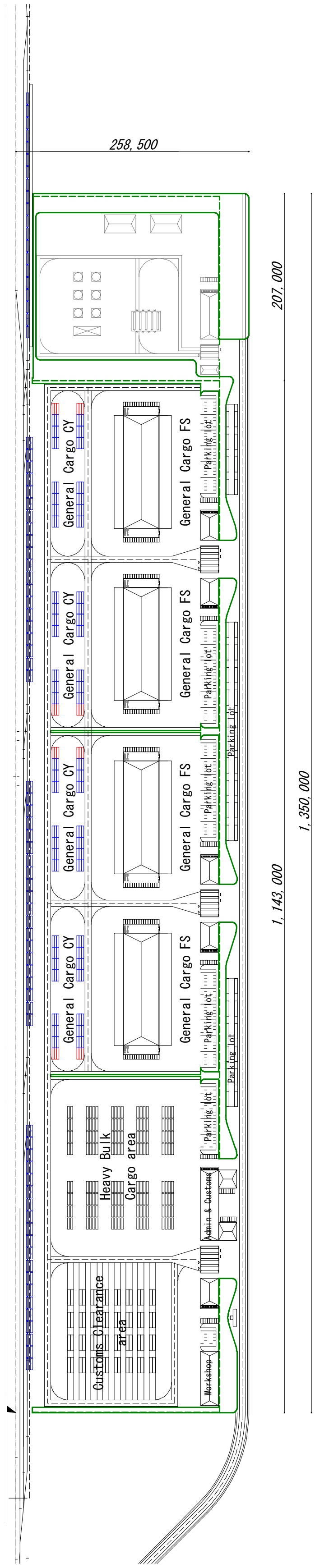
[4] Survey results from Samran Gas Station at Khon kaen.

Table 5.3.9 Summary of Total Area required for VLP

	Floor area (m^2)	Area (m^2)	Occupancy rate at VLP	Remarks
Customs Clearance area	3,700	20,500		
Heavy bulk Cargo area	7,000	32,500		
General Cargo CY area	6,900	39,900		CY area includes CY, container pool, chassis pool and container washing area.
General Cargo warehouse area	21,900	76,200		Warehouse includes warehouse and warehouse office.
Parking Lots	9,200	20,900		Aisle is shared by heavy bulk and general cargo areas
Administration and Customs office	1,500	5,800		
Operator Office	3,000	9,300		
Maintenance shop	1,200	4,000		
Gate and Weight Station	2,600	7,700		
Buffer area	-	17,000		
Load in VLP	-	24,500		
VLP access load	-	10,200		
Siding line of railway	-	17,100		
Others	-	9,100		
Oil Terminal area	-	53,600		
Total area	57,000	348,600	16%	
Total area, excluding oil terminal area	57,000	295,000	19%	

Note Referring to Hironao Takahashi, “Kontena yusou to kontena kouwan”,2004; as for occupancy rate, values from 20% to 25% are common.

Source: JICA Study Team



Source: JICA Study Team

Figure 5.3.11 VLP Layout

5.4 Machine and Equipment

5.4.1 Freight Handling Equipment

(1) Forklift

Forklifts are used for loading and unloading of mainly containerized cargo. 10 forklifts are currently in operation at Thanaleng Warehouse. 30 forklifts may be required at the new VLP since the total volume of cargo will increase by 3 times by 2025. The VLP will have 6 warehouses and therefore 5 forklifts will be used at each warehouse.

Source: JICA Study Team

Figure 5.4.1 Snapshot of Forklift

(2) Reach Stacker

Reach stacker is a heavy-duty vehicle used to carry the container itself to take it to CY. At present, there isn't any reach stacker at the Thanaleng Warehouse. The estimated number of containers will reach 195 FEU per day by 2025. Accordingly, 3 reach stackers would be required at the new VLP as shown below.

3 vehicles =195 containers x {(3 minute/loading + 3 minute/unloading) / 60minute/h +100m/CY / 15,000m/h} x safety factor 1.2 / 10h/day

Source: JICA Study Team

Figure 5.4.2 Snapshot of Reach Stacker

(3) Crane

A crane is also a heavy-duty vehicle for carrying heavy bulk cargo from one vehicle to another. Currently, the Thanaleng Warehouse has 2 cranes; however, they are seldom used. As of November 2009, one of the cranes was under repair. Although the handling volume of heavy bulk cargo at the VLP will increase by 3 times by 2025, only 2 cranes are proposed to be provided at the VLP, considering the small amount of cargo currently handled by the cranes at the existing warehouse.

Source: JICA Study Team

Figure 5.4.3 Snapshot of Crane

(4) X-ray Inspection Apparatus

A few types of imported containers need to be X-rayed for inspection of the cargo. The X-ray will be placed near the customs office.

(5) Weight Station

2 weight stations will be placed near the gate of each operator to check both outgoing and incoming trucks.

Source: JICA Study Team

Figure 5.4.4 Snapshot of Weight Station at Thanaleng ICD

5.4.2 Water Supply

The average consumption of water for domestic use and container washing was estimated to be 100 liters/person/day for VLP staff, 1,000 liters/truck for truck-washing and 150 liters/container for container washing. The numbers of staff, trucks and containers were estimated as tabulated below, based on the future cargo volume. The consumption volume of water in VLP was, accordingly, estimated to be 115m^3 per day. Considering water leakage (20%) and peak factor (1.2), a water supply of 173m^3/day would be required in the VLP.

Table 5.4.1 Numbers of Staff, Trucks and Containers

Items		Number	Remarks
Staff	Custom	50	
	Operator	300	3 operation companies
	Total	350	
Truck		20	
Container		40	

Source: JICA Study Team

Table 5.4.2 Volume of Water Consumption per day

Items	Unit Volume	Number	Volume (m^3/day)
Staff	100lt/staff/day	350	35
Truck	1,000lt/track/day	20	20
Container	150lt/container/day	40	60
Total			115

Source: JICA Study Team

Table 5.4.3 Water Demand per day

No.	Item	Volume (m^3/day)
1	Water Demand	115
2	Water leakage(20 %) = (1)/(1-0.2)	144
3	Peak Factor (1.2) = (2)x 1.2	173
4	Water Demand Forecast	173

Source: JICA Study Team

A water reservoir with a pump is installed under the ground of the VLP. The recommended volume of a reservoir is above 58m^3 (8hour operation per day: 173/3=57.7m3≒58m^3).

Chinaimo Water Treatment Plant with the treatment capacity of 80,000m^3/day supplies water to the existing Thanaleng Warehouse and its surroundings by water pipes of φ300 under the NR-1, and φ150 and φ75 under the access road to the station from NR-1. A water valve was installed at the end of the φ75 water pipe at the side of the access road to the station. 173m^3/day of water would be supplied from this valve through a φ75 water pipe newly constructed under the access road to the VLP. The length of this new water pipe between the existing water valve and water reservoir in the VLP is approximately 2.5km. Water is distributed to the buildings from the reservoir through φ50 water pipes. The total length of the distribution pipes in the VLP is about 3km.

Table 5.4.4 Water Supply Facility

Item		Quantity	Remarks
Water Pipe I	ϕ75	2.5km	Between existing valve and VLP
Water Pipe II	ϕ50	3.0km	Within VLP
Water Reservoir	58m^3	1	Within VLP

Source: JICA Study Team

Hydrants are provided within 50 meters around the building.

5.4.3 Electricity

A 22kV line is located about 250m west of the center of the new rail track, extending northwards and running parallel to the center of the track. Electricity to the VLP would be supplied by this 22kV line. A new 240m long 22kV feeder line will be installed to connect to the existing 22kV line near the tracks at about 5 to 6m above the ground while a new 1,500m long 22kV line will be installed under the ground in the VLP. A transformer will be installed at 4 administration buildings to drop the voltage from 22kV to 400/200V. 400/200V lines of total length of about 500mm will be installed under the ground.

Table 5.4.5 Electricity Facility

Item		Quantity	Remarks
22kV line	Above the ground	240m	Between existing line and VLP
	Under the ground	1,500m	Within VLP
400/200V line	Under the ground	500m	Within VLP
Transformer	22kV to 400/200V	4	Within VLP

Source: JICA Study Team

5.4.4 Telecommunications

4 administration offices, one office for the VLP Management Company and 3 for operators, will be set up in the VLP. Each office will have 2 fixed telephone lines and one Internet connection. A telephone line will be extended to connect to the existing line installed near the station. The length of new telephone lines will reach about 2km.

5.4.5 Drainage

The drainage system is designed to discharge into the existing drainage channel used for agriculture located near the VLP. U-shaped concrete ditches with concrete covers will be installed along roads to collect rainwater within the VLP. Reinforced concrete ditches will be constructed since the axle loads of trailers and trucks with cargo tends to be large.

Volume of flood discharge estimates and capacity of drainage were calculated based on the Road Design Manual (Provisional Use) issued by the Ministry of Communication, Transport, Post and Construction, 1996. The flood discharge was estimated using the following equation:

Q = 1/360 x C x I x A (Rational Formula)

where,

Q: Expected flow (m^3/sec)

C: Run-off coefficient

I: Intensity of Rainfall (mm/hr)

A: Area for drainage (ha)

C: Concrete 0.80-0.95, 0.9; Asphalt 0.7-0.95, 0.85

I: 75mm/h (5 or 10 minute storm with a return period of 2 years)

Capacity of drainage was estimated using the Manning Striker formula.

$Q = K \times A \times R^{2/3} \times S^{1/2} = A \times V$

where,

Q: Discharge (m^3/sec)

A: Cross-section of flow area (m^3/sec)

R: Hydraulic radius = A/WP where WP is the wetted perimeter of flow area (m)

V: Water velocity (m/sec)

S: Longitudinal slope of flow

K: Roughness factor (1/n)

n: Roughness coefficient (concrete: 0.015)

The total length of drainage by size is shown in Table 5.4.6.

Table 5.4.6 Length of Drainage by Size

Drainage Size	Length (m)	Remarks
300 x 300	2,800	U-shaped reinforced concrete with cover
500 x 500	1,300	U-shaped reinforced concrete with cover
700 x 700	900	U-shaped reinforced concrete with cover
900 x 900	600	Includes discharge drainage to existing facility

Source: JICA Study Team

5.4.6 Sewage Treatment

A centralized sewer treatment system was adopted considering environment for not only the VLP but also its surrounding area. This sewage collection system is designed to collect only wastewater from domestic sewage (35m^3/day of wastewater from staff in the VLP). Wastewater generated from each building gravitates to the treatment plant installed in the VLP.

The sewage treatment volume was estimated at 90% of the water supply volume. Seepage of ground water into sewage pipe was also considered.

$Q = Q_1 \times 90\% \times 1.1$

where,

Q: Sewage Volume (m^3/day)

Q_1: Water volume (=35m^3/day)

1.1: Encroaching ratio

Q : $35 \times 0.9 \times 1.1 = 34.65 \fallingdotseq 35m^3$/day

The treated wastewater would be discharged into the existing drainage channel used for agriculture. The water quality required is as shown below:

Table 5.4.7 Water Quality

Parameter	Wastewater (mg/l)	Treated Water (mg/l)
BOD	200	20
SS	250	50

Source: JICA Study Team

Figure 5.4.5 Sewerage Treatment Facility

Facilities and capacity of the centralized sewerage treatment system are summarized as shown in Table 5.4.8.

Table 5.4.8 Facilities of a Centralized Sewerage Treatment System

Item		Quantity
Drain Pipe I	ϕ200	500m
Drain Pipe II	ϕ150	1000m
Sewerage Treatment Tank	35m^3/day	1 piece

Source: JICA Study Team

5.5 Infrastructure and Utility Plan in VLP

5.5.1 Road Network

(1) Access Roads to VLP

A roughly 3 km long access road, illustrated in Figure 5.5.1, will be developed. It is divided into 2 sections as follows;

- Section I: New construction from existing railway crossing to the VLP (1,630m)
- Section II: Improvement of existing road from NR-12A to the railway crossing (1,400m)

Source: JICA Study Team

Figure 5.5.1 Access Road to Be Developed

(2) Precondition

Preconditions pertinent to the planning of the access road are as follows;

1) Section I: New Construction

- The road is constructed within Dongphosy Forest Reserve, local government land, which does not require land acquisition.
- Crossing the railway line by the trucks shall be avoided as much as possible due to safety and operational efficiency concerns. The VLP will be developed on the eastern side of the railway line. The alignment of the section is accordingly located on the eastern side.
- The section is located within the local governmental land where the residential facilities, such as houses, do not exist. The major traffic is assumed to be trucks, with a small portion of commuter traffic of VLP staff.

- It is expected that traffic of passenger vehicles, bicycles and pedestrians will hardly be generated for the same reasons mentioned above.
- The operation of the VLP shall be maintained continuously even on the occasion of traffic disturbance on the access road caused by such incidences as broken-down trucks on the road, since another detour route does not exist.
- Therefore, the traffic lanes and shoulders should have sufficient width which would allow passage of trucks, even when disabled trucks have stalled along the access road.
- The trucks queuing for opening hour of the VLP in the morning shall be accommodated in the parking area of the VLP: parking bays will not be availed along the access road.
- An asphalt concrete pavement of adequate thickness is required given the traffic volume of trucks in 2025.

2) Section II: Existing Road Improvement

- The current total width of the existing section will be maintained considering the limited traffic volume in 2025 (1600 pcu/day) and the adverse environmental impact to the roadside residential area.
- An asphalt concrete pavement of adequate thickness is required given the traffic volume of trucks in 2025.
- The same cross-section as Section I would be applied to maintain continuity between these 2 sections.
- A stopping lane and side walk are accommodated due to the following reasons;

  i) The alignment is located in residential area,

  ii) A commercial complex, which may generate the traffic of commercial and passenger vehicles, is being planned west of this section.

It should be noted that the details of the design of the existing road were unavailable with the exception of drawings. Therefore, the design of these 2 sections was based on the available drawings, site survey of surrounding area, traffic demand forecast conducted by the Study and interviews with the related departments.

(3) Design Condition

Given the preconditions mentioned above, the design conditions for both sections were specified as follows;

- Major Functions:

  Section I: Provide access to/from the VLP with trucks as major traffic

  Section II: Provide access to/from: i) VLP with trucks as major traffic and; ii) roadside residential areas and existing facilities for passenger vehicles and pedestrians
- Target Year: 2025
- Design Traffic Volume: 776 trucks/day/lane in 2025 (Annual Average Daily Traffic)
- Design Vehicle: Combined semi-trailer with the following details:

  Length of vehicle: 16.5m

  Width of vehicle: 12.5m

Number of axles: 4

Total weight: 36t

Axle Load: 10t

As regards design of the access road, Japanese Standards including Road Construction Ordinance were mainly referred to since: i) Lao's design criteria (1996 editions) are provisional and await amendment; ii) contents of Lao's design criteria are rather limited.

(4) Design of Access Road

Section I and Section II were designed as follows;

1) Section I: New Construction

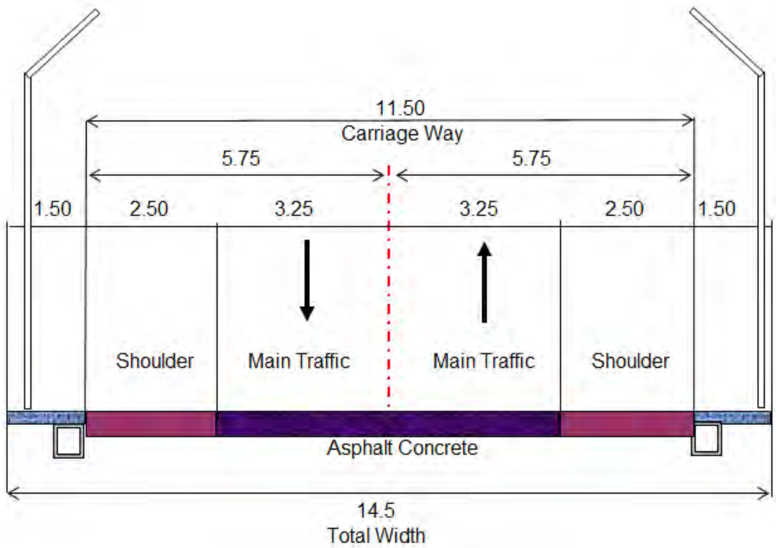
- Length: 1630m
- Design Speed: 50km
- Number of Traffic Lanes: 1 in each direction (2 in both directions)
- Width: 14.5m in total

  Traffic Lane Width: 3.25m

  Shoulder Width (Hard Shoulder): 2.5m

  Shoulder Width (Protected Shoulder): 1.5m
- Pavement: Asphalt Concrete (Surface and Binder Course 10cm, Base Course 30cm, Sub-base Course 30cm)

The typical cross section of the Section I is shown in Figure 5.5.2.



Source: JICA Study Team

Figure 5.5.2 Typical Cross-Section: Section I

Design Criteria/Ground for Design

- Road Classification: Equivalent to Type 3, Class 3 (Japanese Road Construction Ordinance)
- Design criteria for cross-section and pavement thickness are shown in Table 5.5.1.

Table 5.5.1 Design Criteria for Section I (Cross-Section and Pavement)

Component	Applied Value *	Remark
No. of Lanes (one direction)	1 lane	Threshold value for 1 lane: Design Traffic Volume =< 8000 vh/day/lane
Traffic Lane Width	3.25m (3m)	Margin (0.25m) was specified due to large-sized trucks which are major traffic
Shoulder Width (Hard Shoulder)	2.5m	Full shoulder width which allows all types of vehicles to stop was applied
Shoulder Width (Protected Shoulder)	1.5m	Sufficient width to allow construction of street lights and drainage facilities was specified
Pavement Thickness	70cm	Design Traffic Volume is equivalent to B Traffic Category (250 – 1000) **

Note: * Numbers shown in the parentheses are the typical standard values defined by Japanese Road Construction Ordinance; ** Source: Manual for Asphalt Pavement 1989, Japan Road Association

2) Section II: Existing Road Improvement

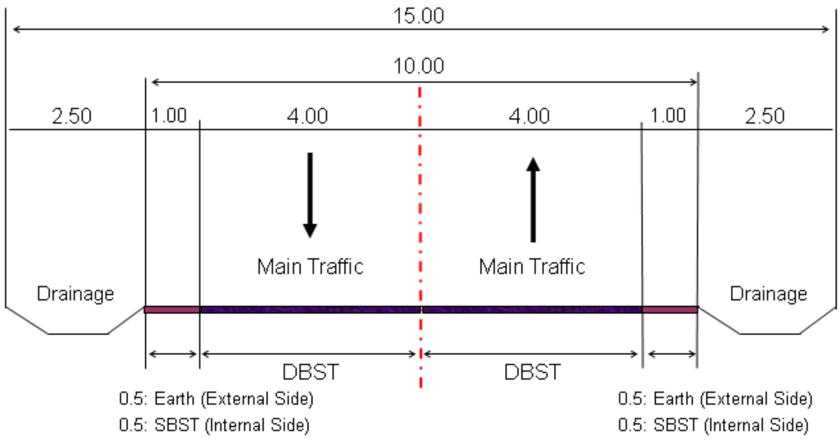
- Length: 1400m
- Design Speed: 60km
- Number of Traffic Lanes: 1 in each direction (2 in both direction)
- Width: 15m in total

  Traffic Lane Width: 3.25m (Current Condition: 4m, DBST)

  Shoulder Width (Hard Shoulder): 2.5m (Current Condition: 0.5m SBST + 0.5m Earth)

  Shoulder Width (Side Walk): 1.75m
- Pavement: Asphalt Concrete (Surface and Binder Course 10cm, Base Course 30cm, Sub-base Course 30cm)

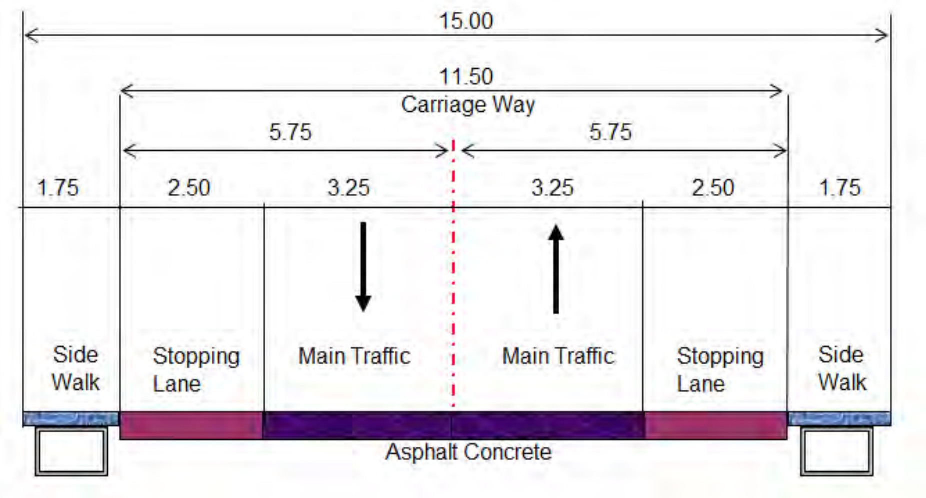
The typical cross section of Section II (Current Condition) is shown in Figure 5.5.3.



Source: JICA Study Team

Figure 5.5.3 Typical Cross Section: Section II (Current Condition)

The typical cross section of the Section II (After Improvement) is shown in Figure 5.5.4.



Source: JICA Study Team

Figure 5.5.4 Typical Cross Section: Section II (After Improvement)

Design Criteria/Ground for Design

- Road Classification: Equivalent to Type 4, Class 3(Japanese Road Construction Ordinance)
- Design criteria for cross-section and pavement thickness are shown in Table 5.5.2.

Table 5.5.2 Design Criteria for Section I (Cross Section and Pavement)

Component	Applied Value*	Remark
No. of Lanes (one direction)	1 lane	Threshold value for 1 lane: Design Traffic Volume =< 8000 vh/day/lane
Traffic Lane Width	3.25m (3m)	Margin (0.25m), equal with section I, was specified due to large-sized trucks which are the major traffic
Stopping Lane Width	2.5m (1.5-2.5m)	Width which allows large-sized truck to stop was applied
Side Walk Width	1.75m	In consideration of pedestrian's occupancy width (0.75m), the maximum available width of 15m was applied
Pavement Thickness	70cm	Design Traffic Volume is equivalent to B Traffic Category (250 – 1000)**

Note: * Numbers shown in the parentheses are the typical standard values defined by Japanese Road Construction Ordinance; ** Source: Manual for Asphalt Pavement 1989, Japan Road Association

5.5.2 Railway

(1) Demand Forecast

1) Demand Forecast for Freight Train

According to the Chapter 4 of this Interim Report, the freight demand was estimated as shown in Table 5.5.3. 2 freight trains are supposed to be operated each day in the year 2015 while 8 trains are supposed to operate each day in the year 2025.

Table 5.5.3 Estimated Demand for Freight Train after Construction of VLP

	Yearly Volume			Daily Volume* (with Industrial Park)		
Import	Unit: tons/yr			Unit: tons/yr		
	2009	2015	2025	2009	2015	2025
Heavy Bulk	0	11,555	63,851	0	44	243
Petroleum	0	28,437	159,625	0	108	608
Container & General Cargo	0	39,360	274,475	0	154	1,390
Total	0	79,352	497,952	0	306	2,241
Export	Unit: tons/yr			Unit: tons/yr		
	2009	2015	2025	2009	2015	2025
Heavy Bulk	0	5,710	27,652	0	22	105
Petroleum	0	0	0	0	0	0
Container & General Cargo	0	1,361	8,719	0	9	377
Total	0	7,071	36,371	0	31	483
Import & Export	Unit: tons/yr			Unit: tons/yr		
	2009	2015	2025	2009	2015	2025
Heavy Bulk	0	17,265	91,503	0	66	349
Petroleum	0	28,437	159,625	0	108	608
Container & General Cargo	0	40,721	283,194	0	163	1,767
Total	0	86,423	534,322	0	337	2,724

*Daily volume was calculated using the following formula:

D=A x f/T;

D: Daily treated cargo volume (ton), A: A: Yearly treated cargo volume (ton), f: Busy coefficient=1.2, T: No. of annual working days=315.

Source: JICA Study Team

Based on the demand, the daily number of treated wagons was calculated using the formula:

$$Q = \frac{(2 \times V \times k)}{v}$$

where,

Q: Daily no. of treated cargo to/from VLP (wagon)

V: Larger one of daily treated cargo volume whether "Coming from" or "Go to"(tons)

v: Average loading volume per wagon (tons)

k: Empty car ratio (assumed as 1.2)

The calculated result is indicated in Table 5.5.4.

Table 5.5.4 Estimated Daily No. of Treated Wagons in VLP

Unit: wagons

Item	2009	2015	2025
Bulk wagon	0	3	17
Oil tank wagon	0	10	56
Container wagon	0	18	167
Sub-total	0	31	240

Note: * Bulk: 35 tons/car , Oil tank: 26 tons/car , Container(40ft) : 20 tons/car

Source: Leading Particulars of Rolling Stock, SRT

Based on the daily number of treated wagons, the daily number of freight trains in operation was calculated as shown in Table 5.5.5.

Table 5.5.5 Estimated Daily Number of Freight Trains in Operation

	2009	2015	2025
Bulk wagon	0/day	1/week	1/day
Oil tank wagon	-	-	2/day
Container wagon	0/day	1/day	5/day
Sub-total for Cargo	0/day	2/day	8/day

Note: Maximum number of cars hauled by 1 locomotive: Bulk: 14 cars, Oil Tank : 18 cars, Container: 20 cars, decided upon in interviews with SRT. It is assumed Oil tank wagon will not be operated in 2015 according to interview with Lao oil company. The operated number is rounded up.

Source: JICA Study Team

2) Demand Forecast for Passenger Train

Passenger demand was estimated based on the F/S Report (2002). The number of passenger trains was estimated to be 5 rounds per day in the year 2015 and 7 rounds per day in the year 2025.

Table 5.5.6 Estimated Daily Number of Passenger Trains in Operation

Type of Train	2009*	2015**	2025
Long Distance Train	0/day	0/day	2/day
Short Distance Train	2/day	5/day	5/day
Sub-total of Pax Train	2/day	5/day	7/day

Note: No.s in 2009 reflect actual conditions. It is assumed that the extension to Vientiane will be completed after 2015; Prepared referring to Korean F/S

Source: JICA Study Team

3) Total Number of Train to be Operated

According to 1) and 2) above, the total number of trains to be operated is as follows:

Table 5.5.7 Estimated Daily Number of Trains in Operation

Type of Train	2009	2015	2025
Freight Train	0/day	2/day	8/day
Passenger Train	2/day	5/day	7/day
Total	2/day	7/day	15/day

Source: JICA Study Team

(2) Design

1) Precondition

Preconditions pertinent to the planning of the railway in VLP are as follows.

- The track layout for the VLP should be located within Dongphosy Forest Reserve.
- Alignment of extended main line between Thanaleng Station and VLP will be straight.
- 2 lines will be installed for container/general cargo yard and 1 line for mineral/construction material yard for loading and unloading.
- Coupling/decoupling function will be placed separately from Thanaleng Station.

- Pooling function will also be placed separately from Thanaleng Station.
- Maximum train length was estimated to be 286m based on the interviews with SRT.
- Decoupling function will be required for the container trains since the containers are transported by a block train.
- 2 lines will be installed for coupling and decoupling of 1 train.
- 3 lines will be installed for pooling of waiting trains and/or broken-down trains by 2025.

2) Design Criteria

Design criteria used for the railway between Friendship Bridge and Thanaleng Station was basically applied to this Study and is summarized as shown in Table 5.5.8.

Table 5.5.8 Design Criteria of Railway

Item		Criteria
Basic	Secure straight distance between curves	0m
	Max. Gradient	0%
	Min. Distance between Track Centers	Between Main Line and Siding: 4.5m Between Sidings: 4.0m
	Required Effective Length	- 321m for full train - 188m for half train (determined from the current train composition of the SRT Northeast line freight train)
Track Structure	Min. Depth of Ballast	Min. 200mm below bottom of sleepers
	No. of sleepers per 25m	34
	Usual size of Turnout	Main Line: 1: 10 Siding Line: 1:10, or 1:8 (for pool lines, turnout No. 8 to be used)
	Rail Profile	BS80A

Source: JICA Study Team

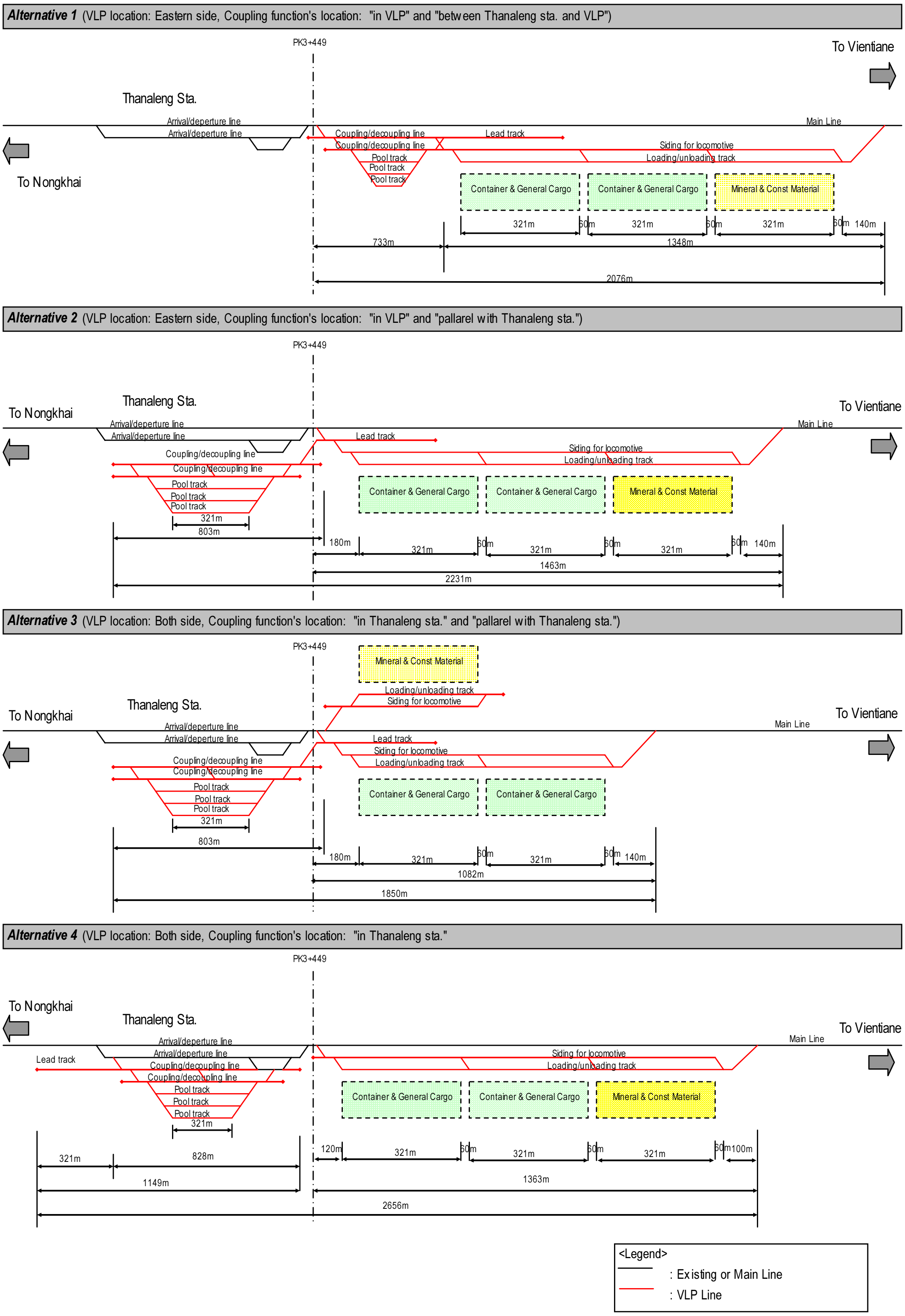
3) Track Layout Plan in ICD

Several alternative track layouts were developed from the following conditions.

- Location of the VLP (either on the eastern side or on both sides of the main line)
- Location of coupling/decoupling and pooling yards (Either on northern side of Thanaleng station or on eastern side of Thanaleng station)
- Train operation (Operation of the VLP should have minimal influence on the railway operations on the main line)

4 alternative track layouts were prepared as shown in Figure 5.5.5. The minimum length for freight handling area was estimated to be 321 meters, based on the estimated length of freight train. The track layout was designed to load and unload cargo on the single side of railway tracks such that need for access to the VLP could be minimized. All the turnouts are to be equipped with electric switch devices because they are to be operated by a driver on board. All tracks will have no vertical gradient (0%) and elevation of the rail level is about 170m (GL: ground level) which is the same elevation of the rail level at the end point of the existing main line.

According to the comparison table shown below, Alternative 2 is recommended as the optimum track layout plan.

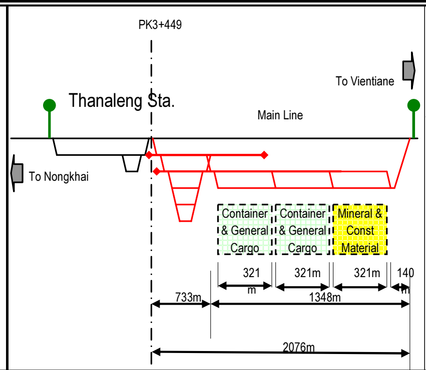
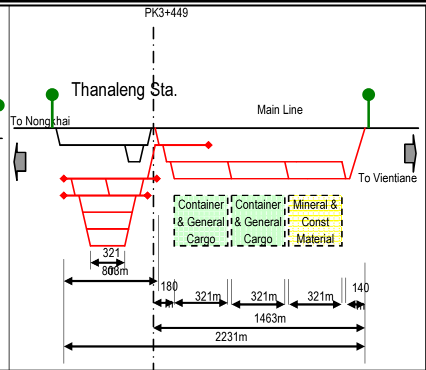
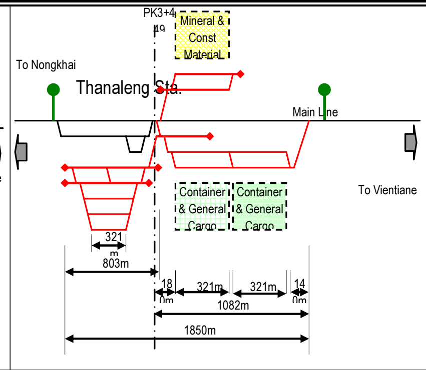
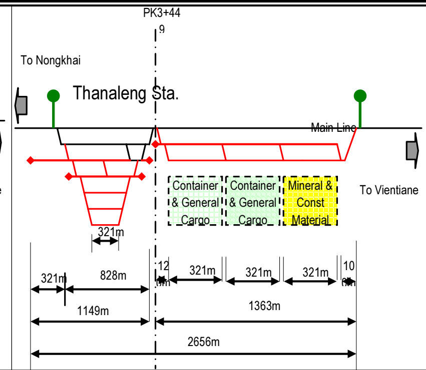


Source: JICA Study Team

Figure 5.5.5 Alternative Track Layouts in and around ICD

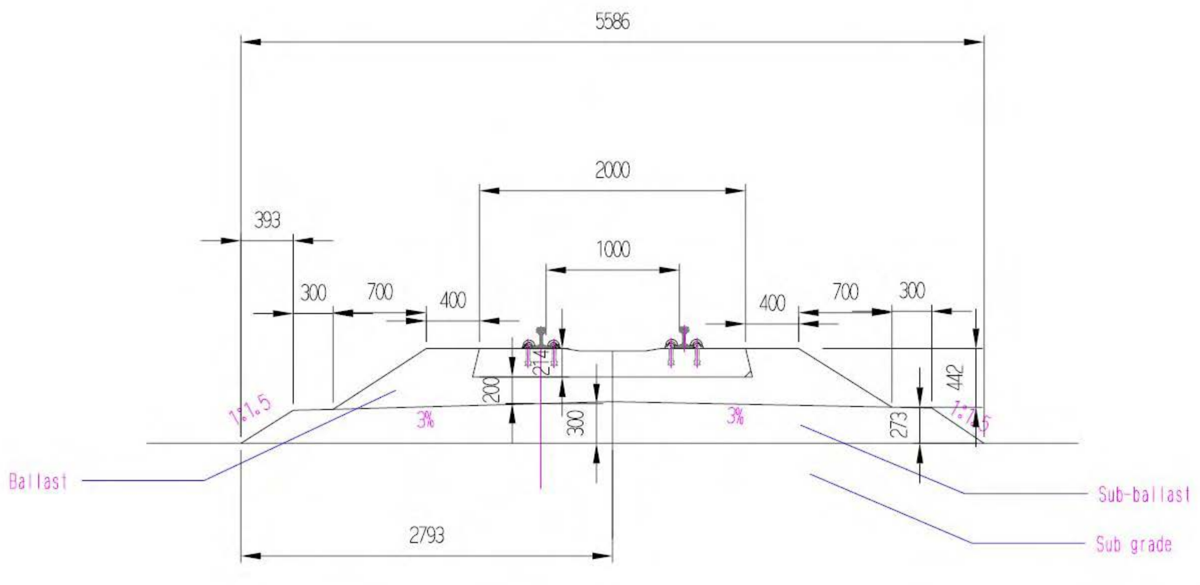
In order to select the most suitable track layout plan, the comparison was conducted based on the comparison table shown below.

Table 5.5.9 Table for Comparison of Alternative Track Layout Plans in VLP

		Alternative1	Alternative2	Alternative3	Alternative4	Remarks
Track Layout						
Location of VLP		Eastern side	Eastern side	Both side	Eastern side	
Location of Coupling/decoupling yard		"in VLP", and "northern side of Thanaleng Sta."	"in VLP", and "eastern side of Thanaleng Sta."	"in Thanaleng Sta.", and "eastern side of Thanaleng	"in Thanaleng Sta. as siding"	
Block area as Thanaleng Sta. Yard		Thanaleng Sta.	Thanaleng Sta.	Thanaleng Sta. and VLP's track	Thanaleng Sta. and VLP's track	
Length of Yard (from PK3+370)		2076m(Northern side)	1463m(North), 803m(South), 2231m(Total)	1082m(North), 803m(South), 1850m(Total)	1363m(North), 1149m(South), 2656m(Total)	
Max. Width of Track (from Main Line)		20.5m to east side	32.5m to east side	32.5m to east side, and 12.5m to west side	28.5m to east side	center to center
Track Length		6190m	6400m	6570m	6320m	
No. of Turnout		25	23	25	24	SC is counted as 6 turnouts
Evaluation Item						
1. Cargo Handling and Management		Poor - Truck is concentrated in the doorway for 1 an access road. - The line of flow of freight becomes same as customs staff.	Poor - Truck is concentrated in the doorway for 1 an access road. - The line of flow of freight becomes same as customs staff.	Good - By two access roads, trucks can be dispersed. - It is necessary for customs staff to step over the main line.	Poor - Truck is concentrated in the doorway for 1 an access road. - The line of flow of freight becomes same as customs staff.	
2. Train Operation		Good - Train operation in VLP does not disturbe the main line's one due to no main line crossing.	Good - Train operation in VLP does not disturbe the main line's one due to no main line crossing.	Poor - Many main line crossing to be required for freight train operation in VLP. - Freight train operation in VLP affect to train operation in main line. - When the other train come to/go from Thanaleng Sta., freight train operation should be stopped because both Thanaleng Sta. and Track in VLP becomes one block area.	Fair - Many main line crossing to be required when train go from Thanaleng Sta. to VLP yard. - When the other train come to/go from Thanaleng Sta., freight train operation should be stopped because both Thanaleng Sta. and Track in VLP becomes one block area.	
3. Earthwork (Balance of Cut and Fill)		Fair - Cut >> Fill	Good - Cut > Fill	Poor - Cut >>> Fill	Good - Cut > Fill	Based on rough eye check by existing topo.map.
4. Construction Cost		- Earthwork: Fair - Railway Facility: Comparatively low	- Earthwork: Comparatively low - Railway Facility: Fair	- Earthwork: Moderate: Comparatively high - Railway Facility: Comparatively high	- Earthwork: Comparatively low - Railway Facility: Fair	
5. Land Acquisition		Big - The area is a part of the Dongphosy Protected Area under the Vientiane Capital. At the same time, a part of the area to be required is outside the Protected Area. - Several households living in the area are observed.	Fair - The areas are inside the Dongphosy Protected Area under the Vientiane Capital. - Several households living in the area are observed.	Fair - The area is inside the Dongphosy Protected Area. However, the area and the adjoining will be transferred to Railway Authority.	Fair - The areas are inside the Dongphosy Protected Area under the Vientiane Capital. - Several households living in the area are observed.	
6. Environmental Aspect		Fair - The area has swamps and bush. Deforestation and land preparation works may affect the surrounding area to some extent.	Fair - The area has swamps and bush. Deforestation and land preparation works may affect the surrounding area to some extent.	Fair - The area has bush at the both sides and swamps at the eastern side. Deforestation and land preparation works may affect the surrounding area to some extent.	Fair - The area has swamps and bush. Deforestation and land preparation works may affect the surrounding area to some extent.	
7. Future Extendability		Poor - Regarding the Eastern side of the main line, difficult to extend - Regarding the Western side of the main line, possible to extend	Fair - Possible to extend	Fair - The expansion is possible in the east and the west. It is easy to operate and handle VLP - From the veiwpoint of future track layout plan, it is required to keep the twice distance between main line and first track of western side to assure the future installation of a leading line. It cause the increase of necesary land.	Fair - Possible to extend	
Evaluation Result		**B**	**A (Recommendable)**	**D**	**C**	

4) Track Structure

A ballast track with PC sleepers was specified for the main line of the new railway. Typical cross-section of track is as shown in Figure 5.5.6.



Source: JICA Study Team

Figure 5.5.6 Typical Cross-Section of Track

5) Signaling and Telecommunication System

The color light signaling and/or mechanical signaling with direct telephone system is currently in operation on the North Eastern Line of the SRT. In addition, the tablet token system with analogue communication system, using IP telephone, was introduced between Nong Khai Station and Thanaleng Station.

For the section between Nong Khai and Thanaleng, the current system is deemed to be reasonable since the number of trains in operation is small at the moment. However, the current system cannot deal with the number of future trains after completion of the VLP since the operation will be complicated by a spur line to the VLP and an increased number of trains to the VLP.

It is therefore recommended that the semi-automatic block system with color light signal for both Nong Khai and Thanaleng Station (the section between both stations is one block section) be installed.

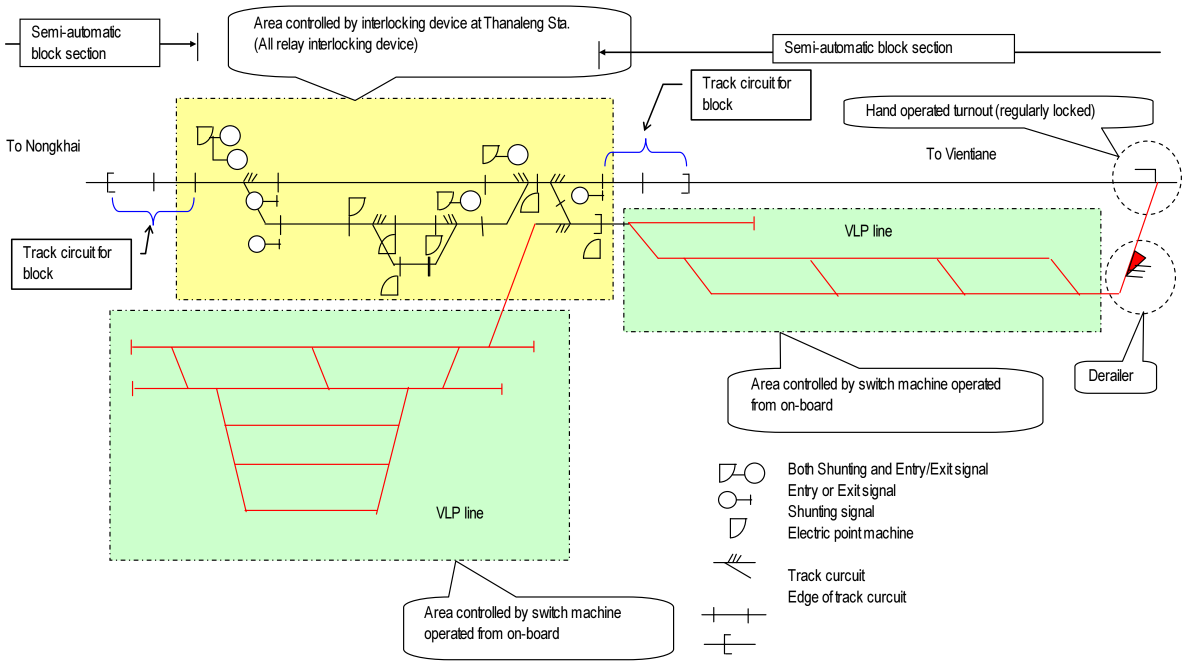
The semi automatic block system controls the “check-in check-out method” by equipping 2 CT/OT track circuits for train detection at the entry/exit points of both stations. No equipment is required for the section between both stations.

On the other hand, for the lines inside the VLP, considering the estimated number of freight trains to/from the VLP, the following system is recommended.

- No signaling system for shunting to reduce construction costs.
- Shunting operation is controlled and conducted by a driver and/or switchman.

- The "Switch machine operated from on-board", which is operated by a driver and/or switchman by knocking a lever connected to the electric switch device, should be installed.
- Route clear lights are installed on the ground for all the turnouts in order to confirm the opened route.
- Radio telecommunication system should be established in order to enable communication between driver, switchman and signal commander in Thanaleng Station.

The layout plan of safety control equipment in Thanaleng station and the VLP is shown in Figure 5.5.7.



Source: JICA Study Team

Figure 5.5.7 Layout Plan of Safety Control Equipment in Thanaleng Station and VLP

5.6 Project Cost

The project cost consists of construction cost, administration cost, consultant cost and contingency. These costs were estimated in November 2009; therefore, the following exchange rate was applied.

USD1.00=JPY93.57=LAK8506.61 =THB33.84

Construction of VLP will consist of land preparation works, building works, railway works and access road works. Table 5.6.1 shows item costs and total construction costs. Construction costs for land preparation works, building works, railway works and access road works were estimated to be about USD12.09 million, USD8.38 million, USD3.32 million, and USD2.55 million, respectively. The total construction cost is around US$26.35 million.

Taxes such as import tax and value added tax were not included in the Project Cost. The Article 52 of Law on Investment Law (2010) stipulates incentives pertinent to import tax and other taxes. Materials and equipment for Logistics Parks are included in the incentives. The Article 10 of Law on Value Added Tax specifies the materials equipments for aid projects. This process is not tax refund but tax exemption.

Administration cost and consultant cost were estimated to be 3% and 7% of total construction cost. Contingency which includes physical contingency and price escalation was estimated as 10% of the sum of the construction cost and the consultant cost. As a result, administration cost is USD 790,000, consultant cost is USD1.86 million, while contingency is USD2.84 million. The total project cost is thus USD 32.08 million.

Table 5.6.1 VLP Project Cost

Items		Total Cost	Foreign Portion and Local Portion			Remarks
			Foreign	Local	Local	
		(USD)	(USD)	(USD)	(LAK1000)	
1	Land Preparation Works	12,326,195	7,210,460	5,115,735	43,517,563	1,140m x 258.5m
2	Building Works	8,384,640	6,413,480	1,971,160	16,767,889	
3	Railway Works	3,324,202	2,647,169	677,033	5,759,256	Within VLP
4	Access Road Works	2,546,050	1,755,080	790,970	6,728,473	
5	Total Construction Cost	26,581,087	18,026,189	8,554,898	72,773,181	1+2+3+4
6	Administration Cost	797,432	-	-		3% of 5
7	Consultant Cost	1,860,676	-	-		7% of 5
8	Contingency	2,844,176	-	-		10% of 5+7
9	Total Project Cost	32,083,371	-	-		5+6+7+8

Source: JICA Study Team

Table 5.6.2 VLP Project Cost (Civil Works)

Item		Unit Cost (US$)		Quantity	Amount (US$)	Remarks
Preparatory Works		0.26	/m²	400,000	104,000	Site cleaning and grubbing
Earthworks	Excavation	1.50	/m³	1,278,266	1,917,399	Sand with Soil
	Filling	4.50	/m³	10,645	47,903	Sand with Soil
	Slope Protection	2.50	/m²	5,000	12,500	Grass
Pavement	within LP (t=25cm)	50.00	/m²			Reinforced Concrete Pavement (thickness=25cm)
	within LP (t=15cm)	35.00	/m²	217,841	7,624,435	Reinforced Concrete Pavement (thickness=15cm)
	Road within LP	30.00	/m²	11,970	359,100	Asphalt Concrete Pavement (thickness=10mm+30mm+30mm)
Utilities	Drainage I	300.00	/m	550	165,000	U-shaped Reinforced Concrete Ditch with Cover (900x900)
	Drainage II	250.00	/m	750	187,500	U-shaped Reinforced Concrete Ditch with Cover (700x700)
	Drainage III	200.00	/m	1,050	210,000	U-shaped Reinforced Concrete Ditch with Cover (500x500)
	Drainage IV	150.00	/m	2,550	382,500	U-shaped Reinforced Concrete Ditch with Cover (300x300)
	Drain Pipe I	40.00	/m	450	18,000	VP ϕ =200mm
	Drain Pipe II	30.00	/m	900	27,000	VP ϕ =150mm
	Centralized Treatment	30,000.00	/piece	1	30,000	Treatment Volume:35m³
	Water Pipe I	40.00	/m	2,500	100,000	VP ϕ =75mm from outside to VLP

Item		Unit Cost (US$)	Quantity	Amount (US$)	Remarks
Utilities	Water Tank	100,000.00 /piece	1	100,000	Underground, Volume:58m^3
	Water Pipe II	15.00 /m	2,750	41,250	VP ϕ ＝50mm
	Electricity (Line I)	100.00 /m	1,350	135,000	22kv line (underground within VLP)
	Electricity (Line II)	20.00 /m	240	4,800	22kv line (overhead outside VLP)
	Electricity (Transformer)	28,000.00 /piece	4	112,000	Transformer（22kv to 400ｖ/220v）, 1000KVA
	Electricity (Line III)	80.00 /m	400	32,000	400v/220v line （underground within VLP）
	Electricity	950.00 /piece	340	323,000	Streetlight
	Telecommunication	120.00 /m	1,000	120,000	Fiber Optic Cable
Green	Grass	3.00 /m^2	16,951	50,853	
	Tree	5.00 /m^2	16,951	84,755	
Others	Fencing	100.00 /m	1,372	137,200	H＝1.7m～2.0m
Total for Civil Works				12,326,195	

Source: JICA Study Team

Table 5.6.3 VLP Project Cost (Building Works)

Item	Description	Unit Cost (US$/$m^2$)	Quantity (m^2)	Amount (US$)
Warehouse (CFS)-1	Slate Structure High-Rise Floor Load=5t/m^2 H=5.5m from Floor Shutter Slope for a fork lift	240	0	0
Warehouse (CFS)-2	Slate Structure High-Rise Floor Load=3t/m^2 H=5.5m from Floor Shutter Slope for a fork lift	220	20,000	4,400,000
Warehouse (Truck Terminal)	Slate Structure High-Rise Floor Load=2t/m^2 H=3.5m from Floor Shutter Slope for a fork lift	200	3,000	600,000
Office next to Warehouse	Slate Structure	250	6,200	1,550,000
Administration office	Reinforced Concrete	250	2,360	590,000
Gate	Reinforced Concrete	200	1,800	360,000
Maintenance Shop	Slate Structure	110	1,200	132,000
Parking	with Roof	80	408	32,640
Weighbridge		6	120,000	720,000
Total for Building Works				8,384,640

Note: The figures shown above is not identically same to those summarized in Table 5.3.9 because the first figures show is estimated based on the actual layout plan and the latter shows the minimum area required for each facility.

Source: JICA Study Team

Table 5.6.4 VLP Project Cost (Railway Works)

	Description	Unit	Unit Rate	Quantity	Total
			USD		USD
Track works	BS 80A Rails (inc. labour cost)	Tonnes	1,734.02	508.928	882,493
	Turnout#8 for BS80A (inc. installation)	Set	30,568.10	6	183,409
	Turnout#10 for BS80A (inc. installation)	Set	31,450.41	17	534,657
	Fastening	Set	40.80	8704	355,128
	PC Sleepers	piece	34.00	8704	295,941
	Track Panel Installation	km	17,255.00	6.4	110,432
	Fish-plated Rail Joint	No.	68.00	512	34,814
	Track Ballast	Cu.m	27.20	9309	253,220
	Manual Switching	Set	1,700.02	23	39,101
	Lock Devices	Set	170.00	23	3,910
	Buffer Stop	Set	3,230.04	5	16,150
	Sub-ballast	Cu.m	5.10	8449	43,054
Drainage Works	Concrete U Ditch	m	62.60	260	16,277
	Concrete V Ditch	m	30.85	8250	254,521
Signal & Telecom.	Switch control equipment	set	15,229.24	12	182,751
	Hand Operation Point and Key Lock	set	7,712.77	11	84,840
	Derailer	set	3,045.85	1	3,046
	Radio Base Station	set	7,614.62	2	15,229
	Antenna Tower (approx. 40m)	set	15,229.24	1	15,229
	Antenna with accessory	set	3,045.85	1	3,046
	Coaxial Cable	m	30.46	100	3,046
	Coaxial Arrester	set	1,066.05	1	1,066
	Lightning protection transformer	set	3,807.31	1	3,807
	DC power supply system including battery (50AH) and charger	set	15,229.24	1	15,229
	Lightining rod and Earthing Plate with accessory	lot	1,751.36	1	1,751
	Lightning cable	m	76.15	60	4,569
	Portable Radio	set	2,284.39	20	45,688
	Miscellaneous equipment	L.S.	15,229.24	1	15,229
	Total				3,324,202

Source: JICA Study Team

Table 5.6.5 VLP Project Cost (Access Road Works)

Section I: New Road Construction							
Item	Description	Unit Rate (USD)		Quantity		Total (USD)	Remarks
Earthworks	Clearing and Grubbing	0.26	/m^2	23,635.00	m^2	6,145	
	Common Excavation	1.50	/m^3	42,188.00	m^3	63,282	
	Common Embankment	4.50	/m^3	10,175.00	m^3	45,788	
	Slope Treatment	2.50	/m^2	7,574.00	m^2	18,935	
Pavement	Asphalt Concrete	30.00	/m^2	18,745.00	m^2	562,350	Subbase, t=300m, Base course, t=300m, Asphalt pavement=100m Pavement W (11.5m)*L(1630)
Utilities	Concrete U Ditch	200.00	/m	3,260.00	m	652,000	
	Street Light	950.00	/no.	65.00	no.	61,750	25m pitch
	Subtotal					1,410,250	
Section II: Improvement of Existing Road							
Item	Description	Unit Rate (USD)		Quantity		Total (USD)	Remarks
Earthworks	Removal of Existing Pavement	2.80	/m^2	21,000.00	m^2	58,800	
Pavement	Asphalt Concrete	30.00	/m^2	16,100.00	m^2	483,000	Subbase, t=300m, Base course, t=300m, Asphalt pavement=100m Pavement W (11.5m)*L(1400)
Utilities	Concrete U Ditch	200.00	/m	2,800.00	m	560,000	
	Culvert (Removal)	50.00	/m	80.00	m	4,000	
	Pipe-type Culvert	150.00	/m	80.00	m	12,000	
	Culvert (Wingwall)	600.00	location	30.00	location	18,000	
	Subtotal					1,135,800	
Grand Total						2,546,050	

Source: JICA Study Team

CHAPTER 6 MANAGEMENT AND OPERATION PLAN

This chapter aims at delineating overall management and operation scheme of VLP through ascertaining various tasks required for management and operation of VLP.

6.1 Actions for success of VLP

VLP is a public inter-modal facility involving both road and rail transport that will function as a cross-border facility to provide CIQ service. VLP is a key facility in supporting the industrial sector in Vientiane by providing transport services, warehousing and trans-loading services and inventory management services. VLP is in addition a unique facility in stimulating logistics business in Vientiane through provision of certain privileges. In this regard, VLP should be recognized not only as a business-oriented facility but also as a strategic facility in national logistics development in Lao PDR. Success of the VLP denotes the realization of logistics policy objectives such as reduction of transport costs, smooth and stable border crossings as well as sustenance of self-sufficiency. The following 3 words are key to achieving success:

- Collaboration
- Efficiency
- Stimulation

VLP will serve multiple functions such as CIQ, railway operations, truck transport and private logistics businesses, such that it is essential for VLP to involve several governmental agencies and private companies. In this regard, "**Collaboration**" among the stakeholders is an indispensable element in the establishment, management and operation of VLP.

On the other hand, "**Efficiency**" indicates several efficiencies to be realized in VLP. First of all, VLP should be able to offer efficient logistics services in terms of speed, safety and security, reliability and cost. For this purpose, VLP must be a financially efficient business for private sector. It is of great importance that VLP incorporates private involvement so as to realize efficiency in service provision.

Private involvement, in particular, the involvement of foreign logistics investors, is essential to the realization of high quality logistics services in VLP. "**Stimulation**" measures for foreign investment should be taken into account. There are 2 incentives that may be applied for the VLP to stimulate participation of foreign logistics investors. One is to designate the VLP as a Specific Economic Zone (SPEZ): stipulations pertinent to SPEZ are delineated in "Law of Investment Promotion". Investment into an area designated as a SPEZ will benefit from several tax privileges. The second incentive that may be applied would be to designate VLP as Common Control Area (CCA). This would allow provision of Single Stop- Single Window service at VLP.

6.2 Project Formulation

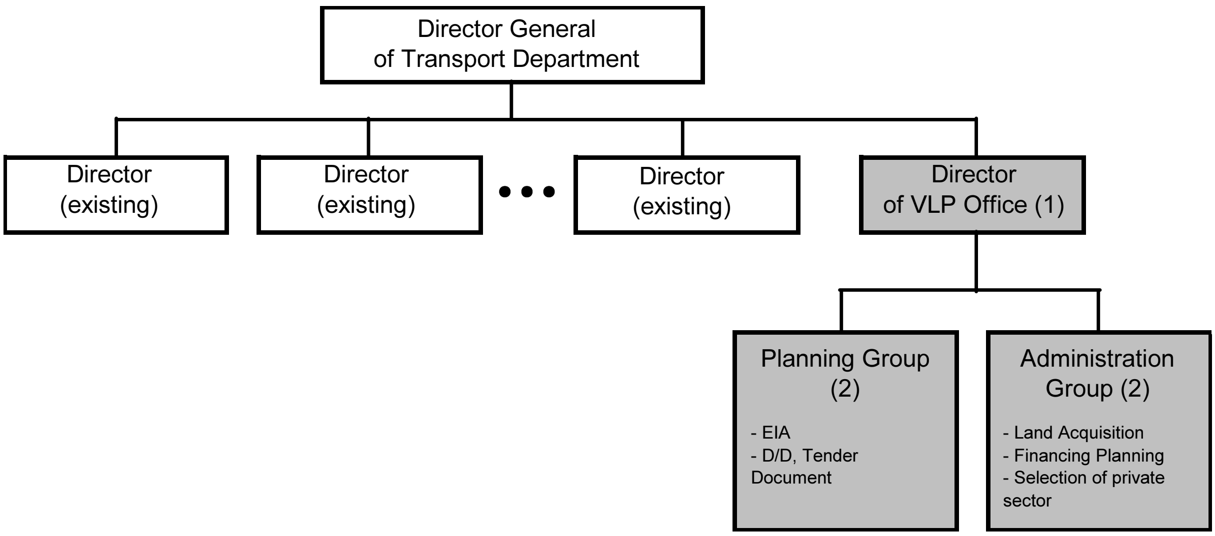
Prior to establishment of VLP, there are several important activities to be undertaken to realize success of VLP project. These are:

6.2.1 Establishment of VLP Office in MPWT

There are many actions required to be done to formulate VLP as project. The Transport Department under MPWT has been responsible for taking care of the VLP project so far; however, there isn't any permanent office, i.e. a secretariat office, to handle VLP matters. It is very important to set up VLP office or VLP unit dedicated to project formation activities of the VLP and carry out least the following tasks:

- EIA
- Land Acquisition
- Detailed design and tender documentation
- Financing planning
- Tender management
- Development of VLP management plan in details
- Selection of private investors

The VLP office would be a new section dedicated to the VLP project on a limited time basis until completion of construction of VLP. The office would have 1 director at the same level as a director under the Director General of Transport Department, with 2 groups such as administration group and technical planning group as shown in Figure 6.2.1. The VLP office would have a total of 5 personnel.



Source: JICA Study Team

Figure 6.2.1 VLP Office in MPWT

6.2.2 Designation of VLP as SPEZ

Lao government revised the "Law on Investment Promotion " to stimulate foreign investment into Lao PDR in July 2009. The law aims at providing several incentives to investment into designated areas such as SPEZ and Special Economic Zones[1] (SEZs). Both SEZ and SPEZ are approved and managed by the national steering committee consisting of Deputy of Prime Minister, Minister of Planning and Investment, Minister of Industry and Commerce, Minister of Public Works and Transport, Minister of Finance, Minister of Justice and Vice Minister of National Land and Management Authority. The secretariat for the committee is established at Ministry of Planning and Investment.

VLP Office in MPWT should take all necessary measures to ensure that VLP is designated as SPEZ to make it more attractive to private investors. Since the new investment law stipulates that SPEZ include logistics parks as well as industrial estates and tourism complexes, it is very likely that VLP will be designated as a SPEZ. However, the Decree on Special Economic Zone is still under preparation; therefore, the kind of conditions necessary for an area to be designated as a SPEZ.

In case VLP were not designated as a SPEZ, it would not have the bonded function. Furthermore, investment procedures for tenants entering the VLP would be complicated.

6.2.3 Designation of Common Control Area (CCA) to VLP

CCA is a fundamental scheme to allow provision of Single Stop-Single Window service at designated Indochina corridors. The function of cross-border procedure at VLP is a fundamental service of the VLP and is a potential field where more value can be added by VLP. Designation of VLP as CCA to offer Single Stop-Single Window service in the future would occur under the existing bilateral agreement on cross-border transport with Thailand. Long discussions with Thailand and difficult coordination within concerned governmental agencies in Lao PDR would be necessary. However it is beneficial for VLP to secure volume of handling goods and foreign investment until free trade is realized within ASEAN.

6.3 Organization Plan

6.3.1 Participants

VLP is multi-modal facility providing multi-services including CIQ, warehousing and trans-loading, and inventory management. VLP accordingly needs several participants to smoothly provide services. In this regard, the involvement of the following organizations in the VLP is at least required:

Project Owner:	Owner of Vientiane Logistics Park who will develop or give concession to private company to develop VLP, and take initiative to coordinate with relevant government agencies

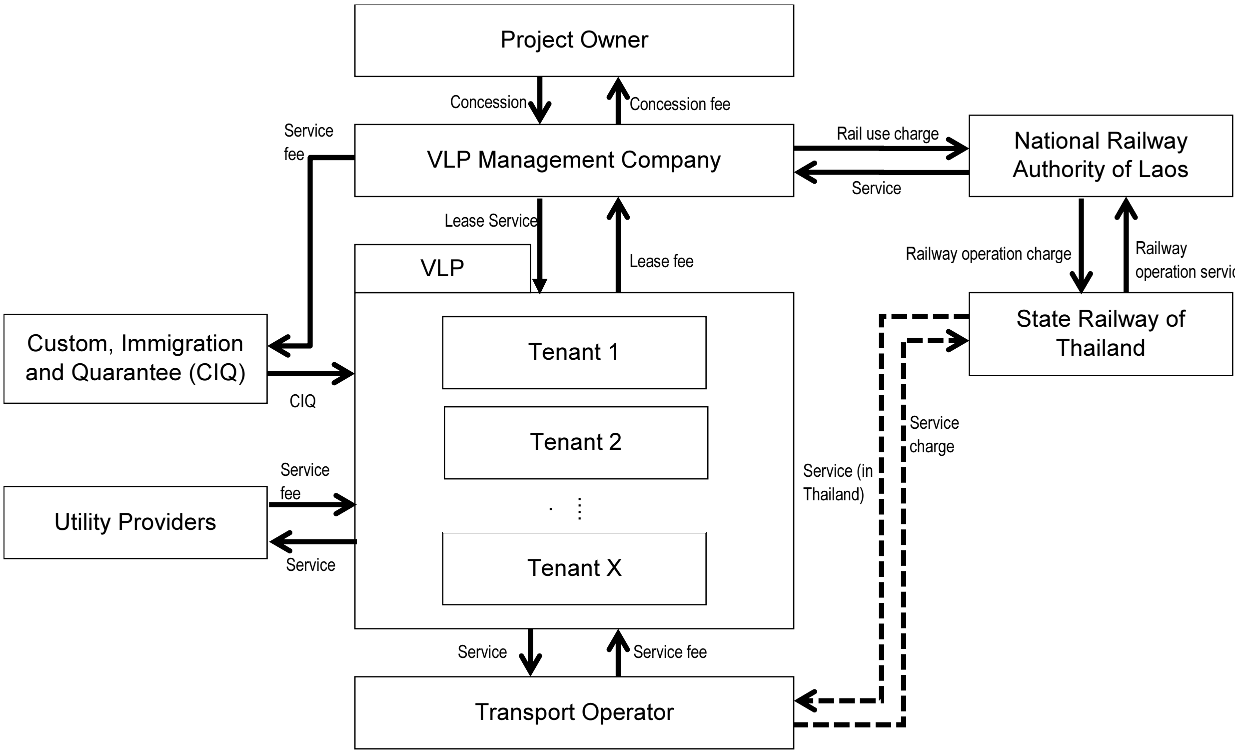
[1] In the new law, SEZ is defined as an area which is more than 1000 ha, and independent economic and financial system with special incentive(s), and SPEZ is defined as areas such as industrial zone, export promotion zone, tourism zone, ICT development zones and national border zones. Both SEZ and SPEZ are designated by the Government of Lao PDR.

VLP SPEZ Management Committee:	A committee consisting of VLP-MC, project owner, Vientiane Capital, MPWT to supervise VLP as SPEZ.
Vientiane Logistics Park Management Company (VLP-MC):	A third party to be responsible for total operation and maintenance services for VLP, contracted by project owner under the laws of Lao PDR
Tenant:	A company to lease module from VLPMB for implementing logistics businesses in VLP.
Transport Operator	A company to utilize VLP to handle their goods at the module of a tenant
State Railway of Thailand (SRT):	Railway operator to take care of daily operations and maintenance of railway
National Railway Authority of Lao PDR (NRAL):	Owner of railway in Lao PDR
CIQ provider:	Custom, Immigration and Quarantine office
Utility Provider:	An authority to provide utility services such as electricity supply, water supply and telecommunications
Ministry of Industry and Commerce (MOIC):	An authority to designate VLP as specific economic Zone (SPEZ)

6.3.2 Overall Organizational Structure

VLP-MC will be contracted by the project owner and will operate and maintain VLP as the representative of the project owner but under the supervision of the project owner. Management of VLP contains various tasks. Some of them will be performed by VLP-MC, while the others will be contracted out by VLP-MC to appropriate service providers. Actual logistics business will be carried out by tenants of VLP, who will be selected by the VLP-MC.

The overall organization of the VLP management is illustrated in Figure 6.3.1.



Source: JICA Study Team

Figure 6.3.1 Overall Management Structure of VLP

6.3.3 Project Owner

(1) Function of Project Owner

The project owner is an authority to plan, develop and manage VLP during the planning, construction and management and operation stages. The project owner should uphold authority:

- to own land and facilities in VLP
- to give VLP policy
- to select and supervise VLP management company (VLP-MC)
- to give consent on selection of tenants by VLP-MC.

(2) Potential Candidate of Project Owner

VLP is a public inter-modal facility involving both trucks and railway transport and equipped with cross-border facilities to provide CIQ service. VLP is also a key facility in promotion of logistics-oriented business in GMS through facilitation of international logistics. VLP is, in addition, a key facility in supporting the industrial sector in Vientiane by providing transport services, warehousing and trans-loading services and inventory management services. In this regard, VLP should be recognized not only as a business-oriented facility but also as a strategic facility in national logistics development in Lao PDR. It is accordingly natural that the project owner of VLP be a government agency. As potential project owner, first refusal should be given to the **Ministry of Public Works and Transport (MPWT)**, which is responsible for administration of cross-border facilitation as well as transport and logistics. MPWT should directly manage VLP to sustain its own development strategy.

On the other hand, there are some considerable potential candidates for the role of project owner such as National Railway Authority of Lao PDR (NRAL), Ministry of Industry and Commerce (MOIC), Ministry of Finance (MOF) and Vientiane Capital.

National Railway Authority of Lao PDR (NRAL) is responsible for planning, development, management and operation of railway in Lao PDR. Since VLP is located along the Thanaleng station and with railway service an important transport mode in VLP, NRAL is a potential agency to manage VLP. There is a similar example of Lat Krabang ICD at Bangkok which is managed by State Railway of Thailand (SRT). However, NRAL has disadvantages in that it has neither the prior experience in logistics nor the capacity to manage and operate VLP given its very limited and small organization structure.

The Ministry of Industry and Commerce (MOIC) has experience in managing the ICD at Thanaleng as the former project owner. MOIC may have accumulated certain know-how on how to supervise concession scheme of ICD business.

Ministry of Finance (MOF) is the current project owner of the Thanaleng ICD, namely "Thanaleng Warehouse State Enterprise". MOF may accumulate certain know-how on how to supervise ICD business from this experience. MOF has another advantage in that it could manipulate custom procedures in VLP to be more flexible since they fall under its jurisdiction.

Lastly, Vientiane Capital, can be a candidate for the role of project owner of VLP since it is the land owner of the project site. The project site along Thanaleng station is located in Dongphosy forest reserve, which is owned by Vientiane Capital.

Among these organizations, the MPWT, Ministry of Finance and Ministry of Industry and Commerce have potential to develop and operate VLP as project owners as shown in Table 6.3.1. Although the project owner will be determined by discussions between these ministries and concerned government agencies, the JICA Study Team evaluated the MPWT as the most appropriate organization given its recent activities such as playing a leading role in logistics policy in the ministries and CBTA meetings.

Table 6.3.1 Rationale of Potential Project Owners

Potential Project Owner	Rationale	Advantages	Disadvantages
Ministry of Public Works and Transport (MPWT)	• Public agency • Responsible for transport, logistics and cross-border transport	• Properly reflects national logistics policy/strategy in VLP management • Know-how to manage project implementation	
National Railway Authority of Lao PDR (NRAL)	• Public agency • Responsible for railway development, management and operation	• Railway operations	• Weak organization • No experience in similar project • No prior responsibility in road transport
Ministry of Industry and Commerce	• Public agency • Experience in managing Thanaleng ICD with Concession	• Authority to approve SPEZ • Project experience • Harmonization with industrial development	• Limited knowledge/ involvement in VLP project • Limited influence in transport and logistics business society
Ministry of Finance	• Public agency • Experience in managing Thanaleng ICD with state	• Authority to manage customs • Project experience	• Limited knowledge/ involvement in VLP project • Limited influence in transport

Potential Project Owner	Rationale	Advantages	Disadvantages
	enterprise	• Harmonization with improvement of Customs	and logistics business society
Vientiane Capital	• Public agency • Land owner of project site	• Easy legal process regarding project land • Experience in infrastructure and utility development, and land development projects with concession	• Limited knowledge/ involvement in VLP project • Limited experience in similar project • Limited influence in transport and logistics business society

Source: JICA Study Team

6.3.4 VLP Management Company (VLP-MC)

(1) Functions of VLP-MC

VLP-MC is a single management and operation body of VLP. VLP-MC is not basically involved in logistics works which are done in modules, but is responsible for 1) management of module and tenants, 2) maintenance of utility and infrastructure and 3) maintenance of safety, security and environment of VLP. The following are the fundamental functions of VLP-MC:

1) General Affairs

As an organization, VLP-MC needs to have function of administration and secretariat of business entity. Below are the major tasks involved in the function:

- Billing and Accounting
- Procurement and contract management
- Personnel affairs; and
- Legal matters and public relations.

2) Tenant Management

VLP-MC is responsible for finding, negotiating and managing tenants who directly carry out logistics business in VLP. In this regard, marketing/sales and lease activities include:

- Selection of tenants
- Entering into contract with tenants
- Providing full support to get necessary business registration, licenses and permits, etc as a One-stop service; and
- Collection of concession fee from tenants.

3) Asset Management

VLP-MC is responsible for maintenance and operation of infrastructure, utilities and buildings in VLP, i.e.:

- Maintenance of infrastructure, utilities and buildings in VLP
- Implementation of drainage, sewerage treatment and solid waste disposal services.

4) Environment Monitoring

VLP-MC is responsible for environmental monitoring and protection of VLP through the following major tasks:

- Development of environmental monitoring plan
- Periodical environmental monitoring
- Issue of caution, recommendations and orders to improve environment.
- Report of results of environmental monitoring to WREA.

5) Safety and Security

VLP-MC is responsible for safety and security in VLP. VLP-MC will provide:

- Security service at VLP
- Coordination with all tenants, the concerned government agencies and local authorities to cope with any natural disaster and emergency.

(2) Potential Candidates of VLP-MC

VLP should provide high quality logistics services so as to support industrial sector in Vientiane. VLP-MC is not the actual logistics service provider to transport operators but is required to generate good business environment for tenants and transport operators, and to clear away troubles in VLP quickly and reasonably. VLP-MC should accordingly have high expertise in business management and operation: therefore, private sector involvement may be essential in role of VLP-MC. For the private involvement, there are several options such as:

- Concession to private sector
- Joint venture between project owner and private sector
- State enterprise
- Project owner

Concession to private sector is the most reliable method to select the most capable entity to handle management business of VLP. This may be the most reliable means to realize high quality logistics services with high flexibility to accommodate changes in demand on services. The private concessionaire of VLP-MC can be flexible by either sub-contracting logistics business to tenants or conducting logistics business directly, depending on their business model. Concession fee to be paid to the project owner is one of the important criteria in evaluation of tenders of prospective concessionaires. The concessionaire will have lee-way in setting up entity as a single foreign company (ies), joint-venture between foreign company (ies) and domestic company (ies), consortium of domestic companies, etc. A scheme may be required to uphold right of intervention so as to keep public nature of VLP.

In Lao PDR, the institutional framework for Public Private Partnerships such as outsourcing operation of public facilities to private sector has not been set up as yet. However, such scheme may be introduced on ad hoc basis. For example, the operation of the existing Tanaleen ICD was outsourced to a private company from 1998 to 2008, while the operation of the Wattay International Airport is undertaken by a joint venture between Lao PDR and Japan. Furthermore, the bidding process for an operator of Michi-no-eki (road side station) which is being constructed by ASEAN Integration Fund is on-going. Hence, the VLP-MC could be selected from the private sector by the same process.

On the other hand, there are other significant potential methods for establishing VLP-MC: these are, joint-venture between Lao government/state enterprise and foreign investor; state enterprise; and project owner.

Joint-venture method involves establishment of new entity for VLP-MC by conglomeration of Lao public sector with a private company who satisfy certain criteria. This has the advantage of meshing the good aspects of private management with the good aspects of public involvement. The public involvement, should be minimized, but it is advantageous to make certain interventions in the VLP management to pursue public interests in emergency and special cases.

The state enterprise method is an ordinal method used in Lao when the Lao government carries out particular projects. The project owner will organize new state enterprise or assign existing state enterprise the role of VLP-MC. Thanaleng warehouse is currently managed by a state enterprise. This method has the advantage of soundness of project implementation based on level of experience in Lao PDR. It is however doubtful as to whether international standards of logistics services in VLP will be realized.

The last option is a case where the project owner acts as VLP-MC. The project owner will set up responsible section within its own organization structure to carry out management by itself.

The comparison of advantages and disadvantages among the potential types of VLP-MC is shown in Table 6.3.2.

Table 6.3.2 Comparison of Potential Types of VLP-MC Entity

Type	Concession	Joint Venture	State Enterprise	Project Owner
Characteristics	• Concession given to private company • Private company is flexible in formulating entity	• Joint-venture between Lao government/state enterprise and private company	• The project owner establishes new state enterprise or employs existing state enterprise.	• Project owner establishes new section in own organization.
Public Involvement	• Less public involvement • Need for certain scheme to uphold right of public intervention in management	• Moderate public involvement	• Full public involvement	• Full public involvement
Business Efficiency	• Higher efficiency in performance is expected.	• Higher efficiency in performance is expected.	• Doubtful with limited experience • Management committee may be needed to off-set private sense of business.	• Doubtful with limited experience • Management committee may be needed off-set private sense of business.

Source: JICA Study Team

As a consequence, the best possible method seems to be one in which the Project owner assigns private concessionaire or establishes a joint-venture with private sector, preferably a foreign investor, to become VLP-MC.

6.3.5 Tenant

(1) Function of Tenants

VLP-MC will select tenants to operate logistics business for each module in VLP. The tenants carry out the actual logistics works in VLP.

(2) Potential Tenants

VLP-MC will select suitable logistics companies to act as Tenants: they must be capable of offering high quality logistics services in VLP. Potential candidates are:

- Single private company including foreign logistics company and domestic logistics company
- Joint-venture and consortium
- Domestic forwarder association
- State enterprise

6.4 CIQ Services

CIQ service will be done by several responsible agencies such as Customs Department, Immigration Department and Quarantine Office at VLP. The VLP-MC will provide CIQ office at its own expense to operate CIQ branch office in VLP. CIQ officers will be seconded from the responsible agencies to VLP. VLP-MC will bear certain portions of recurrent cost of CIQ office including salary of staff.

6.5 Responsibility of Construction and Maintenance of infrastructure, Utilities and Buildings

6.5.1 General

Infrastructure, utilities and buildings in VLP are basically developed by the project owner and are provided to the VLP-MC. Necessary infrastructure and utilities outside VLP which are connected to existing main lines will be transferred to concerned agencies. VLP-MC is responsible for maintenance works of infrastructure, utilities and buildings in VLP, while the infrastructure and utilities transferred to the agencies concerned will be maintained by those agencies.

6.5.2 Utilities

(1) Water Supply

Water supply is solely done by Vientiane Water Supply Enterprise (normally referred to as “Nam Papa”) in Vientiane. Nam Papa is responsible for supplying water to the area. However, the developer is expected to connect water supply pipeline to Nam Papa’s main line at his/her own expense. Accordingly, the project owner of VLP will be responsible for constructing the entire water supply system including water supply system in VLP as well the connection to the main line outside VLP. After completion, the water supply system outside VLP will be transferred to and maintained by Nam Papa. The water supply system in VLP is owned by the project owner and maintained by VLP-MC.

Water used in the buildings is charged depending on amount used. However, water used in common area should be borne as a cost item under administration costs of VLP-MC, which may be inclusively recouped in the concession fee. For water used in the buildings, Nam Papa will collect water charges directly from tenants.

(2) Electricity Supply

Electricity supply is solely done by Entreprise D'electricite du Lao (EDL) in Vientiane. EDL is responsible for supplying electricity to the area. However, the developer is expected to connect main electricity line to the EDL main line at his/her own expense. Accordingly, the project owner of VLP is responsible for construction of entire electric supply system including electricity supply system in VLP and connection to main line outside VLP. After completion, the electricity supply system outside VLP will be transferred to and maintained by EDL. Electricity supply system in VLP is owned by the project owner and is maintained by VLP-MC.

Electricity used in the buildings is charged depending on the amount used. However, electricity used in common area should be borne as a cost item under administration cost of VLP-MC, which may be inclusively recouped in concession fee. For electricity used in the buildings, EDL will collect electricity charge directly from tenants.

(3) Telecommunications

Telecommunications is solely done by Enterprise of Telecommunications Lao (ETL) in Vientiane. ETL is responsible for supplying telecommunications and IT services to the area. However, a developer has to connect main telecommunications line to the ETL main line at his/her own expense. Accordingly, the project owner of VLP is responsible for construction of entire telecommunications system including telecommunications system in VLP and the connection to the main line outside VLP. After completion, the telecommunications system outside VLP will be transferred to and maintained by ETL. Telecommunications system in VLP will be owned by the project owner and maintained by VLP-MC.

ETL will collect service charges by itself directly from tenants, depending on the level of telecommunications usage by each tenant.

(4) Drainage

Drainage will be provided by the project owner in VLP and will be maintained by the VLP-MC. The cost of maintenance will be shared with tenants and will be included in the concession fee paid to VLP-MC.

(5) Waste Water Treatment

Waste water treatment system will be independently provided in VLP. The project owner will provide it. The VLP-MC will operate and maintain the system. The cost of maintenance will be shared with tenants. Service fees charged will depend on only the quantity discharged from buildings. VLP-MC will collect charge directly from tenants.

(6) Solid Waste Disposal Service

Tenants will be individually responsible for solid waste management. VLP-MC will introduce private solid waste management company to the tenants, and the tenants will directly enter into contract with the private solid waste management company.

6.5.3 Infrastructure

(1) Railway

Railway system in VLP will be constructed by the project owner. After completion, the railway system will be transferred to and maintained by NRAL. NRAL will be responsible for maintenance and operation which may be sub-contracted to State Railway of Thailand (SRT). The cost of maintenance will be borne by Tenants through train transport charge.

(2) Access Road

Vientiane Capital is responsible for construction and maintenance of roads in Vientiane. However, a developer constructs access roads to a facility at his/her own expense. Accordingly, the project owner of VLP will be responsible for constructing access road to VLP. After completion, the access road will be transferred to and maintained by Vientiane Capital.

6.5.4 Buildings and Facilities

(1) Facilities in Common Area in VLP

The project owner of VLP will be responsible for constructing all buildings and facilities in VLP. After completion, the VLP-MC will be responsible for maintenance of buildings and facilities at its own expense.

(2) Buildings in Modules

The project owner of VLP will be responsible for constructing all buildings and facilities in module as well. After completion, the VLP-MC will be responsible for maintenance of those buildings and facilities in the modules at its own expense.

Table 6.5.1 summarizes responsibilities in development and maintenance of infrastructure, utilities and buildings.

Table 6.5.1 Responsibilities in Development and Maintenance of Infrastructure, Utilities and Buildings in VLP

Facility in VLP	Outside VLP (connection with main line)	Common Area in VLP	Inside Module
Water Supply	Construction • VLP Project Owner Maintenance • Vientiane Water Supply Enterprise (Nam Papa)	Construction • VLP Project Owner Maintenance • VLP-MC	Construction • VLP Project Owner Maintenance • VLP-MC
Electricity Supply	Construction • VLP Project Owner Maintenance • EDL	Construction • VLP Project Owner Maintenance • VLP-MC	Construction • VLP Project Owner Maintenance • VLP-MC

Facility in VLP	Outside VLP (connection with main line)	Common Area in VLP	Inside Module
Telecommunications	Construction • VLP Maintenance • ETL	Construction • VLP Project Owner Maintenance • VLP-MC	Construction • VLP Project Owner Maintenance • VLP-MC
Drainage		Construction • VLP Project Owner Maintenance • VLP-MC	Construction • VLP Project Owner Maintenance • VLP-MC
Waste Water Treatment		Construction • VLP Project Owner Maintenance • VLP-MC	Construction • VLP Project Owner Maintenance • VLP-MC
Solid Waste Disposal		Responsibility • VLP-MC	Responsibility • Tenant
Railway	Construction • LNRA Maintenance • LNRA Operation • Sub-contract to SRT	Construction • VLP Project Owner Maintenance • LNRA Operation • SRT through LNRA	
Access Road	Construction • VLP Maintenance • Vientiane Capital		Construction • VLP Project Owner Maintenance • VLP-MC
Buildings (facilities) in VLP		Construction • VLP Project Owner Maintenance • VLP-MC	Construction • VLP Project Owner Maintenance • VLP-MC
Equipment in VLP		Procurement • VLP Project Owner Maintenance • VLP-MC	Procurement • Tenant Maintenance • Tenant

Source: JICA Study Team

6.6 Operation of VLP

6.6.1 Operation Time

(1) VLP Operation Hour

VLP will provide 24 hour service with no holidays.

(2) CIQ Operation Hour

Working hours of CIQ office at VLP will run from 8 am to 8pm during weekdays: the office will be closed on weekends (Saturday and Sunday).

6.6.2 Security Control

Security and safety control shall be implemented strictly by VLP-MC.The important points of security are gate control, property security and traffic safety.

(1) Gate Control

At the gate, security shall be maintained. The security at the gate shall check people and cars.

(2) Property Security Management

VLP-MC has the general obligation to safeguard and make appropriate use of the VLP 's property and equipment in VLP. The area will be enclosed by fence. VLP-MC must ensure that there are reasonable security measures implemented to prevent theft, damage or misuse of property and equipment.

(3) Traffic Safety

VLP-MC shall establish traffic control rules and carry out the measures for traffic safety within VLP.

6.6.3 Fire Fighting

VLP-MC will take the necessary measures for the safety of VLP, and follow the laws and regulations related to fire fighting and emergency in Lao PDR.

(1) Government Coordination

VLP-MC will establish a proper fire fighting and emergency system for VLP-MC in close cooperation with the responsible agencies.

(2) Rules and Regulations for Emergency

VLP-MC will formulate the regulations pertinent to emergencies in VLP-MC and will manage, supervise and guide the fire prevention and fire-fighting activities of the Tenants in VLP.

Rabigh CIP OMC should propose the rules and regulations for emergencies.

(3) Emergency Protocols

VLP-MC should establish emergency protocols, i.e. allocation of responsibilities and information network during emergencies.

6.6.4 Environmental Management

VLP-MC should have the overall responsibility of maintaining good environment in VLP. It should ensure that pollution and damage on neighboring people's property due to activities in VLP is avoided. In this regard, VLP-MC must assist, consult and monitor tenants to meet the environmental standards by the following means:

- Providing updated information on environmental regulations and related analyses and interpretations that guide the tenants for better understanding.
- Periodical monitoring of air, noise and water discharged from VLP.
- Liaison of complaints regarding environmental matters from neighboring communities

- Preparing and presenting necessary reports to WREA.

6.7 Railway Operation Plan

(1) Basic Policy for Train Operation Planning

The following matters were taken into consideration in the proposed operation diagrams.

1) 2 Target Years of 2015 and 2025

The train operation plan was established to satisfy the estimated number of trains in 2015 and 2025, according to the result of the demand forecast for VLP.

The number of trains in 2015 and 2025 are indicated in Table 6.7.1.

Table 6.7.1 Number of Trains in 2015 and 2025

	(2009)	2015	2025	Remarks
Freight Train				
Bulk Wagon	-	1/week	1/day	
Oil Tank Wagon	-	-	2/day	
Container Wagon	-	1/day	5/day	
Sub-total for Freight	-	2/day	8/day	
Passenger Train				
Short-distance	2/day	5/day	5/day	Assumed from JETRO FS
Long-distance	0/day	0/day	2/day	
Sub-total for Pax.	2/day	5/day	7/day	
Total	2/day	7/day	15/day	

2) Preparation of Future Diagram based on Current Diagram

The future train operation diagrams in 2015 and 2025 were added to the current train operation diagram between Bangkok and Thanaleng on the Northeastern line.

Freight trains will be operated during the intervals between operation of passenger trains and during the off-peak period of road traffic, i.e. mainly in the early morning and/or night time.

3) Shunting Works in ICD

Maximum loading and unloading time for all transported goods are assumed to be as shown below.

- Container: 6 minutes per container (Loading: 3minutes, Unloading: 3 minutes)
- Heavy Bulk (minerals and construction materials): 20 minutes per wagon (Loading: 10 minutes, Unloading: 10 minutes)
- Oil: 20 minutes per wagon (Loading: 10 minutes, Unloading: 10 minutes)
- Average speed in VLP is assumed to be 15km/hr.

- Coupling/uncoupling lasts 5 minutes in general, and running the show of locomotives can be completed while unloading the freight goods.

4) Train Operations at Night and Early Morning at Friendship Bridge

Adequate traffic control plan shall be established to allow efficient train passage at the Friendship Bridge. According to the survey result in JETRO F/S, peak hour for road traffic at Friendship Bridge is from 9am to 10am on weekdays, as shown in Table 6.7.2.

Table 6.7.2 Number of Vehicles Passing Friendship Bridge during Peak Hours

(From 9am – 10am, Weekdays)

Direction	Vehicle Type	Number of Vehicles per hour
Thailand to Lao PDR	Freight Track	43
	Private Car	18
	Bus	6
	Total	67
Lao PDR to Thailand	Freight Track	19
	Private Car	49
	Bus	2
	Total	70

Source: JETRO F/S

Freight train should be operated mainly in the night and early morning time, in consideration of the above traffic situation to avoid traffic congestion in road transport.

On the other hand, the convenience for passengers and connectivity to long-distance trains at Nong Khai Station are the major determinants for the operation diagram for passenger trains.

5) Business Hours for Friendship Bridge and ICD

Business hours for Friendship Bridge and ICD can be set up flexibly depending on the proposed freight train operation, according to the Railway Authority of Lao PDR. Adequate business hours are therefore proposed in consideration of freight train operation.

(2) Requirement to realize the Train Operation Plan

The following items should be completed by SRT and/or Thanaleng–Vientiane Railway Construction Project conducted by Thai Government before the commencement of train operations in VLP, so as to realize the train operation plan mentioned in this chapter.

1) Installation of Passing Loop between Udon Thani and Nong Khai

According to the interview with SRT, there is a passing loop at Nata point, which is located 5km south of Nong Khai and 70km north of Udon Thani. However, in order to deal with increased number of trains due to the VLP, another loop track should be provided at the intermediate point between Udon Thani and Nong Khai, to allow freight trains moving in opposite directions to pass each other.

2) Establishment of Traffic Management for Road Transportation in and around Friendship Bridge

It is considered necessary to control the road traffic at Friendship Bridge to allow train passage at peak hours. Currently, the sliding gate trolley is used: this is the common way of controlling road traffic in provinces in Thailand. However, the number of trains passing the Friendship Bridge will increase drastically. It is therefore required to establish a plan consistent with the number and schedule of train passage at Friendship Bridge. For instance, the following equipment may be installed.

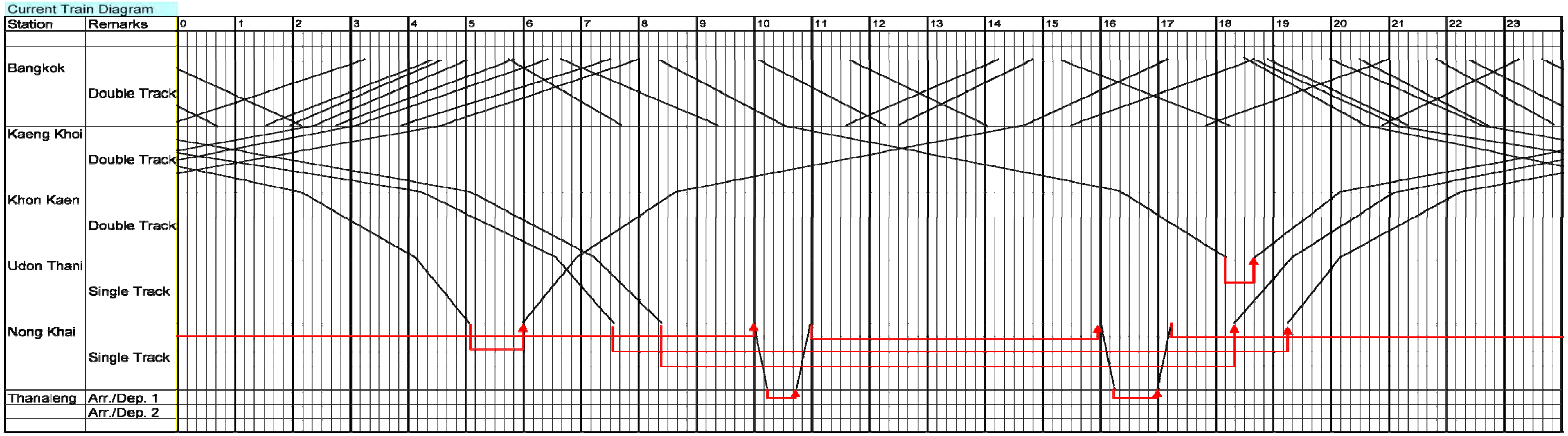
- Road traffic signal and barriers for control and suspension of road traffic on the bridge
- Install CCTV for station-master to confirm traffic on the bridge

3) Installation of Semi-Automatic Block System with Color Light Signal between Nong Khai and Thanaleng

Currently, the tablet token block system is applied as block system between Nong Khai and Thanaleng. However, the block system is primitive and may not be able to deal with level of future train operations. It is therefore recommended that a semi-automatic block system with color light signal be installed, as mentioned in 5.5.2.

(3) Train Operation Diagram

Based on the current diagram for freight and passenger trains obtained from SRT, the Study Team developed the train operation plan as shown in Figure 6.7.1,Figure 6.7.2 and Figure 6.7.3. In regard to the freight trains, the required time in Thanaleng station and VLP was estimated based on Figure 6.7.4 and Figure 6.7.5.



Note: prepared from the Current Timetable

Figure 6.7.1 Current Train Operation Diagram between Bangkok and Thanaleng

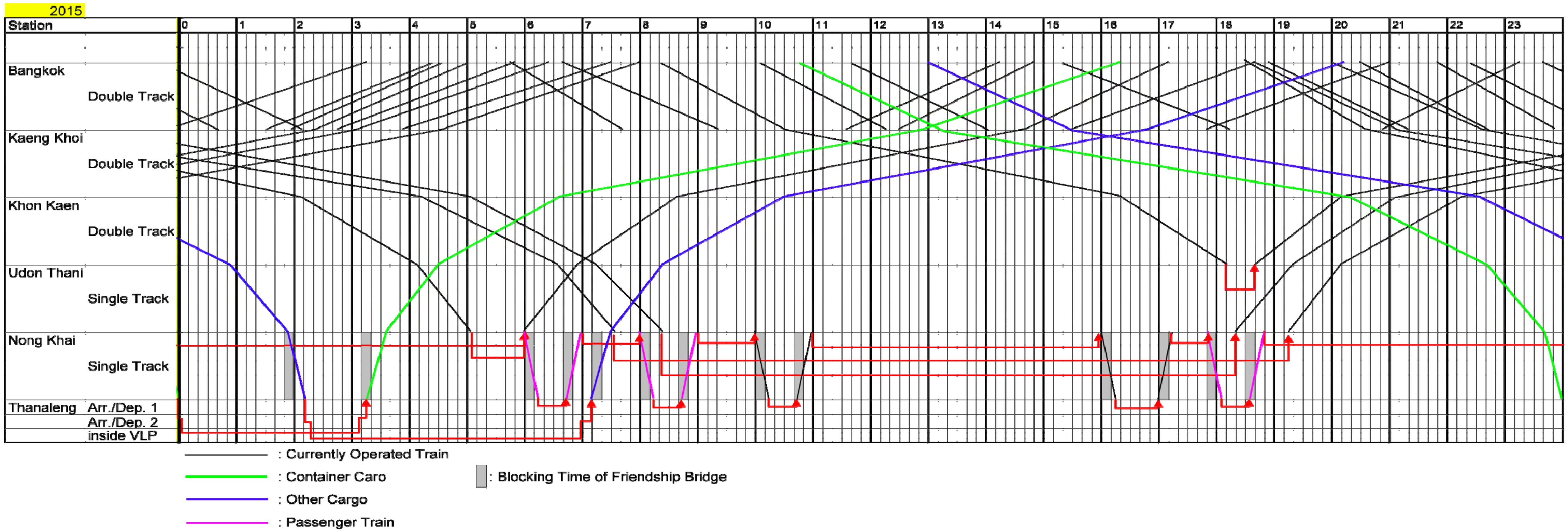


Figure 6.7.2 Projected Train Operation Diagram between Bangkok and Thanaleng (year 2015)

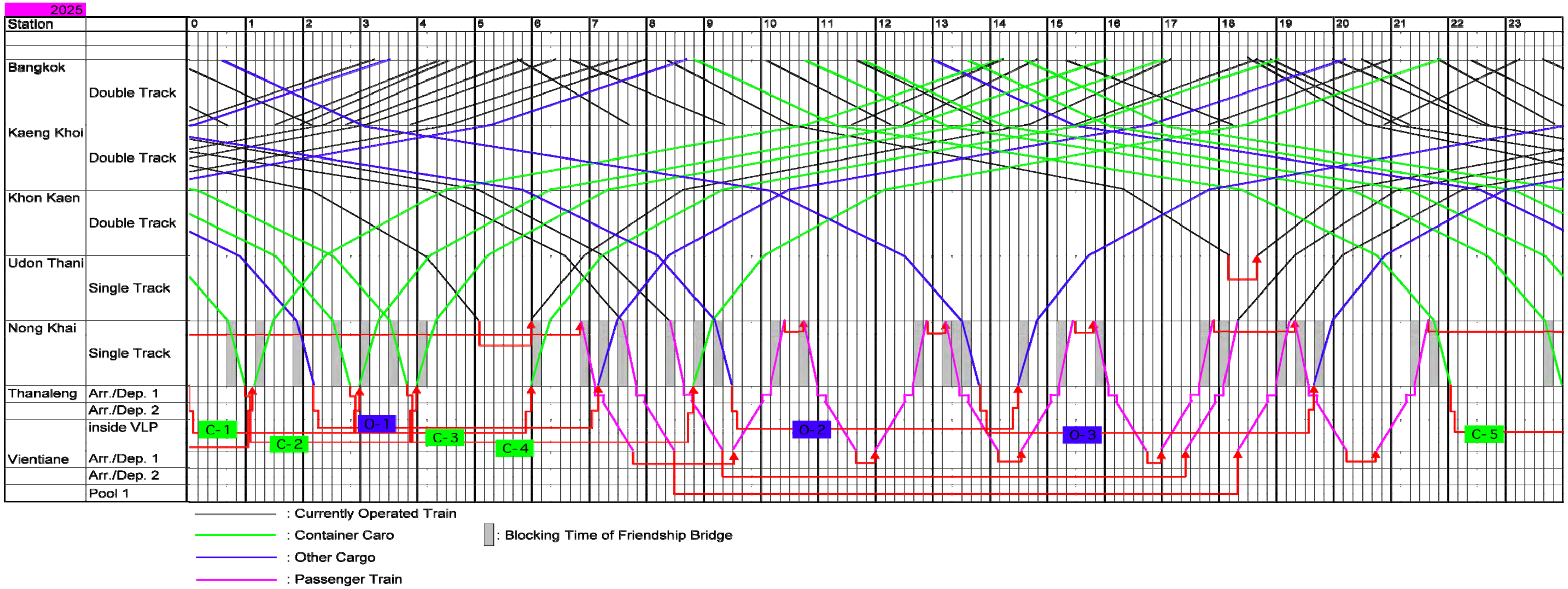


Figure 6.7.3 Projected Train Operation Diagram between Bangkok and Thanaleng (year 2025)

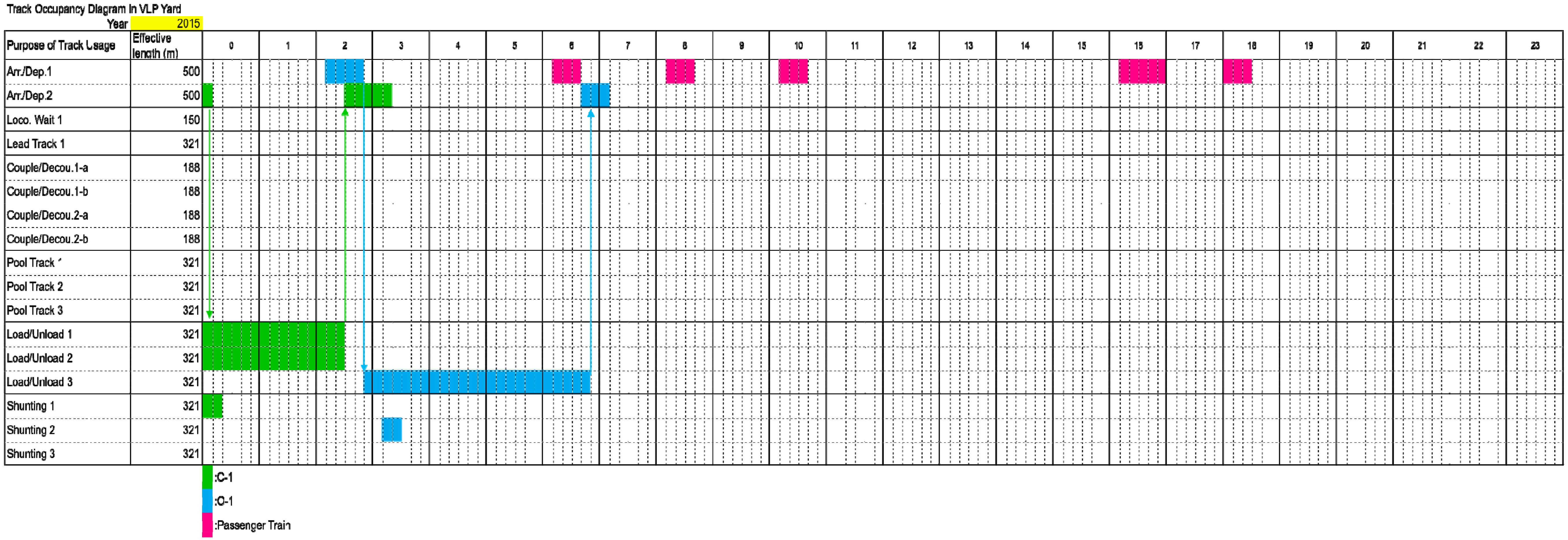


Figure 6.7.4 Track Occupancy Diagram in VLP Yard (year 2015)

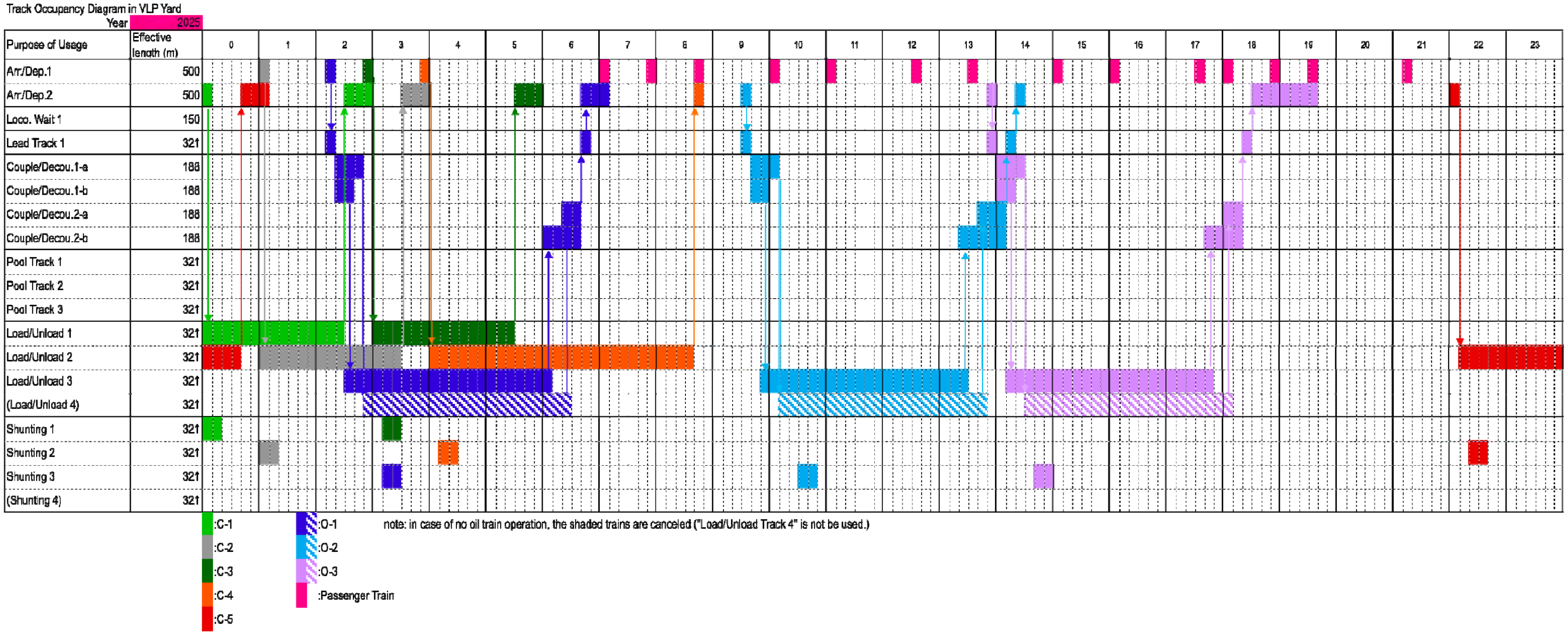


Figure 6.7.5 Track Occupancy Diagram in VLP Yard (year 2025)

Given the operation diagrams above, Traffic Control at Friendship Bridge is as shown in Table 6.7.3 and Table 6.7.4.

Table 6.7.3 Traffic control at Friendship Bridge – Hourly Basis (year 2015)

AM			Freight	Passenger	Total	PM			Freight	Passenger	Total
0:00	-	1:00			-	12:00	-	13:00			-
1:00	-	2:00	1		1	13:00	-	14:00			-
2:00	-	3:00			-	14:00	-	15:00			-
3:00	-	4:00	1		1	15:00	-	16:00			-
4:00	-	5:00			-	16:00	-	17:00		1	1
5:00	-	6:00			-	17:00	-	18:00		2	2
6:00	-	7:00		2	2	18:00	-	19:00		1	1
7:00	-	8:00	1		1	19:00	-	20:00			-
8:00	-	9:00		2	2	20:00	-	21:00			-
9:00	-	10:00			-	21:00	-	22:00			-
10:00	-	11:00		2	2	22:00	-	23:00			-
11:00	-	12:00			-	23:00	-	24:00	1		1
Sub Total			3	6	9	Sub Total			1	4	5
						Daily Total			4	10	14

Source: JICA Study Team

Table 6.7.4 Traffic control at Friendship Bridge – Hourly Basis (year 2025)

AM			Freight	Passenger	Total	PM			Freight	Passenger	Total
0:00	-	1:00	1		1	12:00	-	13:00		1	1
1:00	-	2:00	2		2	13:00	-	14:00	1	1	2
2:00	-	3:00	1		1	14:00	-	15:00	1		1
3:00	-	4:00	2		2	15:00	-	16:00		2	2
4:00	-	5:00	1		1	16:00	-	17:00			-
5:00	-	6:00			-	17:00	-	18:00		1	1
6:00	-	7:00	1	1	2	18:00	-	19:00		1	1
7:00	-	8:00	1	1	2	19:00	-	20:00	1	2	3
8:00	-	9:00	1	1	2	20:00	-	21:00			-
9:00	-	10:00	1		1	21:00	-	22:00	1	1	2
10:00	-	11:00		2	2	22:00	-	23:00			-
11:00	-	12:00			-	23:00	-	24:00	1		1
Sub Total			11	5	16	Sub Total			5	9	14
						Daily Total			16	14	30

Source: JICA Study Team

(4) Procurement Plan for Rolling Stocks for Freight Trains

Procurement of the rolling stocks is not included in the Project because it is expected that freight wagons will be procured by firms and/or SRT, with the locomotives rented from SRT. However, for purposes of reference, the required number of rolling stocks was estimated as shown below, based on the train operation diagrams above.

Table 6.7.5 Required Number of Rolling Stocks

Year 2015

Items	Trains/day	Cars/day	Total Round Trip Time (hr)	Practical No. of Trains in Service	No. of cars needed (cars)			
					Loco.	Container Wagon	Bulk Wagon	Oil Tank Wagon
Container	1	9	48	2	2	18	-	-
Minerals/Construction Materials	1 /2days	3 /2days	48	1	1	-	3	-
Oil	-	-	-	-	-	-	-	-
Total					3	18	3	0

Year 2025

Items	Trains/day	Cars/day	Total Round Trip Time (hr)	Practical No. of Trains in Service	No. of cars needed (cars)			
					Loco.	Container Wagon	Bulk Wagon	Oil Tank Wagon
Container	5	84	48	10	10	168	-	-
Minerals/Construction Materials	1	9	48	2	2	-	18	-
Oil	2	28	48	4	4	-	-	56
Total					16	168	18	56

Note: The number does not include spare cars.

Source: JICA Study Team

As previously noted, it is assumed that all kinds of wagons are procured by goods holders such as private companies. Meanwhile, it is practical to procure locomotives from SRT rental. Further survey is needed to identify the operation rate of locomotives in SRT and further deliberation is required so that SRT should secure margins for available locomotives after rationalizing their operation. In this regard, it is necessary to cooperate with Lao Government, Railway Authority of Lao PDR, Thai Government, SRT, and other concerned organizations.

(5) Maintenance Activities

Maintenance of rolling stocks should be exercised by SRT, the lender, at its own workshops in Thailand. However, handy fuel pump and some spare parts should be provided in ICD.

CHAPTER 7 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

7.1 Introduction

This chapter summarizes major study results of environmental and social considerations, to be associated with the implementation of the proposed Vientiane Logistics Park (VLP). Section 7.2 describes general environmental and social baseline information while Section 7.3 summarizes a site-specific profile of Dongphosy Area (i.e., project site). The current legal/administrative framework of Lao PDR, in particular, the environmental license approval process of any development projects are described in Section 7.4. Within this proposed VLP project, five (5) alternative options (i.e., Alternatives A – E) are developed, and results of a preliminary environmental scoping and screening of those alternative options is summarized in Section 7.5. Throughout this scoping process, potential impacts to be associated with each development option are identified.

Within this study, Alternative B is selected as the best development option by the comprehensive evaluation process of all alternatives, covering from engineering, financial to environmental aspects, and then, an EIA-level study for the selected alternative is conducted. Major study results of this EIA-level environmental and social studies for the proposed VLP project are summarized in Section 7.6. In Section 7.7, key directions for successful environmental management program are presented. Within this study, a local forest management initiative using the concept of the Agro-forestry is summarized. Stakeholder meetings were held twice within this VLP study. Besides, a questionnaire-based public opinion survey was held to encourage the positive public involvement from surrounding communities. Those study results are summarized in Section 7.8. Finally, conclusions and recommendations for the proposed VLP project from environmental and social aspects are described in Section 7.9.

7.2 Current Conditions of Vientiane Capital

7.2.1 Natural Environment

Lao PDR is located in the middle of Indo-China peninsula and is sharing the boarders with five countries: Thailand, Cambodia, Vietnam, China and Myanmar. This country is a land-locked country with rich forest and has valuable and ecologically abundant natural resources. Vientiane Capital is the capital city of the country and is located in the alluvial plain of the Mekong River.

(1) Climate

As per the country as a whole, the Project Area enjoys a tropical climate with two seasons: the rainy season from April to October and the dry season from November to March. Annual rainfall in Vientiane area ranged from 1,140 to 2,290 mm per annum based on data for the period from 1976 to 2005 with an average rainfall of about 1,600 mm. Cyclones and depressions which are generated in the South China Sea affect the hydro-meteorological temperature ranged from 22.3 to 34.3 degrees Celsius, and the average humidity ranges from 50 to 91 percent.

Table 7.2.1 Temperature and Rainfall in Vientiane Capital (2008)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum temperature (C)	28.5	26.2	32.0	33.6	31.4	31.5	31.3	31.2	31.7	32.1	29.2	27.7
Minimum temperature (C)	17.6	17.3	21.2	24.5	24.3	24.6	24.7	24.7	24.3	24.3	20.2	16.5
Mean temperature	23.1	21.8	26.6	29.1	27.9	28.1	28.0	28.0	28.0	28.2	24.7	22.1
Rainfall (mm)	15.6	25.0	134.7	112.0	279.1	385.4	432.4	220.3	264.6	225.3	107.0	0.2

Source: Department of Meteorology and Hydrology, Water Resource and Environment Authority, 2009

Table 7.2.2 Mean Annual Rainfall in Vientiane Province (1951 - 2008)

	Rainfall (mm)	Note
Annual	1756.1	
Rainy Season	1632.1	May- October
Dry Season	199.9	Nov – April

Source: Disaster Management System in Lao PDR, prepared by Department of Meteorology and Hydrology, Water Resource and Environment Authority, 2009

(2) Topography

Average elevation of the Vientiane Capital is 159 m[1]. The area along the Mekong River, especially the urban area in Vientiane Capital, is alluvial plain consisting of a sandy gravel layer covered with clayey soil. Geological characteristics of that area consist of two main categories, QIV and N2-G1Ve. The former is composed of sand, gravel, shingle, clay and peat, while the latter consists of gravel, shingle, sandy, kaolinite and laterite.

(3) Hydrology

The Mekong River is an international river, flowing in Lao PDR, Cambodia, China and Thailand, and is utilized for various purposes, such as water transport, water supply and hydro-power supply for people living in the surrounding countries. The water level of Mekong River varies by about ten meters between the dry and rainy seasons. Table 7.2.3 is a record of the annual water level of the Mekong River in 2008 and shows that the highest level was recorded in August and the lowest in April. The annual flood discharge (1913-2007) is 16,750 cubic meters per second[2].

Table 7.2.3 Annual Water Level of the Mekong River in 2008 (Location point: KM 4)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum water level (m)	1.74	1.91	1.10	1.33	3.17	6.32	10.83	13.66	11.17	9.67	8.59	3.70
Minimum water level (m)	1.08	0.88	0.82	0.70	1.27	2.20	5.25	9.82	7.69	5.48	3.70	2.16
Mean water level (m)	1.30	1.29	0.96	1.10	2.30	4.63	8.31	11.43	9.78	7.00	5.91	2.91

Source: Department of Meteorology and Hydrology, Water Resource and Environment Authority, 2009

In August 2008, Vientiane Capital was hit with monsoon and the flood peak marked high alarm. As

[1] Mekong River Commission, 2009
[2] Mekong River Commission, 2009

a result, some villages and households were affected and their properties, such as vegetation area, paddy fields and livestock, were lost. Inadequate inundation system and drainage against overflowing of the Mekong River is pointed out as a reason for that situation, and the improvement of disaster management systems such as dike protection and flood forecast/warning systems through the various media and the improvement of drainage maintenance have been considered by Department of Meteorology and Hydrology in Water Resource and Environment Authority (WREA).

(4) Land Use

Vientiane Capital has a land use plan of the central area only, namely Vientiane Urban Border Development Plan for 2000-2010. As for a part of the outer area including the Project Area, a land use plan has been under preparation by the Lao Government. Recently, activities aiming at economic development, business promotion and leisure have been spread out over that area.

(5) Flora and Fauna

1) Protected Areas

As shown in Table 7.2.4, 5.1% of the national land is utilized for rice cultivation and those areas are located mostly around the Mekong River and its tributaries. On the other hand, 41.5% of the land is utilized for forestry (2002). Forest is one of the most important resources in Lao PDR because 61.5% of the country land is forest (2007, Department of Forestry, Ministry of Agriculture and Forestry (MAF)). However, the forest resource has been decreasing due to logging industries and conversion of forestland to other usage such as business activities and agriculture. Considering these change, the Lao government introduced the Forest Law, enacted in 1996 and modified in 2007, in order for continually increasing wealth such as balance of nature, sustainable use of forests and forest lands, protection of water resources, and preventing soil erosion. At the same time, MAF also has enhanced reforestation activities over the country.

Table 7.2.4 Recent Change of Forest Coverage in Lao PDR

	1982	1992	2002
Current forest (%)	49.1	47.2	41.5
Potential forest (%)	36.1	37.8	47.1
Other wooded area (%)	6.5	6.1	1.2
Permanent agriculture land (%)	3.1	3.6	5.1
Other (%)	5.2	5.4	5.1
Total (%)	100.0	100.0	100.0

Note: Total area of Lao PDR is 23,680 ha.

Source: Report on the assessment of forestland use during 1992-2002, cited by Water Resources and Environment Administration in 2009

Forest Law categorizes the forest in Lao PDR into the three for the purpose of preservation and development, Protected Forest, Conservation Forest and Production Forest and their definitions are summarized in Table 7.2.5. Forest in the National Biodiversity Conservation Areas (NBCAs) is categorized into Conservation Forest. In the Law, it is not allowed to cut trees, mine mineral resources and convert lands to other uses in Protected Forests and Conservation Forests. However, with the official procedure along with the government, lands in the protected areas may be transferred to other purposes.

Table 7.2.5 Description of Forests in Lao PDR

Category	Expected Functions
Protection forests	- Protecting water resources, river banks and road sides - Preventing soil erosion, protecting soil quality, strategic areas for national defense - Protection from natural disasters, environmental protection and so on
Conservation forests	- Conserving nature - Preserving plant and animal species, forest ecosystems and other valuable sites of natural, historical, cultural, tourism, environmental, educational and scientific research experiments.
Production forests	- Utilizing for production and wood and forest product business which satisfy with the requirements of national socio-economic development and people's living.

Source: Forest Law (2007)

Recently, deforestation and deterioration of the forest have been one of critical environmental issues. In order to protect the existing forestry, the Government of Lao PDR stipulates 21 National Protected Areas (NPAs) and 2 Corridors at the national level and Provincial Protected Areas (PPAs) and District Protected Areas (DPAs). Their total sphere amounts to about 5.3 million ha, 22.5% of the total national land as shown in Table 7.2.6. Those NPAs and Corridors are known as NBCAs, which are designed for preservation of natural resource, protection of the abundance of nature and the environment of such nature and preservation of the beauty of natural scenery for leisure resorts, study and research.

Table 7.2.6 Details of Protected Areas in the Lao PDR

Category	Description	Administration in charge	Number in the Lao PDR		Total area (ha)
				Vientiane Capital	
National Protected Area	National protected Areas are established by the Prime Ministerial Degree 164 in order to achieve the three objectives; protection of forests, wildlife and water, maintenance of natural abundance and environmental stability and protection of natural beauty for leisure and research.	Ministry of Agriculture and Forest	21 NPAs 2 Corridors	2	3,387,370
Provincial Protected Area	Provincial protected areas are determined by the Ministry of Agriculture and Forestry. When any development projects are planned inside of this protected area, submission of EIA to WREA is mandatory while environmental approval shall be obtained before construction start.	Department of Agriculture and Forestry, Province Authority	57 Conservation Areas 23 Protected Forest	4	1,393,397
District Protected Area	District protected areas are determined by the Ministry of Agriculture and Forestry. They have no legal status. The areas are categorized into district protected areas.	Office of Agriculture and Forestry, District Authority	144 Conservation Areas 52 Protection Areas	N/A	559,446
Total					5,340,195

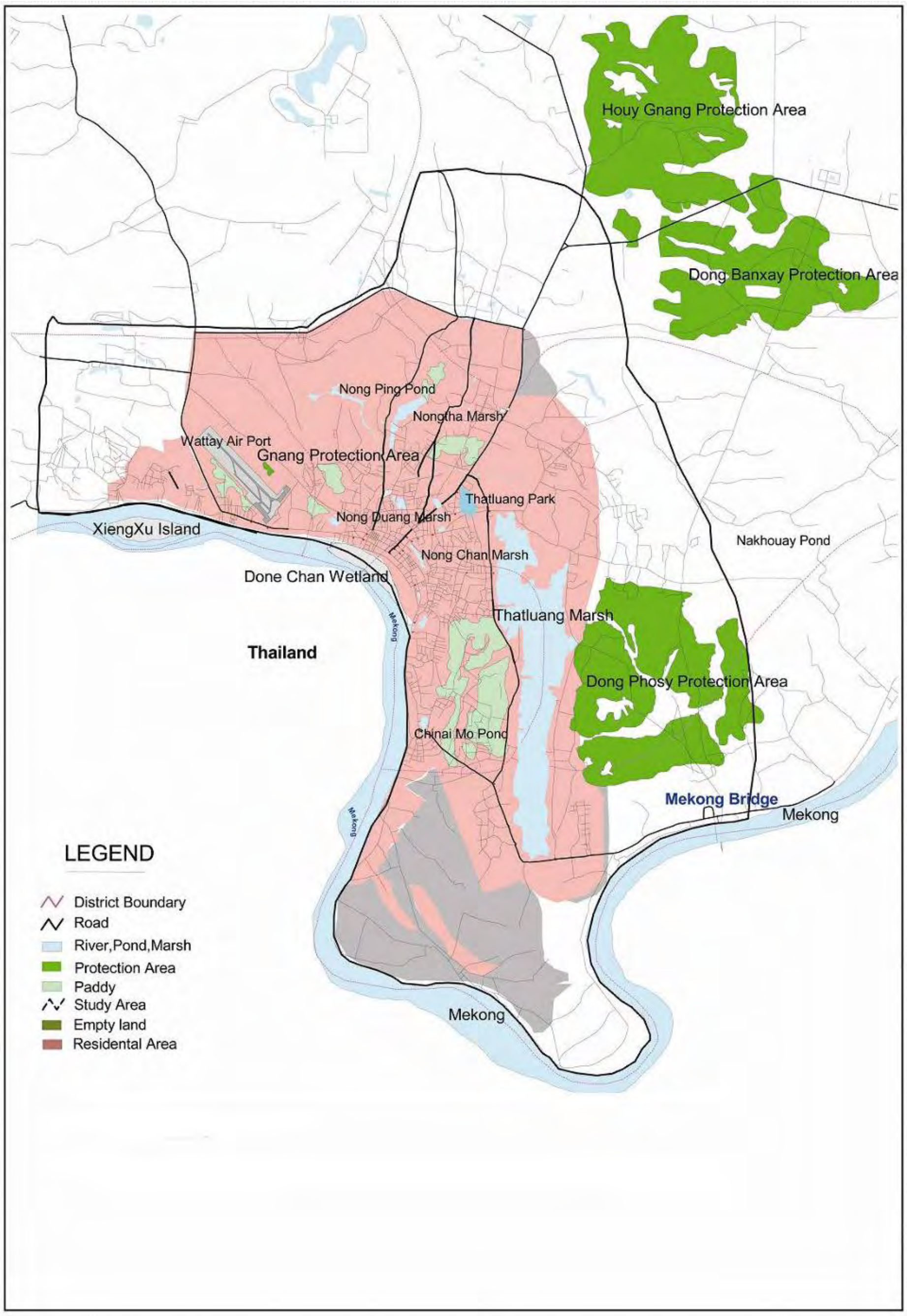
Source: JICA Study Team with reference to Lao PDR Environment Monitor (2007), World Bank

Table 7.2.7 is the list of protected areas at the national and provincial levels in Vientiane Capital and Figure 7.2.1 shows the locations of those protected areas in the central area. The current condition and management policies of nearest forest reserves and national park are to be briefly described later.

Table 7.2.7 List of Protected Areas in Vientiane Capital

No	Items	Total Area (ha)	Area Covered by Vientiane Capital (ha)	Village/District Location	Function
1	Phou Khao Khoay	200,000	33,400	Xaythany and Mayparkngum districts	National Protected Area
2	Phou Phanang	70,000	46,000	Sikhottabong, Naxaithong and Sangthong districts	National Protected Area
3	Dongphosy	1,793.25	1,793.25	Xaysetha district: Xiengda village, Nakhuay village Hadxaifong district: Nong Hieo village, Dongphosy village, Dong Khamsang village.	Provincial/Capital Protected Area
4	Dong Houay Gnang	808	808	Xaythany district	Provincial/Capital Protected Area
5	Dong Banxay	788.75	788.75	Xaythany district: Dong Sanghin village, Phokham village, Xaysomsouk village, Khok Sa At village, Phonthon village, and Nakhok village	Provincial/Capital Protected Area
6	Done Xang Fay	48,548	48,548	Mayparkngum district	Provincial/Capital Protected Area

Source: JICA Study Team with reference to Lao PDR Environment Monitor (2007), World Bank



Source: The Study of Master Plan on Comprehensive Urban Transport in Vientiane in Lao PDR, JICA, 2007

Figure 7.2.1 Location of Protected Areas in the Central Vientiane Capital

2) Biodiversities

The Law on Wildlife and Aquatic Animals, enacted in 1997 and amended in 2004, categorize those species into the three, Prohibition Category (First Category, I), Management Category (Second Category, II) and Common or General Category (Third Category, III), dependent on degrees of extinction. The list of endangered species designated by the Law is reviewed yearly by the Ministry of Agriculture and Forestry and the International Union for Conservation of Nature (IUCN). As of November, 2009, the Red List of IUCN for Lao PDR has no extinct species (see Table 7.2.8).

Table 7.2.8 Endangered Species in Lao PDR

Category	Definition	Number of Species					
		Mammals	Birds	Reptiles	Amphibians	Insects	Fisheries
Prohibition Category	Rare, near extinct, high value and of special importance in the development of social-economic, environmental, educational, scientific research.	44	36	9	1	0	6
Management Category	Beneficial in terms of national economic, social, environmental interests and important for livelihoods of multi ethnic people and educational scientific research.	15	22	13	0	7	9
Common or General Category	Able to reproduce wildly nature and very important for social-economic development and educational scientific research	6	5	8	3	5	18

Source: JICA Study Team with reference to Law on Wildlife and Aquatic Animals and Red List used as of October 2009, determined by Ministry of Agriculture and Forestry (Provided by IUCN Lao PDR Office)

(6) Air Quality

The recent air quality in Vientiane Capital is shown in Table 7.2.9. Compared to the international standards, the air quality does not have critical issues. However, it seems that recent development activities over the Capital may have adverse impacts on the quality to some extent. In general, air quality during the dry season is poorer than one in the rainy season.

Table 7.2.9 Air Quality in the City of Vientiane (2002)

Parameter	Unit	Range of Results	Average of Results	International Standards
Total suspended particulates (TSP)	mg/m^3	0.082 – 0.296	0.165	0.33
Particulate matter (PM 10)	mg/m^3	0.040 – 0.089	0.068	0.12 – 0.35
Sulfur dioxide (SO_2)	mg/m^3	0.025 – 0.276	0.108	0.32 – 0.36
Nitrogen dioxide (NO_2)	mg/m^3	<0.001-0.057	0.014	0.30

Source: Lao PDR Environment Monitor (2007), World Bank

(7) Water Quality

As of November, 2009, there are three water quality standards in Lao PDR[3]. As for quality standards of drainage, Science, Technology and Environment Organization (STENO), the former organization of WREA, stipulated the first standards in 1998 and Ministry of Industry and Commerce (MOIC) established another standards only for wastewater from industrial factories, namely “Provision on Discharge of Domestic Sewerage and Wastewater from Industrial Factories”. In addition, Ministry of Health has the quality standards for drinking and household to be supplied, enforced as “Decision on the Management of Quality Standards for Drinking and Household Water Supply” in 2005.

Though Vientiane Capital has not been monitoring regularly the environmental conditions, a water quality study was conducted on 15 points inside Vientiane Capital in 2002 and the study result is

[3] On 7 December, 2009, WREA stipulated a new comprehensive environmental standards of air, noise, surface water, ground water and geological conditions.

shown in Table 7.2.10. While some items were observed beyond the standard for wastewater discharge, it may be concluded that water quality in Vientiane Capital was generally fine.

Table 7.2.10 Result of the Water Quality Study in Vientiane Capital, as of 2002

Parameters	Unit	Range of	Average	Standard
pH	-	6.38~8.44	7.34	6-9.5
Conductivity	mS/m	11.0~78.2	36.262	-
Alkalinity	mg/L	57~250	175.56	-
BOD5	mg/L	5~35	14.09	<20
COD	mg/L	70~200	115.93	<120
Temperature	°C	12.2~30	24.42	<40

Note: (a) Samples were collected from 15 monitoring stations in Vientiane Capital.

(b) Results are compared with the standard for wastewater discharge (Class A) by STEA

Source: Lao PDR Environment Monitor (2007), World Bank and Standard for wastewater discharge (1998), WREA

(8) Noise and Vibration

Table 7.2.11 shows the noise levels recorded in 2002 at the seven points in the central area of Vientiane Capital. Considering the recent rapid increase of vehicle travel volume, the average noise in the Capital may have become bigger than those values especially in the central area.

As shown in the table, the maximum level of the noise is recorded as louder than the international standards. One of the reasons for this record is that locations selected for the survey were in the center of the Capital.

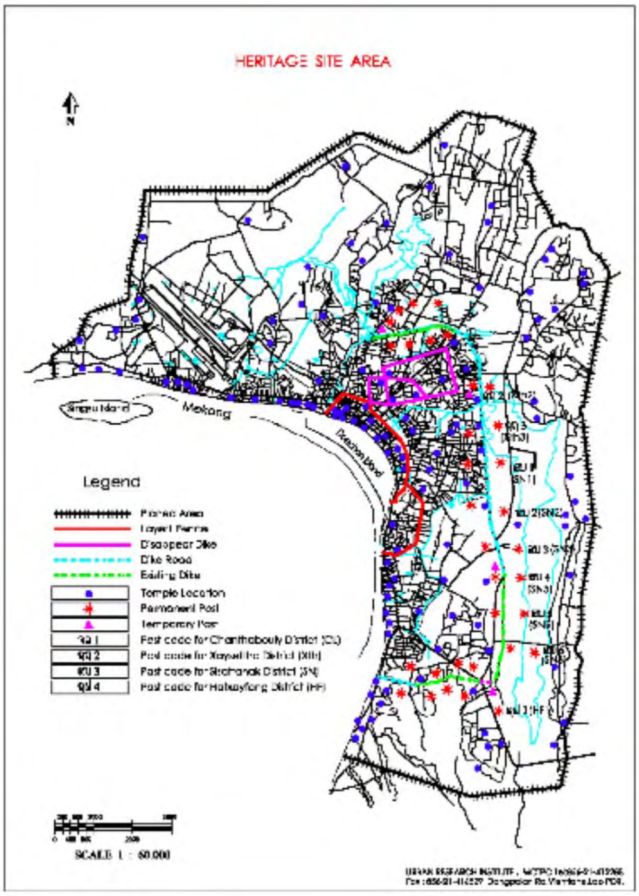
Table 7.2.11 Noise in Vientiane Capital (2002)

Parameter	Unit	Range of Results	International Standards
$L_{eq}8$ (average over 8 hrs)	dB(A)	60.1 – 63.0	60 – 70 dB(A)
L_{max} (maximum level)	dB(A)	79.5 – 85.0	< 70 dB(A)

Source: Ambient Air and Noise Monitoring in Vientiane Capital (September 2002 – February 2003), Danida National Capacity Building Project

(9) Archaeological and Heritage Resources

Vientiane Capital has many archaeological and heritage resources as shown in Figure 7.2.2. However, in the Project Area, there is no archaeological and heritage resource. There are many historical heritages and cultural assets in Vientiane, however the most of them could be found in the city center. A surrounding area of the Project Area has nothing worthy to preserve historical and cultural ruins, buildings and assets.



Source: Public Works and Transport Institute, MPWT, 2009

Figure 7.2.2 Heritage Site in the central Vientiane Capital

7.2.2 Social Environment

(1) Population Structure

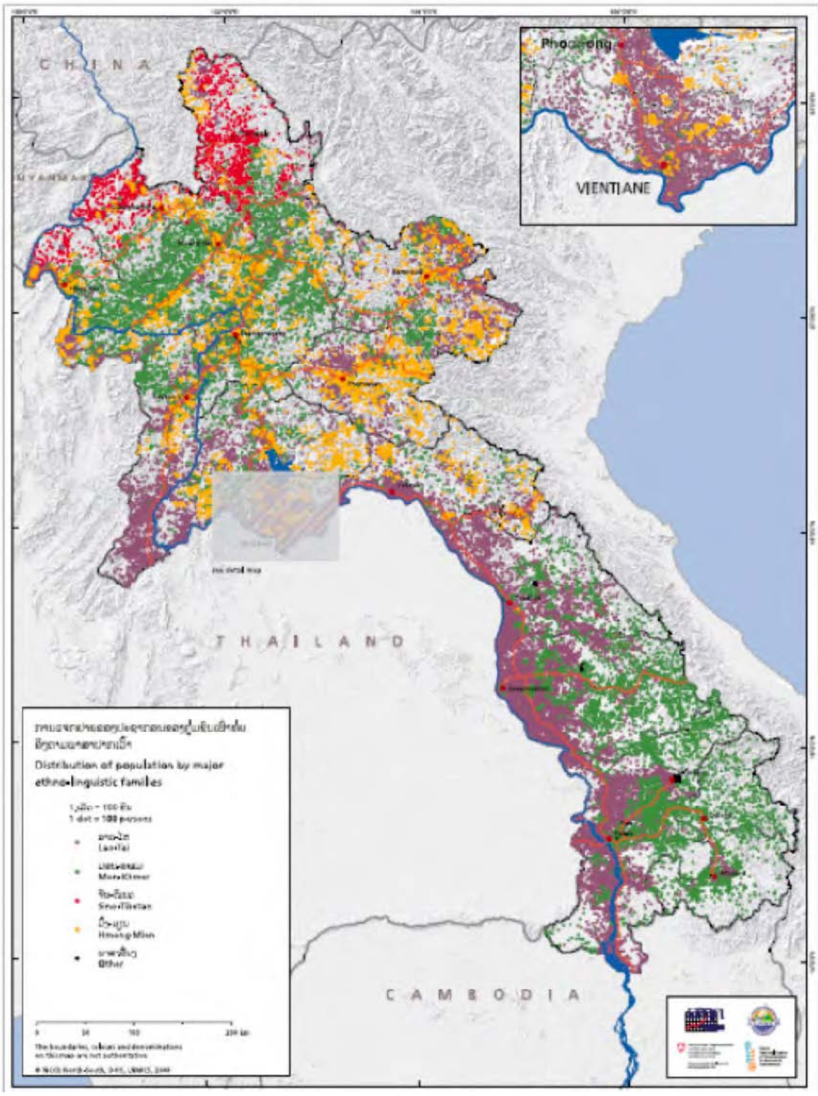
As social indicators of Vientiane, the total area, population and population density of Vientiane Capital in 2005 were shown in Table 7.2.12.

Table 7.2.12 Population and Population Density at the national

	Area (km^2)	Population	Male	Female	Density (person/km^2)
Lao PDR	236,800	6,000,379	2,993,041	3,007,339	25
Vientiane Capital	3,920	740,010	269,717	349,624	189

Source: Statistical Year Book 2008, Ministry of Planning and Investment

As for the ethnic composition, Lao PDR has various ethnic groups and the biggest group is Lao, amounting to 54.6 % in the 2005 census. As shown in Figure 7.2.3, major groups in Vientiane Capital are Lao and Thai, while Hong, Mien, Mon and Khmer are there.



Source: Socio-economic Atlas of the Lao PDR, downloaded from the website of www.laoatlas.net in November, 2009

Figure 7.2.3 Distribution of Ethno-linguistic Families in Lao PDR

(2) Social services

1) Water supply

Most of the city center in Vientiane Capital has received water supply service but not all (see Table 7.2.13). In terms of sewage, Lao PDR has not been introduced the system yet in entire country.

Table 7.2.13 Distribution by source of water for drinking and cooking in Vientiane Capital

	Piped water in/out side	Well/ Borehole protected	Well /Borehole unprotected	River, stream of dam	Mountain source	Rain water from tank	Other	Not stated	Total
Lao PDR	12.9 %	22.0 %	23.8 %	20.5 %	19.1 %	0.1 %	0.6 %	0.9 %	100.0 %
Vientiane Capital	42.5 %	28.8 %	24.5 %	1.5 %	0.2 %	0.0 %	0.5 %	2.1%	100.0 %

Source: Results from the Population and Housing Census 2005 (2006), Steering Committee for Census of Population and Housing

2) Electricity

Electricity service in Vientiane Capital is provided by Electricite du Laos (EdL). Table 7.2.14 shows that the coverage of households with public electricity service is higher in Vientiane Capital rather than other areas in Lao PDR.

Table 7.2.14 Distribution by Source of Water for Drinking and Cooking in Vientiane Capital

	With Electricity through Public Net		Own generator	Car Battery	Not Electrified	Not stated	Total
	Own meter	Share meter					
Lao PDR	38.9 %	10.8 %	1.0 %	6.5 %	41.2 %	1.6 %	100.0 %
Vientiane Capital	74.2 %	20.6 %	0.3 %	0.7 %	2.1 %	2.1 %	100.0 %

Source: Results from the Population and Housing Census 2005 (2006), Steering Committee for Census of Population and Housing

3) Solid waste management

Vientiane Capital Urban Development Authority (VUUDA) is responsible for waste collection in Vientiane Capital. There is a landfill site for solid waste located 32 kilometers from the city center, newly constructed in 2008 in Xaythany district. Solid waste collection services in Vientiane Capital, a 48% of the whole households were covered (World Bank, 2007). In uncovered areas, people burn their waste from their houses.

As shown in Table 7.2.15, the amount of waste collected in the former landfill, located 18 kilometers from the city center, site increased gradually till 2007 and the amount in 2008 collected to the new site reached 96,794 ton. This recent trend mentions that the amount of waste from the Vientiane Capital will be increased further.

Table 7.2.15 Amount of Waste thrown in km 18 (2000 – 2007)

Year	2000	2001	2002	2003	2004	2005	2006	2007
Ton	35,889	41,488	47,475	47,066	49,427	46,576	50,400	58,841

Source: Ministry of Public Works and Transport, 2009

4) Health

As of February 2009, Vientiane Capital has public health facilities as shown in Table 7.2.16.

Table 7.2.16 No. of Public Health Facilities in Vientiane Capital (2007/2008)

District Hospital	Dispensary	Clinic	Pharmacy
9	41	108	445

Source: Basic Statistics Data on Socio-Economic Development 2007/2008 of Vientiane Capital (2009), Vientiane Capital

Main diseases observed and causes for death are summarized in Table 7.2.17

Table 7.2.17 No. of Cases Observed and Causes for Deaths

	Diarrhea	Pneumonia	Tuberculosis	Red small-pox	Stomach ache	Dengue fever	Aids	Others
No of cases	768	436	332	2	2,306	815	62	24,765
No of death						1	15	

Source: Basic Statistics Data on Socio-Economic Development 2007/2008 of Vientiane Capital (2009), Vientiane Capital

5) Education

Lao PDR has various languages as well as ethnic groups, even though the official language is Lao in the country. Reflecting the distribution of ethnic groups and their languages over the country, literacy gaps are identified. According to the result of the census in 2005, higher literacy rates are found in and around major urban centers and provincial capitals and along the Mekong River, compared to other areas. As shown in Table 7.2.18, Vientiane Capital is the highest literacy rate in the country.

Table 7.2.18 Literacy Rate for Population Aged 15 Years and Above in Vientiane Capital

	Female	Male	Total
Lao PDR	63.2 %	82.5%	72.7 %
Vientiane Capital	88.1 %	95.3 %	91.7 %

Source: Results from the Population and Housing Census 2005 (2006), Steering Committee for Census of Population and Housing

The compulsory education in Lao PDR is only primary education (Grade 1 to Grade 5). The enrollment rate in primary education and literacy rates are in proportion to each other. It is observed that children of ethnic groups and girls experience disadvantaged in school education to some extent and they finally drop out even from primary education. In order to overcome such situations, the Government of Lao has developed effective inclusive education policies and plans in the Education Sector Development Framework 2009 - 2015 (ESDF) approved in April 2009.

Table 7.2.19 No of Schools in Vientiane Capital

	Kindergarten	Primary 1st – 5th	Lower secondary 6th – 8th	Upper secondary 9th – 12th	Lower and upper secondary school 6th – 12th
Government	44	414	39	10	41
Private	141	86	29	0	10
Total	185	500	68	10	51

Source: Basic Statistics Data on Socio-Economic Development 2007/2008 of Vientiane Capital (2009), Vientiane Capital

Table 7.2.20 School Attendance for Proportion Aged 6 Years and Above in Vientiane Capital

	Never been to school	At school	Left school	Unknown	Total
Lao PDR	22.8 %	28.4%	46.7%	2.1 %	100.0 %
Vientiane Capital	5.6 %	29.7 %	63.0 %	1.7 %	100.0 %

Source: Results from the Population and Housing Census 2005 (2006), Steering Committee for Census of Population and Housing

(3) Economic activities

In Vientiane Capital, more economic active population engages in industrial and commercial sectors compared to the agriculture sector.

Table 7.2.21 Distribution of economic active population to occupation in Vientiane Capital

	Economic active population	Distribution of occupation					Total
		Farmer	Fisherman	Livestock farmer mainly	Mixed farmer	Non-farm activity	
Lao PDR	2,738,892	64.3 %	0.1 %	0.2 %	14.0 %	21.5 %	100.0 %
Vientiane Capital	326,395	25.4 %	0.1 %	0.3 %	9.5 %	64.7 %	100.0 %

Source: Results from the Population and Housing Census 2005 (2006), Steering Committee for Census of Population and Housing

7.3 Profile of the Project Area

7.3.1 Natural environment

(1) Fauna and flora: Dongphosy Forest Reserve

The Project Area is a part of the Dongphosy Forest Reserve, which is categorized into the Provincial Protected Area of Vientiane Capital and is managed by Vientiane Capital. Dongphosy Forest Reserve straddles two districts; Xaysetha and Hadxaifong. The Forest Reserve was originally conserved as Nong Heo National Park by Department of Forest since 1941. Afterwards, the jurisdiction of the area has been shifted to Vientiane Capital in 1990. Since that transfer, the land use of the Forest Reserve has been discussed among Vientiane Capital, other relevant ministries and developers. With the official procedure along with the government, the Area is allowed to be transferred to other purposes.

Dongphosy Forest Reserve (A = 1,793.25 ha, see Figure 7.2.1 and Figure 7.3.1), one of six major protected areas around Vientiane, is about 25km south of the city centre. This forest was used as the community forest for surrounding villages, and, due to the traditional slash-and-burn agricultural method, the current floral condition of most parts of this forest reserve is classified as the secondary forest. There are several communities of illegal squatters inside of this forest reserve that did not exist around Year 2006. Some of those residents hunt small animals and/or birds nesting inside of this forest reserve although those hunting activities are not allowed therein.

Recently, several development projects such as the railway facilities, including the construction of Thanaleng Railway Station, were implemented around the southern part of this forest reserve. With the intensified illegal encroachment activities, the degradation of entire forest conditions has been accelerated although there are several remnant tropical forests comprising of huge trees such as *Dipterocarves sp*. Several reforestation efforts are observed around this forest reserve. Within the future land use plan, currently in the final approval process by PMO (as of August 2010), Department of Agriculture and Forest (DoAF), Vientiane Capital, is planning to set up the reforestation area while Department of Forest, MAF, set up botanical garden therein. This reforestation plan and the botanical garden are to be described later.

No endangered and/or rare faunal/floral species occur around this forest reserve. A periodical bird counting activity around the Mekong floodplain including this forest reserve was conducted by the local scientist during 2003 -2005. According to this study, it is reported that 131 bird species are observed around this area so far (see Appendix A for more detailed information).

Remnant forest of Dongphosy Forest Reserve (1)

Thanaleng Railway Station

Roadside Vegetation of Dongphosy Forest Reserve

Remnant forest of Dongphosy Forest Reserve (2)

Source: JICA Study Team, 2010

Figure 7.3.1 Dongphosy Forest Reserve

(2) Botanical Garden

As mentioned earlier, the botanical garden (A = 150 ha), owned by Department of Forest, MAF, is located around the medical logistics center, northern part of Dongphosy Forest Reserve. This garden was set up 5 or 6 year ago, and several domestic trees as well as imported ones such as Eucalyptus (see Figure 7.3.2) are planted inside of this garden. Fence is set up along the boundary of this garden for its protection, however, several parts have already been broken and minor encroachments are recognized therein.

	
Eucalyptus Plantation inside of DoF, MAF Botanical Garden, Dongphosy Forest Reserve	Fence of DoF, MAF Botanical Garden, Dongphosy Forest Reserve.

Source: JICA Study Team, 2010

Figure 7.3.2 Botanical Garden of Department of Forest, Ministry of Agriculture and Forestry

Within Dongphosy Forest Reserve, intensive illegal land occupations and farming have started around late 90s when the urban development of Vientiane became accelerated. During several technical site visits, conducted in March and April, 2010, it was found that some of them are Thai nationals. After that, many people bought land from previous land occupiers although some of them knew those lands were parts of the protected area (i.e., illegal encroachment). Purchasers believed the government would issue land titles since many people lived and farmed there continuously (see Figure 7.3.3), and this fact would substantiate their hopes. They continued to encroach further therein and the land transfer of those illegally-invaded lands at individual level was continued.

However, due to the fact that Dongphosy is a protected area, the authorities did not issue any land titles to those who already lived and farmed there and/or had occupied lands without any permissions from the authorities (laofab, 2010).

	
Illegal Encroachment, inside of Dongphosy Forest Reserve.	Sign, declaring that logging and hunting are prohibited inside of Dongphosy Forest Reserve

Source: JICA Study Team, 2010

Figure 7.3.3 Encroachment Events

(3) Land Use of Dongphosy Forest Reserve

1) Past Local Land Use

Table 7.3.1 summarizes the past land use of Dongphosy Forest Reserve in 2005, prepared by Vientiane Capital. As summarized in this table, no large-scale development projects such as railway facilities and/or golf course, depicted in Figure 7.3.5, described later, was delineated in Year 2005.

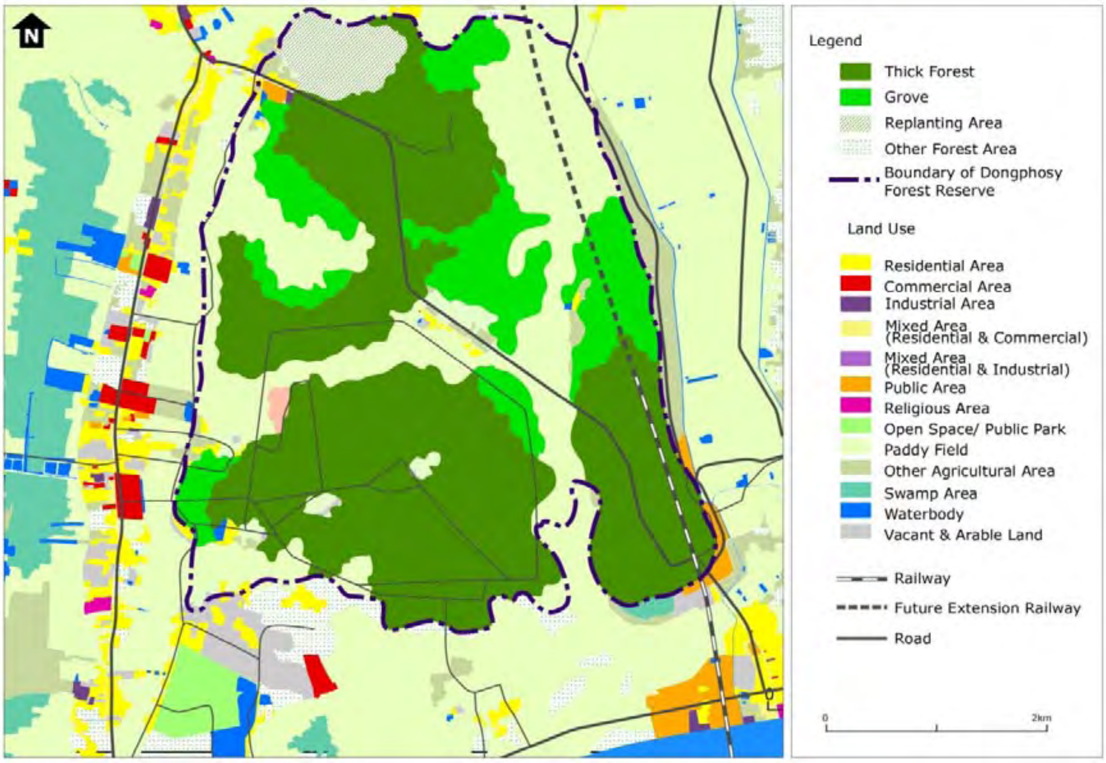
Table 7.3.1 Current Land Use Condition of Dongphosy Forest Reserve Area (2005)

	Zone	Area (ha)
1	Electricity Sub station	15.25
2	Roads	3.21
3	Ponds	2.00
4	School	2.00
5	Medical Supply Logistics Center	11.00
6	Mixed deciduous Forest	867.62
7	Reforestation	33.91
8	Botanical Garden (DoF, MAF)	59.41
9	Grove Forest	353.73
10	Agricultural Land	360.13
11	Building/Housing	18.99
12	MPWT's Land	66.00
Total		1,793.25

Source: Department of Agriculture and Forestry, Vientiane Capital

2) Current Land Use Plan

After Year 2005, several development zones such as the railway line and Thanaleng Station were newly approved (see Figure 7.3.4 and Table 7.3.2).



Source: JICA Study Team

Figure 7.3.4 Land use of the Dongphosy Forest Reserve (as of 2007)

Table 7.3.2 Land Use of Dongphosy Forest Reserve (As of November, 2009)

Main Usage		Area (ha)
1. Private use		1034.52
	Building	98.5
	Rice field	193.57
	Vegetation	670.85
	Empty area	66.6
	Pigsty	5.00
2. Public facilities		100.96
	Railway station and warehouses	45.00
	Market	28.00
	Electricity lines	15.25
	Medical warehouse	5.50
	Truck road	3.21
	Water reservoir	2.00
	Xiengda Primary School	2.00
3. Golf course		500.00
4. Replantation area		150.00
5. Others		7.77
Total (1.+2.+3.+4.+5.)		1,793.25

Source: JICA Study Team, prepared on the basis of the interview with Department of Agriculture and Forest, Vientiane Capital, 2009

As of 2009, Vientiane Capital has observed that more than 300 households have their own houses and/or living areas and around 1,000 households also have cultivated their vegetation and paddy fields inside the Forest Reserve. Those households have used the Forest Reserve without any official land certificate. In addition, the development of business industrial areas has proceeded rapidly.

3) Future Local Land Use

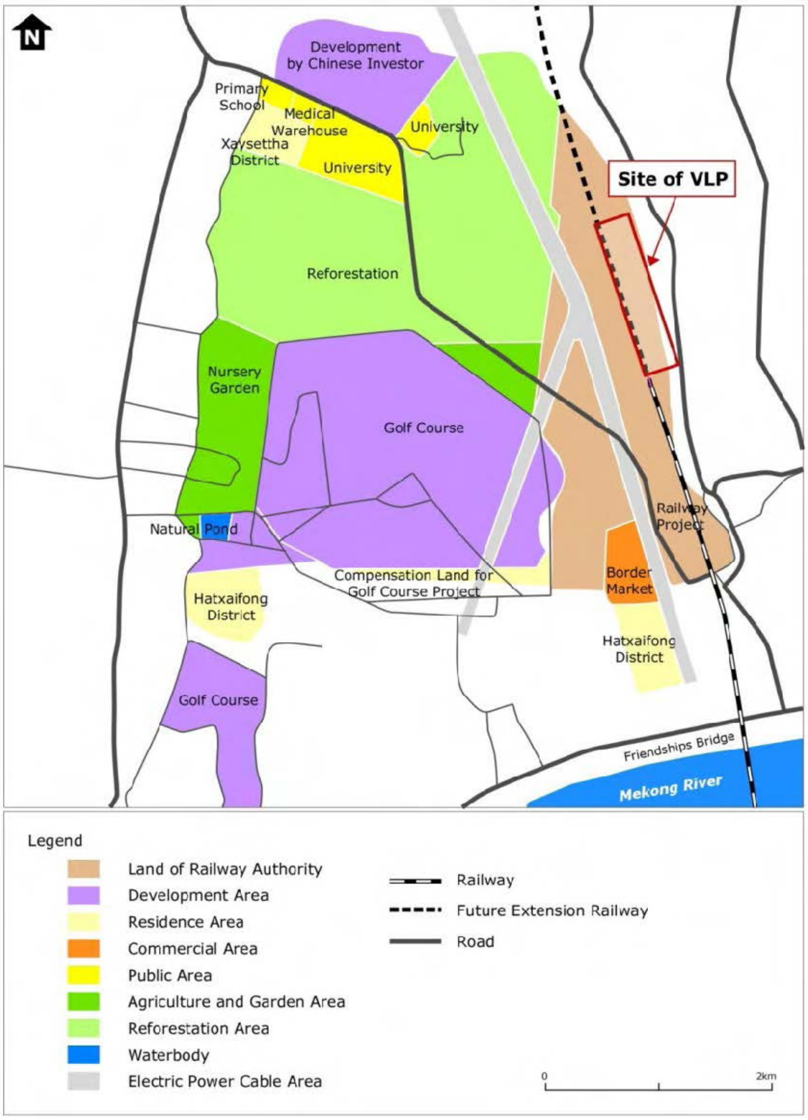
According to the interview with Department of Forest, MAF, the following authorities participate in the process of converting the Dongphosy Forest Reserve for other purposes. Person and authorities required with their approval for the conversion;

- Governor of Vientiane Capital
- Ministry of Planning and Investment
- Vientiane Capital, Land Management Authority
- Vientiane Capital, Department of Forestry
- Vientiane Capital, Department of Housing and Urban Planning

Authority required with technical comments on the conversion;

- Ministry of Agriculture and forest

Future land use plan of entire Dongphosy Forest Reserve was delineated by Land Management Authority, Vientiane Capital (DoAF, Vientiane Capital, 2010, see Figure 7.3.5). It is noted that VLP site is located inside of the future extended land of Lao Railway's, the railway authority of Lao PDR.



Source: JICA Study Team

Figure 7.3.5 Future Land Use Plan of Dongphosy Forest Reserve

(4) Topography

The geological structure in the Project Area is categorized as N2-G1ve, namely Vientiane Formulation. The definition of Vientiane Formulation is "Unconsolidated gravel, sand, silt and clay mostly of fluvial origin with basaltic lava flows, ash and loess. Laterised intrasequence erosion surfaces are present"[4].

(5) Hydrology

As discussed in Section 7.2, Vientiane Capital has a high probability of suffering from seasonal floods and overflows of drainage, especially in the rainy season. As discussed earlier, a part of

4 Geological and Mineral Map of Vientiane Area, created in 1999, by Ministry of Energy and Mines.

Hadxaifong District, especially along the Mekong River, was submerged in August 2008 by the hit of the seasonal typhoon and it may be said that the Project Area has probabilities of facing ephemeral drainages. Taking these seasonal characteristics into consideration, it is essential to design management systems of drainage from the logistic park.

(6) Landscape and Visual Resources

At present, except the station building and some residential buildings, there is no visual and landscape features at either the national or local level.

(7) Air Quality

The Project Area is far from the center of the Capital and the traffic volume is not so big because there is no critical transport facility except the Thanaleng Station. Only around the departure and arrival time of trains between Thanaleng and Nong Khai Stations, the traffic volume may be bigger than usual. Therefore, it may be assumed that the air quality in the area is better than the values shown in Table 7.2.9.

(8) Noise and Vibration[5]

The Project Area is a rural area and at present, it can be said that there exists no problem related to noise and vibration. Current noise levels are generally not a concern to surrounding communities.

(9) Archaeological and Heritage Resources

The Project Area does not have any archaeological and heritage resources.

7.3.2 Social Environment

(1) District-based Socio-economic Information

The Project Area is located on the border between the Xaysetha and Hadxaifong Districts. The existing profiles of these districts are explained in Table 7.3.3.

Table 7.3.3 Existing Profile of the Xaysetha and Hadxaifong Districts

		Xaysetha District[*1]	Hadxaifong District
1. Population	Male	48,176	40,057
	Female	49,674	41,158
	Total	97,850	81,215
2. Main economic activities		Agriculture; Livestock; Tourism	Agriculture; Industry
3. No of villages		52	60
4. Public infrastructure	Water supply	A company is operating.	Around 38% of the population is served with water supply service. Others use wells for their living water.
	Wastewater and sewerage systems	No operation, except pilot drainage systems as a part of a development	Some industrial factories only have wastewater discharge systems.

5 Referred to Initial Environmental Examination of the Feasibility Study Report of Nongkhai-Vientiane Railway Link Project Phase 2 (Km 3.5 – Km 12.5), submitted to Lao Railway Authority, Ministry of Public Works and Transport in August 2008

		Xaysetha District[*1]		Hadxaifong District	
		projects			
	Waste disposal	Trucks for waste collection from households are working in some areas.		Trucks for waste collection from households are working in some areas.	
	Sanitation system	Toilet is not fully installed over the village.		Toilet is not fully installed over the village.	
5. Education	No of kindergarten	Government	1	Government	15
		Private	15	Private	14
	No of primary school	Government	42	Government	48
		Private	18	Private	8
	No of lower secondary school	Government	7	Government	5
		Private	5	Private	3
				Priest	1
	No of upper secondary school	Government	1	Government	3
		Private	0	Private	0
	No of lower and upper secondary school	Government	3	Government	3
		Private	3	Private	0
6. Health	No. of health center	0		0	
	No. of clinic	17		7	
	No. of hospital	1		1	
7. Ethnicity		According to the census carried in 2005, most of people living in these districts are categorized to an ethno-linguistic family of Lao-Tai (Tai-Kadai).			

Note: Items on 1-6 are described with reference to the interview survey by JICA Study Team, while Item of 7 is referred to Socio-economic ATLAS of the Lao PDR (2009)

(2) Village-based Socio-economic Information

As the Project Area is described above to be located on the border between two districts, the Area is over the two villages, Dongphosy Village (Hadxaifong District) and Nakuhay Tai Village (Xaysetha District). The followings in Table 7.3.4 are the information available in the interview surveys with the governor and/or administrative officers of these villages conducted by the Study Team.

Table 7.3.4 Existing Profile of the Xaysetha and Hadxaifong Districts

		Dongphosy Village (Hadxaifong District)	Nakuhay Tai Village (Xaysetha District)
1. Population	Male	1,255	N/A
	Female	1,326	
	Total	2,581	1,836
2. Main economic activities		Agriculture (Mainly, rice production) Forestry	Agriculture (Mainly, rice production) Temporary worker
3. Public infrastructure	Water supply		Water supply services are operated inadequately. Most of the villagers use wells for their daily life.
4. Education	No of kindergarten	0	0
	No of primary school	1	2
	No of lower secondary school	0	2
	No of upper secondary school	0	0
	No of lower and upper secondary school	0	0
5. Ethnicity		According to the census carried in 2005, most of people living in these districts are categorized to an ethno-linguistic family of Lao-Tai (Tai-Kadai).	

Source: JICA Study Team

7.3.3 Management Policy and/or Programs of Nearby Forest Reserves and/or National Parks

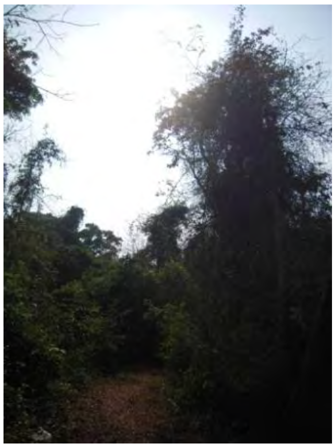
(1) Outline

As summarized in Table 7.2.7, there are two national parks and four forest reserves including Dongphosy Forest Reserve around Vientiane. The management of two national parks is mainly conducted by the national park protection unit of the Ministry of Defense while those of remaining four forest reserves are by the Department of Agriculture and Forestry, Vientiane Capital.

An organized park management is carried out for those two national parks, with relevant technical and financial assistances from international donors as well as local institutes and/or organizations.

Among the four forest reserves, the current forest condition of Dong Houay Gnang Forest Reserve is in good condition and the good practice is taken place for its management (see Figure 7.3.6) whereas most parts of Dong Banxay have been cleared due to recent development activities occurred therein (see Figure 7.3.7).

Gate of Dong Houay Gnang FR



Inside of Dong Houay Gnang FR

Source: JICA Study Team, 2010

Figure 7.3.6 Dong Houay Gnang Forest Reserve


Several Stumps, remained inside of Dong Banxay FR.


Collected tree roots, found inside of Dong Banxay FR

Source: JICA Study Team, 2010

Figure 7.3.7 Dong Banxay Forest Reserve

Here, current management framework of Dong Houay Gnang Forest Reserve (Vientiane Capital) and two National Parks (Ministry of Defense) will be summarized in following sections, separately.

(2) Management of National Parks

Currently, 730 peoples including 171 officials of MoD are working for the management of Phou Khao Khoay (PKK) and Phou Phanang (PPN) National Parks. Several studies and researches, in collaboration with universities, institutes and/or organizations are on-going.

For PKK, entire region is categorized into 35 zones while the access from the park outside is restricted to 3 checkpoints across this national park (PKK NP, 1999). At PKK national park, several eco-tourism events are taken place (see Figure 7.3.8), and small groups of international tourists started to visit. The entire forest management seems to be in good condition.


Inside of PKK National Park with Guide


Tributary running through PKK National Park

Source: JICA Study Team, 2010

Figure 7.3.8 Technical Site Visit on Phou Khao Khoay National Park

(3) Management of Dong Houay Gnang Forest Reserve

Currently, 15 officials and experts are working for the management of all four forest reserves including this Dong Houay Gnang located around Vientiane. At Houay Gnang, entire reserve is categorized into 3 categories; i.e., Zones A, B and C, respectively, depending on the current topographic patterns and the land use condition therein. Within this forest reserve, approximately 250 floral species as well as the occurrence of small mammals such as rodents are reported.

Within this forest reserve, there is a nursery section. Several domestic tree species as well as imported tree to be used for the ethanol production are planted (see Figure 7.3.9), and then, those seeds and saplings are replanted around surrounding community forests.

Nursery of Dong Houay Gnang Forest Reserve (1)

Nursery of Dong Houay Gnang Forest Reserve (2)

Source: JICA Study Team, 2010

Figure 7.3.9 Nursery of Dong Houay Gnang Forest Reserve

7.3.4 Management Policy o Dongphosy Forest Reserve

As shown inFigure 7.3.5, DoAF, Vientiane Capital, is planning to set up one reforestation zone around the northern half of Dongphosy Forest Reserve, adjacent to the future Lao Railway's land, and one nursery zone (A = 100 ha) to the west end of the golf course (note: currently, its construction is on-going). Currently, several illegal squatter's communities exist around this planned nursery zone, so that, appropriate resettlement and compensation program will be required in order to proceed the set-up of this nursery zone.

Beside these future forest management-related zones, DoAF is planning to set up one more nursery zone (A = 20 ha) around the existing medical logistics center. Several preliminary studies including the topographic survey were conducted for 3 ha of that second nursery zone (DoAF, 2010). No house nor private property exist around the project site of this second nursery zone, and thus, the set up of the second nursery would not be complicated, compared with the first one.

Several big trees exist inside of the planned golf course and DoAF is planning to summarize the tree inventory, to be remained after the operation of the golf course will start.

7.4 Environmental Legislative Framework at the Project Implementation in Lao PDR

7.4.1 Laws, Regulations and Standards

For logistic park development in the Lao PDR, legal instruments related to environment are listed in Table 7.4.1.

Table 7.4.1 List of Relevant Legal Instruments in the Environmental Sector for Logistic Park Development in the Lao PDR

Category	Title	Enacted Year
Generals on environment	Environment Protection Law	1999
	Forestry Law	2008
	Law on Aquatic Life and Wild Animal	2008
Environmental standards	Industrial Waste Discharge Regulation	1994
	Regulation on Monitoring and Control of Wastewater Discharge	1998
	Decision on the Management of Quality Standards for Drinking and Household Water Supply	2005
	Provision on Discharge of Domestic Sewerage and Wastewater from Industrial Factories	2005
Environmental impact assessment	Regulation on Environmental Assessment in the Lao PDR Decree on Environmental Impact Assessment	2002 2010
Land management (Protection areas, land acquisition and compensation)	Regulation on Management of Protected Areas and Animals	2003
	Land Law	2003 (Amended in 2008)
	Decree on the Compensation and Resettlement of the Development Project	2005
	Regulations for Implementing Decree on Compensation and Resettlement of People Affected by Development Projects	2006
	Technical Guidelines on Compensation and Resettlement in Development Projects	2005

Source: JICA Study Team

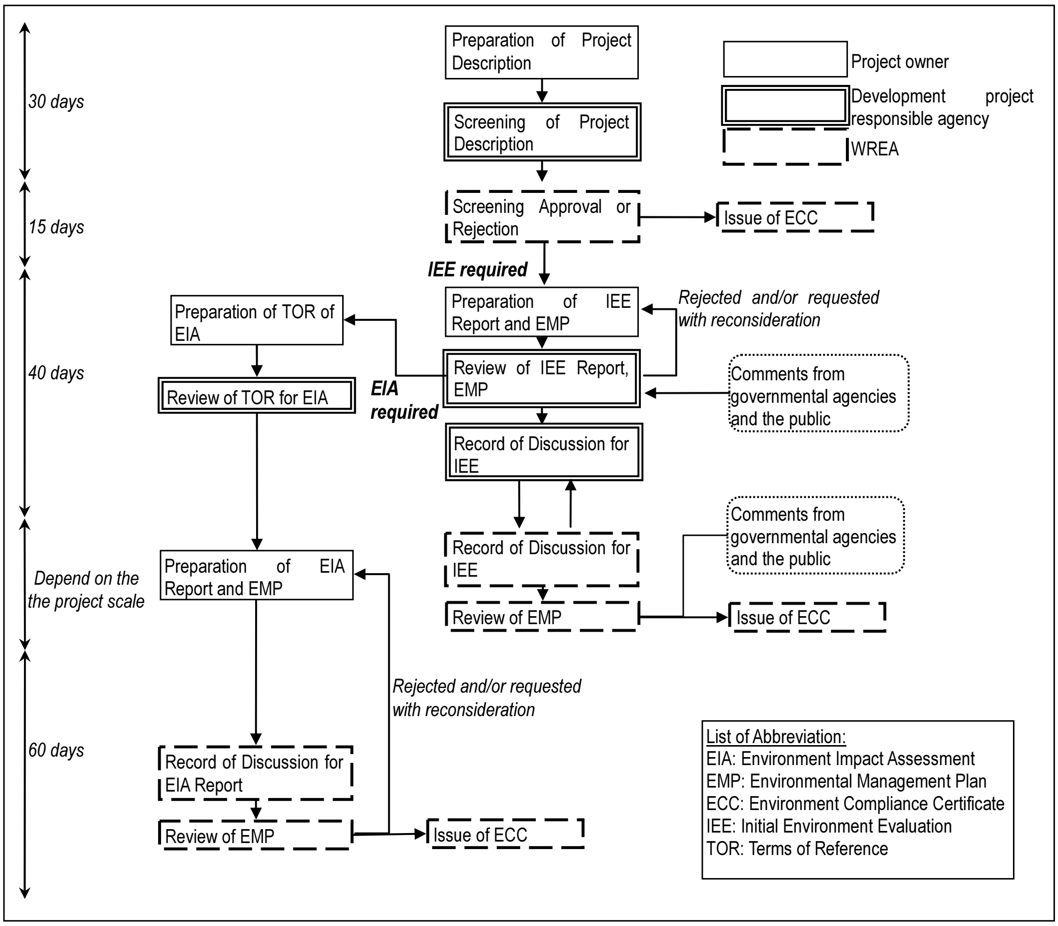
7.4.2 Procedure of the Environmental Impact Assessment for Development Projects

In the Environment Protection Law which is a core framework law for ensuring environmental management in the Lao PDR, the Article 8 shows the definition of environment impact assessment as “Environmental impact assessment is process of estimating impacts on the environment by development projects and activities. It also identifies methods and standards for mitigating and reducing such anticipated impacts on the natural and social environment”. So as to practice environment impact assessment (EIA) as defined, the Regulation on Environment Assessment in the Lao PDR specifies the procedure as below.

(1) Regulation on Environment Assessment in the Lao PDR (2002)

The Regulation on Environment Assessment in the Lao PDR (The Regulation) was enacted in 2002 by the Science (hereinafter referred to as 2002 EIA Regulation), Technology and Environmental Agency (STEA), which was reorganized into WREA in 2007, with reference to the Environment Protection Law. The Regulation has the two objectives. The first is to clarify common procedures of EAs for all development projects in the Lao PDR. The second is to build the general basis and requirements to be shared among line ministries responsible for planning and implementing development projects. That may help those ministries accomplish their duties of issuing their own environmental assessment regulations. The entire EIA procedure is shown in Figure 7.4.1.

Within a series of meeting with WREA held in 2009, it was agreed that this EIA regulation was applied for logistic park development in the Lao PDR in the Study. In July 2009, the WREA has submitted to the PMO a draft of the Decree on Environmental and Social Impact Assessment in the Lao PDR and been approved in March, 2010. Later, it was agreed that relevant environmental approval process for the proposed VLP project shall be conducted based on the newly approved EIA Law (see Section 7.6 for more detailed descriptions).



Source: JICA Study Team

Figure 7.4.1 EIA Procedure (2002 EIA Regulation) for Logistic Park Development in the Lao PDR

Regarding the public involvement (PI), the Regulation states that PI is essential in the EIA process. The Regulation stipulates that the PI activities are held in the following process;

- Notification of stakeholders
- Dissemination of information about the project and its impact
- Consultation with the affected parties and parties interested in the project regarding their opinions
- Invitation to affected parties and parties interested in the project to attend hearings or other meetings when (i) when the development project responsible agency (DPRA) is reviewing an IEE report, (ii) WREA is reviewing and approving an EIA report if EIA is necessary, (iii)

responding to affected and interested parties' concerns during project planning and implementation.

(2) Decree on Environmental Impact Assessment (2010)

The 2002 EIA Regulation, mentioned above, was upgraded and revised by WREA as the Decree on Environmental Impact Assessment (The Decree) to strengthen the effect for mitigating and reducing impacts on the natural and social environment. In February 2010, The Decree has been approved by PMO and enacted. The Decree has the five objectives as follows;

- To disseminate and implement the Article 8 of the Environment Protection Law
- To regulate principle, rules, measures, functions, management and monitoring of EIA
- To ensure that all investment project are designed with appropriate measures
- To effectively prevent, minimize and
- To contribute to the national development with sustainability

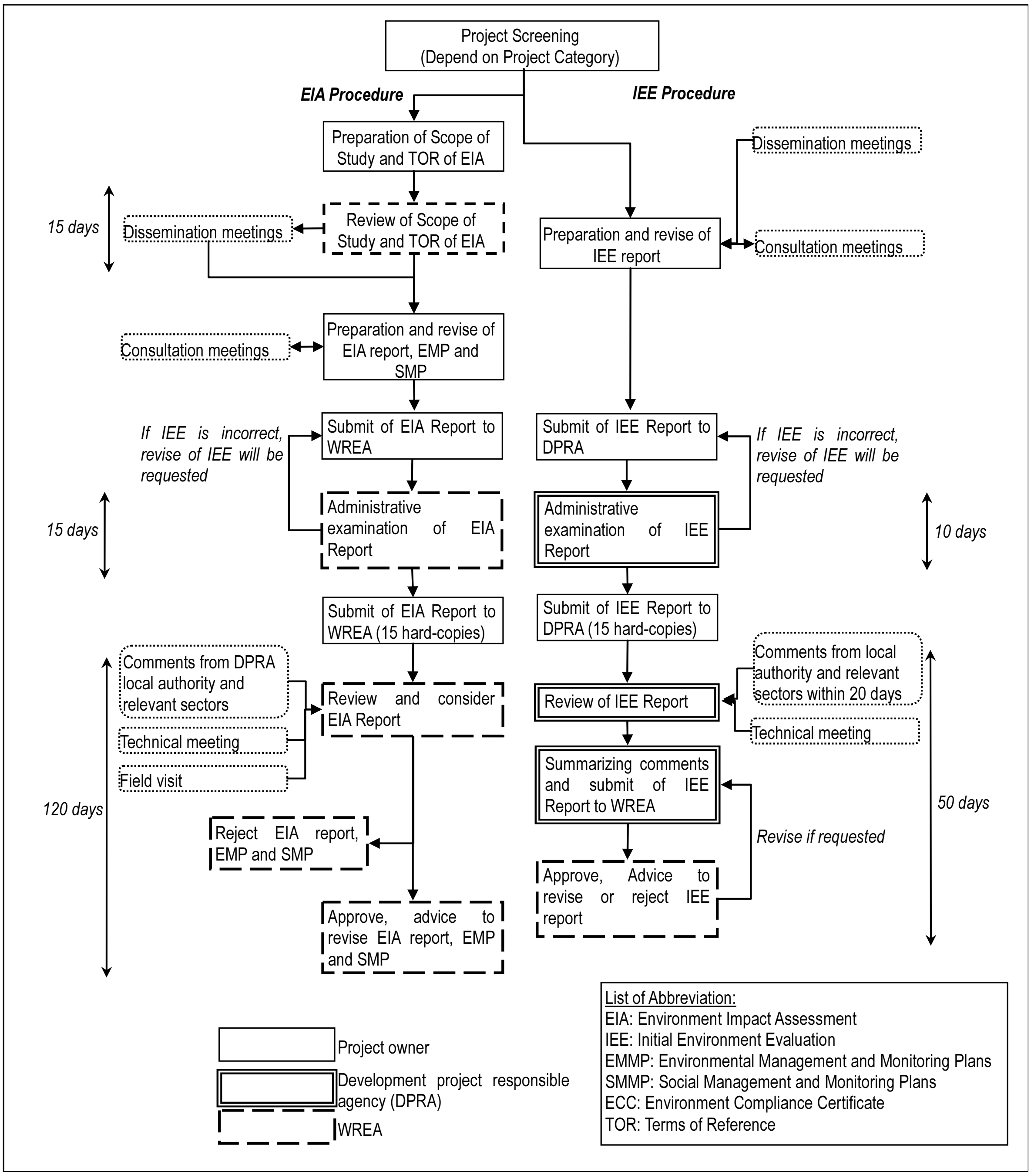
Entire flow of this revised EIA law is shown in Figure 7.4.2. The main modified points from the previous regulation to new one are listed as follows;

- Approach of EA application: to evaluate the proposed project for the requirement of either the IEE or the EIA depending mainly on scale of the project by sector, not as previous screening procedure that IEE must be required before EIA for the evaluation and review of necessity of EIA.
- EIA procedure: An individual, legal entity or organization which conduct IEE or EIA services in Lao PDR must be licensed and registered at WREA
- Public involvement (PI): Public involvement procedure has been enforced by means such as requirement of the minutes of each meeting to be attached the IEE or EIA report.

Regarding PI, it is essential to ensure the participation of the people who are or likely to be affected by an investment project in the IEE or the EIA process. The Decree stipulates that the PI activities are held in the following process;

- To organize dissemination meetings at the time of collecting information to prepare the IEE or the EIA report
- To organize consultation meetings during preparation and examination of the IEE or the EIA report

To inform and to allow to access the project information during survey exploration, construction and operation of the project



Source: JICA Study Team

Figure 7.4.2 EIA Procedure (2010 EIA Law) for Development Project in the Lao PDR

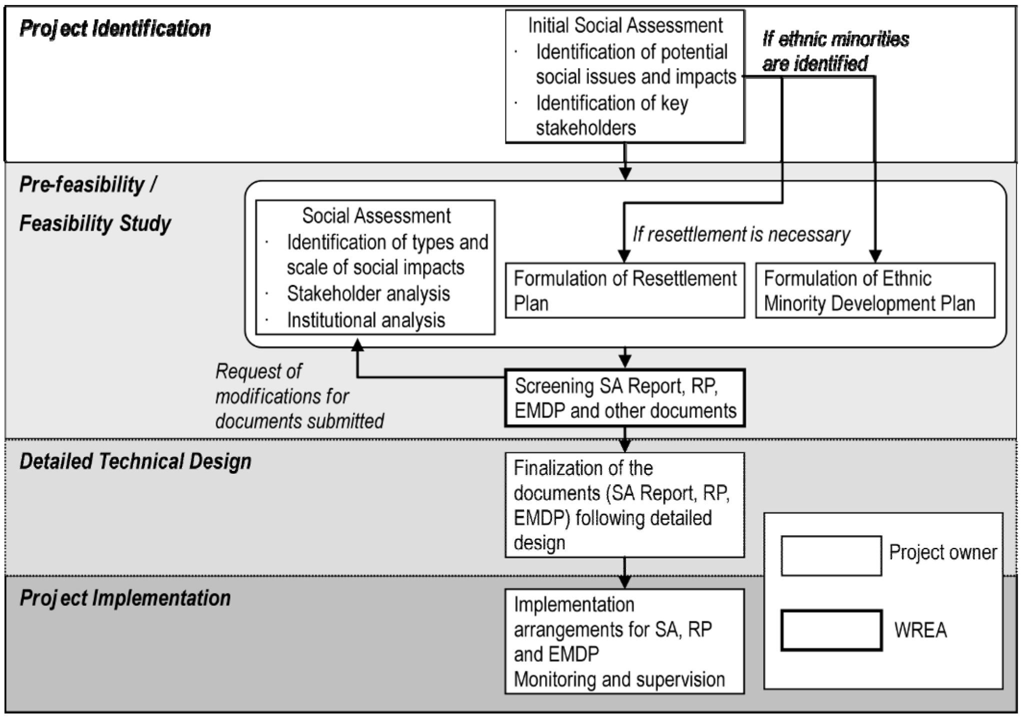
As for social environmental aspects, it is essential to consider about compensation and resettlement of people affected at the implementation of development projects. The followings should be taken into consideration as legislations related to this issue:

- Decree on Compensation and Resettlement of People Affected by Development Project (No. 192/PM, 2005)
- Regulations for Implementing Decree on Compensation and Resettlement of People Affected by Development Projects (No. 2432/STEA, 2006)
- Technical Guidelines on Compensation and Resettlement in Development Project

According to the Decree No. 192, if development projects give adverse impacts on livelihoods of people such as losses of their assets and resources, the preparation of the resettlement plan (RP) is required for those people, namely project affected persons (PAPs). The RP is to be submitted with the IEE or EIA Report and the EMP Report with satisfying with requirements listed in the Technical Guidelines as follows:

- Identification of APs and their profiles
- Clarification of types and degrees of potential impacts on them
- Compensation measures for the APs and relocation plans (resettlement sites and their eligibilities, alternative options of resettlements)
- Exercise of public participation, consultation, information disclosure and grievance redress mechanism
- Administrative structure and capacity development for practicing the RPs
- Monitoring and supervision
- Cost estimates and budget
- Implementation arrangements

On the basis of them, the procedure of compensation and resettlement of those people is implemented by project owners as shown in Figure 7.4.3.



Abbreviation: EIA: Environment Impact Assessment, IEE: Initial Environment Evaluation, EMDP: Ethnic Minority Development Plan, RP: Resettlement Plan, ISA: Initial Social Assessment, SA: Social Assessment

Source: JICA Study Team, referring to Technical Guidelines on Compensation and Resettlement in Development Project

Figure 7.4.3 Procedure of Compensation and Resettlement of People Affected by Development Projects and/or Activities

7.4.3 Relative Agencies and Institutions

In Lao PDR, the environmental sector is led by the Water Resource and Environment Administration (WREA) in the Prime Minister's Office (PMO). Here, relevant organizations related to constructing logistic parks in the Lao PDR are the following three.

- Water Resource and Environment Administration, Prime Minister's Office
- Land Management Authority
- Ministry of Agriculture and Forest

Their details are explained as below:

(1) Water Resource and Environment Administration, Prime Minister's Office

Water Resource and Environment Administration (WREA) in the Prime Minister's Office (PMO) is responsible for formulating and issuing environmental laws, regulations and policies and other documents such as environmental standards in the Lao PDR.

The Department of Environment and Social Impact Assessment is responsible for environment and social impact assessment of development projects. Prior to those projects' implementation, Project Owner is required to submit reports on Initial Environment Evaluation (IEE) or Environment Impact Assessment (EIA) to the Department. If the Department approves the reports, it issues the organizations the Environmental Compliance Certificate (ECC) and then the project owner starts their projects' implementation.

(2) Land Management Authority

The Lao PDR has the Land Management Authorities (LMAs) at the national, provincial, district and village levels. Responsibilities for each level are described in the Agreement on the Implementation and Activity of the Cabinet, Center and Departments of National Land Management Authority and the Land Law.

The National Land Management Authority (NLMA) is in charge of managing land use plans over the country at the national level in centralized and uniform manners. The NLMA organizes the information collected from the LMAs each province, district and village so as to achieve their responsibilities. On the other hand, the LMAs at the local levels (provincial, district and village) are responsible for land use management in their administrative areas, such as registering land use rights, conducting land inspections, acquiring data and statistic information related to land use and so on. For accomplishing the comprehensive land management, the NLMA and the local LMAs coordinate the land use management each sector with relevant ministries.

(3) Ministry of Agriculture and Forest (MAF)

For issues related to protected areas In the Lao PDR, the Department of Forest in Ministry of Agriculture and Forest has the responsibility at the national level. The role of the Department is to take care of National Protected Areas as stipulated in Forest Law and the Regulation on Management of Protected Areas and Animals.

7.5 Preliminary Environmental Assessment of Vientiane Logistics Park Project

7.5.1 Environmental Screening and Scoping

(1) Introduction

An area proposed for the Project will be totally around 35 ha, consisted of the Vientiane Logistics Park (VLP) and access roads which will connect adjoining areas and the Industrial Park in future. Logistics Park will be equipped with management offices, custom office, truck terminals, warehouses, workshops, bonded warehouses as well as oil tank facilities. Besides, there will be basic infrastructure including water supply, sewage, drainage, electricity, and telephone line. Taking the engineering features and specifications of the VLP facilities into consideration, the preliminary environmental screening and scoping is conducted within this section.

There are five (5) alternative sites for this VLP construction project, so-called, Alternatives A, B, C, D and E, respectively (see Table 7.5.1 and Appendix B for those locations and photo records). Based on the JICA Guideline for Environmental and Social Considerations (hereinafter referred to as JICA Guideline), a preliminary environmental examination is carried out for these five alternatives. Based on 30 environmental factors, listed in JICA Guideline, several environmental sub-factors are developed, considering current environmental features and land-use condition of the study sites for each evaluation.

Table 7.5.1 Outline of Candidate Site

Alternatives	Descriptions
Alt. A	Located to south-west of Thanaleng Station (former borrow pit sites), inside of Dongphosy Forest Reserve. Currently, border market zone is under consideration within future land use plan (as of August 2010). New access road (L≈700 m) is required. Feeder railway line (L≈500 m, RoW = 80 m) is required.
Alt. B	Located near to Thanaleng Station, inside of Dongphosy Forest Reserve. New access road (L≈500 m), reaching existing paved road, is to be constructed within land of railway authority.
Alt. C	Located near to Vientiane Station, (planned: construction and relevant expropriation as well as relevant EIA-study are not initiated, yet). VLP candidate site itself is located outside of Dongphosy Forest Reserve, but construction of railway extension to this future Vientiane Station from Thanaleng Station will be carried out within reforestation zone of future land use plan of Dongphosy Forest Reserve. Exiting rural road is used as access road (L=6,000 m), connecting logistics park and Vientiane City.
Alt. D	Located near to Industrial Park (D/F of this JICA-funded industrial park study was completed as of May 2010). Similar to Alternative Option C, VLP candidate site itself is located outside of Dongphosy Forest Reserve, but construction of railway extension to this industrial park from Thanaleng Station via future Vientiane Station, mentioned above, will be carried out within reforestation zone of future land use plan of Dongphosy Forest Reserve. No construction activity for access road is required. Feeder railway line (L≈2,000 m, RoW = 80 m) is required.
Alt. E	Use space of existing Thanaleng truck terminal.

Source: JICA Study Team

As mentioned in Table 7.5.1, the operation of the future Vientiane Railway Station including the railway extension from Thanaleng Station is prerequisite for the operation of Alternatives C and D. It is noted that the environmental screening and scoping for VLP candidate sites, conducted within this section, focuses on the potential environmental impacts, caused by the construction and operation of VLP facilities, and the evaluation of compound impacts to be caused by the future railway extension project is out of scope.

(2) Results of Environmental Scoping

Here, results of preliminary environmental scoping for five alternatives, mentioned earlier, are described. Basically, this environmental scoping is carried out by taking into consideration of both construction and operation phases (see Table 7.5.2 and 7.5.3). Based on the JICA Guideline, environmental scoping for each alternative is conducted, using 52 environmental sub-factors. Tables 7.5.4 - 7.5.6 summarize potentially critical issues regarding socio-cultural, bio-physical and pollution, respectively.

Table 7.5.2 Preliminary Environmental Scoping Results for Vientiane Logistics Park Project

Environmental Factor				Evaluation				
				Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
Socio-Cultural Environment	1	Involuntary Resettlement	VLP	C	B	C	D	D
			Access Roads	D	D	C	D	D
			Feeder railway line	D	D	D	D	D
	2	Local Economy	Decrease of agricultural income due to expropriation of agricultural lands.	B	B	B	A	D
			Impacts on local economy, caused by temporal traffic congestion during construction period.	B	B	B	B	D
	3	Land use and Utilization of Local Resources		B	B	B	B	D
	4	Social Institutions		C	C	C	C	D
	5	Existing social infrastructures and services	Impacts on regional infrastructures around study site during Construction.	B	B	B	B	D
	6	The poor, indigenous of ethnic group		B	B	B	B	D
	7	Misdistribution of benefit and damage	Neighboring site of VLP	B	B	B	B	D
			Traffic congestion around existing truck terminal station.	D	D	D	D	B
	8	Cultural Heritage		C	C	C	C	D
	9	Local Conflict of interests		C	C	C	C	C
	10	Water use/or water right	Impact on shallow wells.	B	C	C	C	D
			Impacts on irrigation for agricultural lands (e.g., rice paddy fields)	D	C	B	B	D
	11	Public Heath	Working Environment at Construction Site (Malaria, Dengue and others)	B	B	B	B	D
			Household waste treatment at construction camp	B	B	B	B	D
	12	Infectious Disease (e.g., HIV.AIDS)		C	C	C	C	C
	13	Accidents	Temporal degradation of traffic safety due to temporal increase of traffic volume during construction period.	B	B	B	B	B
			UXO	C	C	C	C	D
			Accidental spillage from oil storage facilities	B	B	B	B	D
Bio-Physical Environment	14	Topography and Geology	Significant topographic change due to large-scale earthwork (VLP)	B	B	B	B	D
			Construction of large embankment (feeder railway line)	A	D	D	A	D
	15	Soil Erosion	VLP	B	B	B	B	D
			Access Roads	B	B	B	B	D
			Feeder railway line	B	D	D	A	D
	16	Groundwater	Disruption of regional groundwater flow	D	D	D	D	D
	17	Hydrological condition	Disruption of regional drainage pattern due to large-scale landfill of swamp and/or ponds.	B	C	B	C	D
			Disruption of run-off water due to deforestation	B	B	D	D	D
			Disruption of regional drainage due to embankment	B	D	D	A	D
			Disruption of regional drainage pattern due to large-scale landfill of swamp and/or ponds.	C	C	B	B	D
	18	Coastal condition		D	D	D	D	D
	19	Flora/fauna and biodiversity	Impacts on Dongphosy Forest Reserve（VLP）	A	A	D	D	D
			Impacts on Aquatic flora/fauna around swamp	C	D	D	D	D

Environmental Factor				Evaluation				
				Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
	20	Meteorology		D	D	D	D	D
	21	Landscape		C	C	C	C	C
	22	Global warming		B	B	B	B	B
Pollution	23	Air Quality	Temporal roadside air quality degradation during construction period	B	B	B	B	D
			Worsened roadside air quality during operation period.	B	B	B	B	B
	24	Water Quality	Temporal water quality degradation of nearby surface/sub-surface water during construction period.	B	B	B	B	D
	25	Soil Contamination	Risk of soil contamination due to effluents discharge from VLP construction site.	B	B	B	B	D
	26	Waste	Treatment of construction waste during construction period.	B	A	A	A	D
			Treatment of construction waste from construction yard.	B	B	B	B	D
			Waste Treatment during operation period	B	B	B	B	B
	27	Noise/Vibration	Temporally worsened roadside noise/vibration during construction period.	B	B	B	B	D
			Worsened roadside noise/or vibration during operation period.	B	B	B	B	B
	28	Ground subsidence	VLP	A	C	B	A	D
			Access Roads	C	C	C	C	D
			Feeder railway line	B	D	D	A	D
	29	Obnoxious smell		C	C	C	C	B
	30	River bed		D	D	D	D	D

Note A: significant, B: major, C: minor, D: less significant, U: Unknown

Source: JICA Study Team

Table 7.5.3 Summary of Environmental Scoping

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
A	3	2	1	7	0
B	30	25	27	24	8
C	11	13	11	10	3
D	8	12	13	11	41

Note that the total number of sub factors, listed above, is of 49.

Source: JICA Study Team

Table 7.5.4 Key Environmental Aspects of Each Alternative Option (Socio-Cultural)

Alternative	Descriptions
Alt. A	**Resettlement:** Four huts (i.e., four households) exist inside of this VLP candidate site, and all of them use shallow wells located therein in their daily lives. Also, several houses and rice fields exist around VLP-related facilities such as feeder railway line, to be extended from existing railway line to this site. No land-take occurs for construction of access road to Site A. However, land take for construction of feeder railway line will be required (A≈4 ha: 500 m x 80 m). **Local Economy:** Agricultural income will be decreased due to expropriation of agricultural lands such as rice paddy fields. **Land Use:** According to future land use plan of Dongphosy Forest Reserve, this candidate site is categorized into border market. Also this site is located far from both reforestation and nursery (100 ha) zones, delineated in that future land use plan of Dongphosy Forest Reserve.
Alt. B	**Resettlement:** Approximately 30 households exist around VLP candidate site. Agricultural activities such as rice paddy field and crop lands are common to be seen around this candidate site. No land-take occurs for construction of access road to Site B. **Local Economy:** Agricultural income will be decreased due to expropriation of agricultural lands such as cropland.
Alt. C	**Resettlement:** Project area of this alternative option, including future Vientiane Station, is mainly used as

	agricultural land. So far, only one house exists therein, but expropriation of certain amount of private lands (A = 35 ha) would be inevitable. In Lao PDR, compensation of expropriation is "land-to-land" basis, so that secondary expropriation for this compensation land may be required further. Local feeder roads would be used as access road to VLP, and those feeder roads are not wide enough for future cargo deliveries between Vientiane City and this site. So, certain amount of road widening and relevant expropriation would be required. Current road width is not wide enough for trailer circulation, and partial road widening and resultant set-back of several roadside houses may be required (note that compensation shall be required for 'set-back' to be caused by road widening if property owners have proper land certificates in Laos). **Local Economy:** Agricultural income will be decreased due to expropriation of agricultural lands such as rice paddy fields.
Alt. D	**Resettlement:** Local land use of this candidate site is mainly classified as agricultural and sparse forest lands and no house exist. So, expropriation of certain amount of private lands (A = 35 ha) would be inevitable. Also, land take for construction of feeder railway line will be required (A≈16 ha: 2000 m x 80 m). As mentioned above, compensation of expropriation is "land-to-land" basis in Lao PDR, so that secondary expropriation for this compensation land may be required further. **Local Economy:** Agricultural income will be decreased due to expropriation of agricultural lands such as rice paddy fields.
Alt. E	**Resettlement:** VLP will be constructed inside of existing truck terminal, so that no expropriation of any private lands will be required. **Illegal parking:** Current cargo handling capacity of this existing truck terminal has been already saturated, and temporal roadside parking of cargo trucks, waiting for their deliveries into this terminal, becomes common to be seen. **National Development Plan:** Truck terminal extension and/or improvement of cargo handling capability are recognized as one of prioritized projects for national economy. Without these improvement projects, regional cargo delivery would become stagnant, and some delays in relevant regional development program will be caused (i.e., regional socio-economical negative impact would be significant).

Source: JICA Study Team

Table 7.5.5 Key Environmental Aspects of Each Alternative Option (Bio-Physical)

Alternative	Descriptions
Alt. A	**Flora/fauna:** VLP candidate site exists within Dongphosy Forest Reserve. Several shrubs and low height trees exist partially. **Topography:** Significant topographic change due to large-scale landfill and relevant earthwork such as ground improvement for foundation construction of VLP facilities will occur. Also, embankment of feeder railway line (L ≈ 500 m, H = 7 m) will appear. **Local Hydrology:** This area was used as borrow pit site in the past, so there are many traces of excavations holes across field. Several holes with depth of 3- 4 meters exist, and some of them are used as aquaculture ponds. During rainy season, water levels of those ponds rise by about 1 meter. Embankment of feeder railway line (L≈500 m, H = 7 m) will be constructed, and may need consideration for regional drainage of newly-created triangle area surrounded by existing railway and proposed feeder railway lines and hilly terrain of Dongphosy Area.
Alt. B	**Flora/fauna:** VLP candidate site is located across hilly place of Dongphosy Forest Reserve. Most of forest flora is classified as secondary one, and shrub and remnants of big trees such as Dipterocarpus with chest-height diameter of more than 30 cm occur. Many rice fields or croplands exist around these secondary forests. **Topography:** Large-scale earthwork such as open-cutting will be required for VLP construction. **Local Hydrology:** Several irrigation channels and ponds exist around this candidate site. Low land area (i.e., rice paddy fields) around this candidate site was flooded in 2008 flood event.
Alt. C	**Topography:** VLP candidate site is located in the middle of rice paddy field, outside of Dongphosy Forest Reserve, and may need ground improvement and/or weak- soil treatment for facility foundation construction. **Local Hydrology:** Low land area (i.e., rice paddy fields) around this candidate site was flooded in 2008 flood event.
Alt. D	**Topography and land use**: Candidate site is classified as sparse forest and agricultural lands, and located outside of Dongphosy Forest Reserve. **Local Hydrology:** Embankment of feeder railway line (L≈2,000 m, H = 7 m), crossing wetland around Houay Makhiao will be constructed.

Alternative	Descriptions
Alt. E	**Topography and land use:** Existing Thanaleng Truck terminal is located near Thai-Lao Friendship Bridge, flat low terrain of Mekong River floodplain. Several offices, oil storage facilities such as state oil firm and Shell, many small shops and restaurants exist along National Road #1 (Th Tha Deua Road) around this candidate site. No environmental reserve exists. Neither rice paddy field nor any other agricultural land exists near this existing truck terminal.

Source: JICA Study Team

Table 7.5.6 Key Environmental Aspects of Each Alternative Option (Pollution)

Alternative	Descriptions
Alt. A	**Waste:** Need waste treatment of vegetation, to be removed by ground clearance activities for VLP construction. Need waste treatment during operation phase, also. **Noise/Vibration and Air Quality:** During construction period, roadside environment of noise/vibration and air quality may be worsened due to temporal increase of construction vehicles. During operation period, roadside noise /vibration and air quality condition may be worsened due to increase of regional traffic circulation volume. **Ground Subsidence:** Ground subsidence may occur by landfill, part of ground improvement activities. Also, additional environmental considerations may be required for newly-created borrow pit site, to be used for landfill for VLP construction.
Alt. B	**Waste:** Similar to Alternative A option, proper waste treatment of vegetation, to be removed by ground clearance activities for VLP construction shall be required. Also, large-scale earthwork such as excavation will be required for VLP construction and may need enough soil dump site. It would be important to encourage re-use of excavated soil as much as possible. Need waste treatment during operation phase, also. **Water Quality:** Project site is located around hilly terrain and proper treatment of turbid water to be generated during construction period shall be implemented in order to avoid accidental discharge of construction effluent into downstream ends such as rice paddy fields, fish ponds and/or irrigation channels. **Noise/Vibration and Air Quality:** During construction period, roadside environment of noise/vibration and air quality may be worsened due to temporal increase of construction vehicles. During operation period, roadside noise /vibration and air quality condition may be worsened due to increase of regional traffic circulation volume.
Alt. C	**Waste:** Need waste treatment during operation phase, also. **Noise/Vibration and Air Quality:** During construction period, roadside environment of noise/vibration and air quality may be worsened due to temporal increase of construction vehicles. During operation period, roadside noise /vibration and air quality condition may be worsened due to increase of regional traffic circulation volume. **Ground Subsidence:** Ground subsidence may occur by landfill and/or embankment, part of ground improvement activities. Also, additional environmental considerations may be required for borrow pit site, to be used for landfill for VLP construction.
Alt. D	**Waste:** Need waste treatment during operation phase, also. **Noise/Vibration and Air Quality:** During construction period, roadside environment of noise/vibration and air quality may be worsened due to temporal increase of construction vehicles. During operation period, roadside noise /vibration and air quality condition may be worsened due to increase of regional traffic circulation volume. **Ground Subsidence:** Ground subsidence may occur by embankment construction of feeder railway line, connecting future Vientiane Station and VLP. Also, additional environmental considerations may be required for borrow pit site, to be used for landfill for VLP construction.
Alt. E	**Noise/Vibration and Air Quality:** Current cargo handling capacity of this existing truck terminal has been already saturated. If nothing is changed with this cargo handling situation, temporal roadside parking of truck cargos, waiting for their deliveries into this truck terminal, will become very common, and thus, local traffic congestion be more severe around terminal. Eventually, roadside environment of noise/vibration and air quality will be worsened.

Source: JICA Study Team

7.5.2 Discussion

Based on the knowledge of the current bio-physical and socio-cultural environment of the study area, summarized in previous sections, it was found that several environmental factors would be important and critical for the implementation of each VLP candidate site.

From this initial environmental examination, negative environmental impacts to be caused by Alternative D seem to be the most significant. This is mainly due to the construction of the feeder railway line (L ≈ 2,000 m, RoW = 80 m), connecting Vientiane Station (planned) and proposed VLP site crossing a flood-prone wetland area around the Houay Makhiao River. Potential negative impact of the ground subsidence, to be associated with the construction of the embankment of the feeder railway line would not be negligible during the operation phase, also. Also, it is likely that the regional drainage would be affected due to the construction of a long-distanced railway embankment, intercepting the regional flow of the Houay Makhiao River. Similar discussions of negative impacts to be caused by the construction of the feeder railway line can be made for Alternative A (L ≈ 500 m, RoW = 80 m).

Land expropriation would be significant for Alternatives A – D. In particular, the total area to be expropriated for Alternative D would be the largest (A ≈ 51 ha), then, 39 ha for Alternative A, and to be followed by Alternatives B and C (A = 35 ha), depending on the spatial construction scales of the feeder railway lines of each alternative. The current regional land use for both Alternatives C and D are classified as the agricultural fields such as the rice paddy and/or the fruit vegetation while fruit vegetation and aquaculture ponds for both Alternatives A and B. So, reductions of certain amounts of agricultural income are expected due to the expropriation of those agricultural lands for all alternatives.

Some parts of Alternative A was used as the borrow pit site in the past, so that there are many excavations holes therein (several holes with depth of 3 - 4 meters exist, and some of them are used as aquaculture ponds). If Alternative A is selected, a large-scale landfill and relevant earthwork such as the ground improvement for the foundation construction of VLP facilities will be required. Potential negative impact of the ground subsidence, to be associated with the construction of the VLP foundation and the embankment of the feeder railway line would not be negligible during the operation phase, also. Also, it is likely that the local drainage pattern around Alternative A would be changed due to the construction of VLP and the feeder railway embankment. Alternative C is located across the rice paddy field, so that similar potential negative impacts regarding the ground subsidence and the local drainage can not be ignored.

The railway extension is prerequisite condition for the VLP's operation under both Alternatives C and D options. If either of Alternative C or D is selected, negative potential impact on local flora/fauna, to be induced by the railway extension within Dongphosy Forest Reserve, would be considerable. To summarize this discussion, it can be said that Alternative B would be most suitable from the environmental and social points of view.

It is noted that negative impacts on Dongphosy Forest Reserve during the construction phase cannot be ignored for both Alternatives A and B. Some mitigation measures would be required if either of options is selected for this VLP construction.

Comprehensive alternative selection is conducted, considering many aspects such as the engineering, finance and regional planning as well as environmental and social ones (see Section 4.4, Chapter 4, for more detailed descriptions).

7.6 EIA-level Environmental Study

7.6.1 Study Preparation

(1) Background

As described above, there are five alternative options for the proposed VLP construction project. Throughout the comprehensive evaluation process of all alternatives, summarized in Section 4.4 of Chapter 4, Alternative B was selected as the best plan among those alternatives. This selection process has several evaluation factors such as its engineering aspects and structural characteristics, social and environmental impact, land acquisition and compensations, conformity with existing facilities, and so on.

According to the meetings with WREA, held between October and December 2009, WREA mentioned that only IEE process was appropriate enough in order to obtain the relevant environmental license for the implementation of the proposed VLP project at selected site (i.e., Alternative B). Then, MPWT started to its preparation for the official environmental approval process and submitted the relevant application documents to WREA in December 2009.

Meantime, a series of discussion with JICA Environmental Advisory Committee were held at Tokyo, Japan in order to figure out proper environmental and social considerations that should be taken for this VLP project. As a result, JICA Environmental Advisory Committee suggested to conduct more detailed, EIA-level environmental and social surveys for the selected option since the selected site (i.e., Alternative B) is located inside of Dongphosy Forest Reserve, ecologically-protected area.

Based on this suggestion, it was decided that EIA-level environmental and social studies for the proposed VLP project shall be taken in order to collect more detailed baseline information as well as to support the development of more comprehensive EMP, to be conducted within the official environmental approval process. This official environmental application process is to be conducted by MPWT after EIA-level environmental and social study is completed. More detailed information of the environmental approval process of this proposed VLP project is described, later.

(2) ToR Development

Based on the potential impacts that may be induced during both construction and operation phases of VLP project at selected alternative option (i.e., Alternative B), further environmental studies/or surveys, regarding several environmental issues, are carried out within this study. Table 7.6.1 summarizes potential negative impacts, evaluated as either of “A” or “B” in the environmental screening and scoping process, carried out in previous section.

Table 7.6.1 Summary of Potential Impacts for Alternative B

Evaluation	Descriptions
Evaluation A	1. VLP candidate site is located inside of Dongphosy Forest Reserve. 2. Large amount of construction waste such as excavated soil will be generated during construction period.
Evaluation B	1. There are several houses and properties around study area, and land take negotiation are necessary for the construction of VLP. 2. Need to prepare fair working environment (e.g., anti-Malaria and Dengue program) during construction

Evaluation	Descriptions
	period. 3. Need to establish contingency program for oil tank-related accidents. 4. Temporal worsened traffic safety due to frequent deliveries of construction material during construction phase. 5. Worsened regional drainage due to topographical change. 6. Risk of occurrence of soil erosion during construction period. 7. Temporal water quality degradation of groundwater during construction period. 8. Temporal water quality degradation of nearby channel and/or ponds during construction phase. 9. Disruption of local run-off water due to deforestation. 10. Worsened roadside air quality due to increase of local traffic volume during/after construction phase. 11. Worsened roadside noise due to increase of local traffic volume during/after construction phase. 12. Risk of local soil contamination in case of accidents.

Source: JICA Study Team

Based on those environmental screening and scoping results and engineering features of the proposed VLP, ToR development for EIA-level environmental and social study is conducted. This Tor development is conducted through a series of discussions with WREA, MPWT as well as JICA Environmental Advisory Committee. Table 7.6.2 summarizes the Term of Reference (ToR) of relevant environmental studies, developed for this VLP-related environmental and social study.

Table 7.6.2 ToR (outline) of EIA-level Environmental Study

Sub Task Environmental/Social Study	Objectives
1. Water Quality Analysis (Surface and subsurface water)	There are ponds, wells and channel around study area. Accordingly, it is important to obtain current baseline water quality condition of subsurface/ surface water.
2. Sediment and Soil Analysis	Several earthworks will be conducted within this VLP project. Accordingly, it is important to obtain baseline soil condition around study area.
3. Air Quality	Current regional traffic volume is very small and future one will be increased after VLP will start its operation. Accordingly, it is essential to obtain baseline roadside air quality condition around study area.
4. Noise Survey	Same as above. Accordingly, it is essential to obtain baseline roadside noise condition around study area.
5. Drainage System Study	Several earthworks will be conducted within this VLP project. Accordingly, it is important to study local water balance around study area.
6. Biological Environmental Study (Flora and Fauna Survey)	Study area is located inside of Dongphosy Forest Reserve. Accordingly, it is important to have baseline flora/fauna study around study area.
7. Potential Analysis of the Local Seed Bank	There were flood around study area in the past, so potentiality to have seed bank at surface soil layer cannot be neglected. Accordingly, it is important to carry out local seed bank study.
8. Fundamental Biological Inventory Study of Nearby National Park and/or Reserved Area	Beside Dongphosy Forest Reserve, several similar forest reserves exist around Vientiane. Accordingly, it would be beneficial to have fundamental flora/fauna study at those areas for comparison.
9. Socio-cultural Survey #1 (RAP-related Survey)	There are several houses and properties, to be affected by implementation of VLP. Accordingly, it is important to have preliminary RAP-related studies around study area.
10. Socio-Cultural Survey #2 (Public Opinion Survey)	An interview-based socio-cultural survey is conducted to study public concern about proposed VLP project as well as to encourage positive PI activities.
11. Preliminary Archaeological and Cultural Survey	There are several important archaeological sites around Vientiane. Accordingly, it is important if there are any further archeological sites around study area.
12. Stakeholder Meetings	Several communities and/or villages exist around study site. Accordingly, it

Sub Task Environmental/Social Study	Objectives
	is important to have comprehensive PI (i.e., public involvement) activities for better understanding of VLP project and smooth establishment of project consensus.

Source: JICA Study Team

(3) Study Schedule

Tender and consultant selection was initiated in February 2010, and, a local environmental consultant, MEK, was selected to perform this EIA-level study. On-site briefing was conducted in both March and April of 2010, and the draft final (D/F) of this EIA-level study, entitled "Technical Report" was submitted to JICA Study Team in September, 2010.

Basically, this EIA-level study consists of following two campaigns: i.e., (i) the dry season study campaign, and (ii) the rainy season campaign. Meantime, two stakeholder meetings and information disclosure processes are conducted. In addition, a public involvement (PI) from surrounding local communities is precipitated by conducting the socio-cultural survey #2 (a questionnaire-based public opinion survey, Task 10, listed in Table 7.6.2) within this study. More detailed descriptions of this stakeholder meeting and its relevant information disclosure are summarized in Section 7.8.

7.6.2 Summary of EIA-level Environmental Study

Table 7.6.3 summarizes major findings and results of each subtask of EIA-level environmental study, listed in Table 7.6.2. It is noted that a full-report of this EIA-level environmental study is summarized as Technical Report, separately. Here, the current baseline environmental condition such as the roadside noise, the air quality and the water quality of surface/subsurface water are evaluated, using reputable environmental standards/or guideline such as WHO.

Summaries of key tasks such as the biological environmental study (Tasks 6 – 8, listed in Table 7.6.3), RAP-related socio-cultural survey (Task 9), questionnaire-based public opinion survey (Task 10) and stakeholder meeting (Task 12) are described briefly. Major study results of all environmental surveys, listed in Table 7.6.3, are attached in Appendix.

Table 7.6.3 Major findings and Results of EIA-level Environmental Study

Task	Major Findings and Results
1. Water Quality Analysis (Surface and subsurface water)	Water quality analysis for surface/subsurface water and were conducted at 3 points twice (both dry and rainy seasons). It was found that no severe water quality degradation occurs and baseline water quality condition is in good condition (but not recommended for drinking) within this study.
2. Sediment and Soil Analysis	Soil analysis was conducted at three points. It was found that no severe soil contamination occurs across the study site.
3. Air Quality	24 hour-continuous Roadside air quality survey was conducted at 3 points twice (both dry and rainy season). It was found that baseline air quality condition is in good condition within this study.
4. Noise Survey	24 hour-continuous Roadside noise survey was conducted at 3 points twice (both dry and rainy seasons). It was found that baseline roadside noise environment is in good condition within this study.
5. Drainage System Study	Current Local drainage condition was studied, and found that no creeks or river running across Dongphosy Forest Reserve exist. 21 shallow wells and ponds exist, and it was found that regional groundwater seems to flow to NE direction.

Task	Major Findings and Results
6. Biological Environmental Study (Flora and Fauna Survey)	Current baseline inventory of flora/fauna are summarized, conducting several on-site field studies. Based on comprehensive literature review and interviews with local scientists as well as local environmental NGOs such as WCS and IUCN, it is found that there is no important species to be protected and/or conserved around study area. Study summary is described in Section 7.6.
7. Potential Analysis of the Local Seed Bank	Local seed bank study is conducted at 15 points inside of study area. It is found that totally 7 floral species are identified.
8. Fundamental Biological Inventory Study of Nearby National Park and/or Reserved Area	Houay Gnang Forest Reserve, located at northern suburb of Vientiane, was selected and its baseline floral/faunal condition was studied for the comparison. "Quadrat method"-based local floral survey is conducted at both Dongphosy and Houay Gnang Forest Reserves. It is found that current floral biodiversity of Houay Gnang is better than those of Dongphosy.
9. Socio-cultural Survey #1 (RAP-related Survey)	RAP-related social survey is conducted at the selected Alternative Option B. It is found that properties of 30 households would be affected by the implementation of VLP project. More detailed information is described in Section 7.6.
10. Socio-Cultural Survey #2 (Public Opinion Survey)	200 interviews-based socio-cultural survey is conducted at four villages around Dongphosy Forest Reserve as one of public participation. More detailed description of this survey is attached in Section 7.8.
11. Preliminary Archaeological and Cultural Survey	From an interview-based preliminary archaeological survey was conducted at study site, literature reviews and hearing at Ministry of Information and Culture, it was found that neither important archeological site nor artifacts exist around the study site. Study summary is described in Section 7.6.
12. Stakeholder Meetings	Two stakeholder meetings (May 21, 2010 and July 30, 2010), and information disclosure of each stakeholder meeting are held. More detailed descriptions are summarized in Section 7.8. Note that this is first practice of information disclosure regarding large –scale development project in Lao PDR.

Source: JICA Study Team

7.6.3 Status of Environmental Approval of VLP Project

As mentioned earlier, the official environmental approval process of this proposed VLP project was initiated in December 2009, based on 2002 EIA Regulation. In February 2010, the concept of the oil tank facilities was incorporated into original VLP plan, and then, the entire VLP facility lay-out was modified. Due to this lay-out modification, the on-going environmental approval process was suspended for a while. After this new facility integration, WREA, governmental body supervising all environmental approval process of development projects in Lao PDR, informed MPWT that it would be better to apply a new environmental license for the modified VLP project in order to save time and man-power.

Consequently, MPWT decided to abort on-going environmental approval process and re-submit new application form of the environmental approval for the modified VLP project in March, 2010. Official Comments from WREA were sent to MPWT in July 2010, and it is noticed that the proposed VLP project need a full-scale EIA studies and all environmental approval process shall be conducted based on newly enacted 2010 EIA Law.

It is noted that ToR of EIA –related studies shall be approved by WREA before starting a full-scale EIA Study. After this approval process, MPWT, the project owner, can hire a well-qualified EIA consulting company, registered at WREA, and then, all official EIA-related activities can be initiated.

7.6.4 Biological Environmental Study

(1) Study Outline

The biological environmental study is conducted in order to grasp the current flora/faunal condition around the study site (A=35 ha), by preparing current floral/faunal inventories are summarized as well as the vegetation map therein. This study has following specific objectives:

a. To compile a list of species of terrestrial flora and fauna (from selected taxonomic groups) in vicinity of proposed project site.
b. To determine presence/or possible absence of threatened/or endangered species and species communities in same area.
c. To assess potential significance of any impacts that construction will have on relevant species and species communities, particularly threatened/or endangered species.
d. Assess potentiality of local seed bank.
e. To map major vegetation types, that have strong influence on habitats in area and to highlight areas of special sensitivity.
f. To conduct a comparative study regarding baseline floral/faunal condition with nearby forest reserves and/or national parks.

Table 7.6.4 summarizes study methodologies implemented within this biological environmental study.

Table 7.6.4 Major study methodologies implemented within Dongphosy fauna/flora study

1. Literature and Unpublished Data Review
All traceable previous biodiversity studies in the study area are reviewed, focusing on key faunal/floral components (i.e., globally and regionally threatened species).
2. Field Surveys
Field surveys focus on birds and an overview assessment of habitat types and dominant plant species. Timing of the field surveys only represents a late dry, hot spell at the end of a drought-like dry season (late February 2010 – May, 2010). These surveys only represent a late dry season snapshot of species occurrence; species composition would certainly differ at the height of the rainy season. Also, floral species of three focal points (two in Dongphosy and one in Houay Gnang Forest Reserves, respectively) while changing size of study areas are conducted.
3. Interview Surveys.
Interview surveys are used as most efficient method to assess presence/absence of mammal and reptile species that may occur in the area at very low densities and to obtain information on a standard set of question relating to occurrence or former occurrence of mammal and reptiles in area.

Source: JICA Study Team

(2) Results and Discussions

From this environmental study, it is found that no rare, endangered species exist around the study area, located inside of Dongphosy Forest Reserve and there several small animals such as rodents occur therein. Similar tendency is also recognized at nearby forest reserve such as Houay Gnang Forest Reserve, located north of Vientiane Capital.

Figure 7.6.1 shows the vegetation map, prepared within this biological environmental study. As shown in this figure, there are several fruit trees and shrubs around houses. Also, the crop land dominates across this study area. So, it can be said that the current floral condition of the study site is classified as the secondary forest.

Source: JICA Study Team

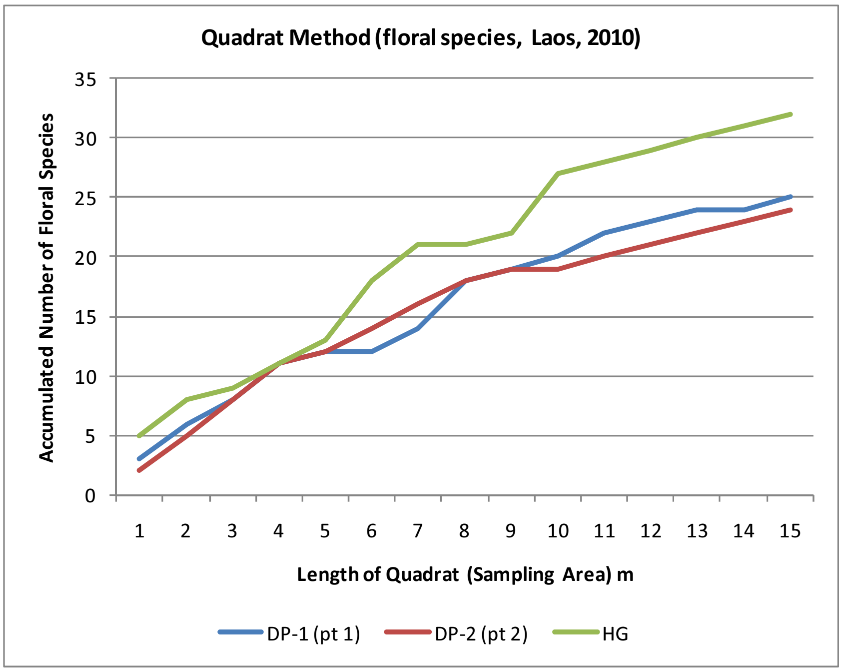
Figure 7.6.2Figure 7.6.2 shows the study results of “Quadrat method”-based local floral survey (note that “Quadrat” means a rectangular-shaped sampling area). As shown in this figure, the number of the accumulated floral species, counted at Houay Gnang Forest Reserve are higher than those of Dongphosy Forest Reserve (32 species at 15 m-Quadrat whereas 25 and 24 under the same condition at Dongphosy). As mentioned earlier, good forest management practices are implemented at Houay Gnang Forest Reserve around Vientiane Capital, and this study difference may be caused due to the difference of each forest management method.

More detailed information of study results of this biological environmental study is described Technical Report of this study.

Note; "Biological Point" indicates the survey points of "Quadrat-method" –based local floral survey.

Source: JICA Study Team

Figure 7.6.1 Vegetation Map around the Study Area



Note: Two survey points, DP-1 (pt 1) and DP-2 (pt 2) are conducted within Dongphosy Forest Reserve while survey point HG is inside of Houay Gnang Forest Reserve.

Source: JICA Study Team

Figure 7.6.2 Quadrat Survey (Local Floral Species)

7.6.5 Regional CO2 Loading

(1) Impact on CO2 Capture and Storage Effect of Forest

Here, the effect of CO2 capture and storage effects of the forest of the study area is estimated under following two scenarios :i.e., (i) the current land-use condition in that “slush-and-burn” agricultural method is rampant, and (ii) the forest of the study area is conserved and no “slush-and-burn” agricultural method is carried out therein.

<u>(i) Scenario 1: Current Land-use Condition Kept</u>

In general, CO2 capture and storage effects of the forest are not ignored at its initial growing stage. Within this proposed VLP project, roughly 35 ha of the shrub and the forest, occurred inside of the study site, will be cleared. So, it can be said that the local CO2 capture and storage capability corresponding to this 35 ha - shrub and forest area will be disappeared.

The current floral condition of the study area is classified as the secondary forest, and traces of ‘slash-and-burn’ agricultural activities are recognized (see Figure 7.6.3). It is also found that this agricultural activity is very popular across the study site. It means that total amount of CO2, captured and stored at the growing stage of entire plants, is released to the atmosphere by this agricultural activity periodically.

Figure 7.6.4 shows the effect of CO2 capture and storage effect of the secondary forest on where it is assumed that a ‘slush-and-burn’ agricultural method is carried out with 10 year cycle. As shown in this figure, both forest growth and its CO2 capture/storage are significant at the initial growing stage. Then, all captured CO2 is released to the atmosphere by burning of the secondary forest therein. From the field study, it is found that a 'slush-and-burn' agricultural method is applied to entire study area. This indicates that CO2 captured and stored within the forest growth of the study area is released back to the atmosphere periodically.

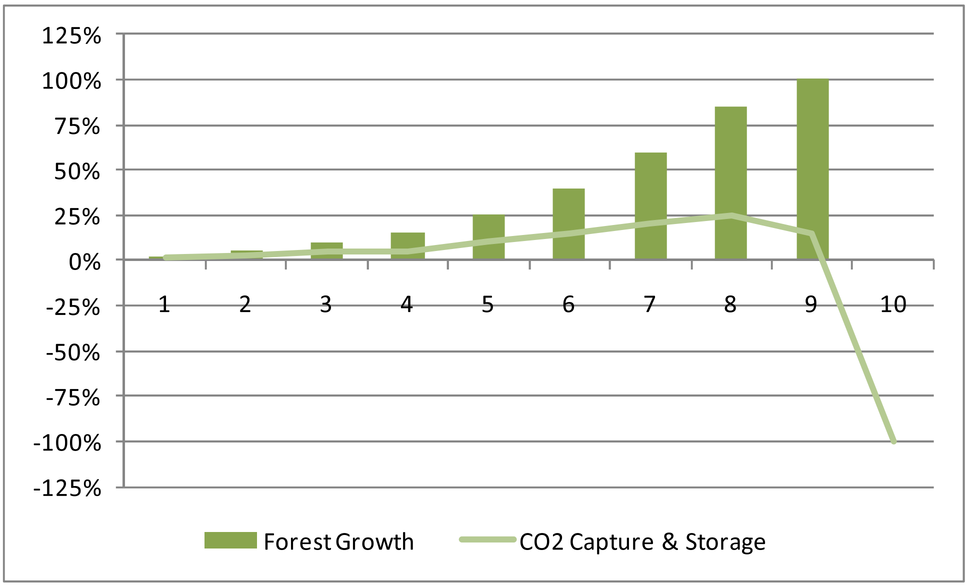
Table 7.6.5 summarizes the comparison of "Do-VLP project" and "Do-nothing" scenarios, regarding CO2 capture and storage of local shrub and forest across the study site. From this table, it can be said that the long-term impact on CO2 capture and storage capability of local forest is negligible.

'Slash and Burn' activity, observed at Study Area

Charred trees

Source: JICA Study Team

Figure 7.6.3 Slash and Burn Agricultural Activity, observed at Study Area



Source: University of Kochi

Figure 7.6.4 CO2 capture and Storage Effect of "Slush and Burn" Area

Table 7.6.5 Summary of CO2 Capture and Storage Effect (Scenario 1)

Case	Descriptions
Do-Nothing	Due to the current 'slash-and-burn' agricultural activity, CO2 capture and storage capability is zero in long term although CO2 are captured and stored temporally during each plants growing process.
Do-VLP Project	Entire plants will be removed, so that CO2 capture and storage capability will be deteriorated during/after construction phase.

Source: JICA Study Team

(ii) Scenario 2: Forest Conserved

In general, CO2 capture and storage effect by forest, Qco2, can be estimated as follows,

$$\text{Qco2 (t/year)} = \text{GR} \times \text{CP} \times 44/12 \qquad (1)$$

where,

CP: Carbon Percentage = 0.5

GR: Growth rate (ton/year) of Secondary Forest (tropical Forest)

Dry Tropical zone: 1 – 8 ton/ha/year (first 10 year)

Wet Tropical zone: 4- 15 ton/ha/year (first 10 year)

VLP site is located inside of the dry tropical zone, so the mean value, 4.5 ton/ha/year of the parameter for the dry tropical zone, mentioned above, is used. Also, it is assumed that the secondary forest of VLP site is active and is capable to capture CO2 from the atmosphere for the first 20 years. Total area of the VLP site is of 35 ha, so that the total amount of CO2 capture and storage by the secondary forest can be computed as follows,

$$\text{Qco2 (T= 20 years)} = 4.5 \times 20 \times 35 \times 0.5 \times 44/12 = 5{,}775 \text{ ton C (T = 20 years)}$$

So, roughly 6,000 ton C of the carbon can be captured and stored if the secondary forest of the study site (A = 35 ha) is conserved.

(2) CO2 Reduction by Regional Vehicular Emissions.

Preliminary evaluation of CO2 loading, to be induced by the modal shift from the trailer to the railway, is conducted in Section 8.2.3. Table 7.6.6 summarizes the regional CO_2 loading from both trailer and diesel locomotive

Table 7.6.6 CO_2 Loading

	CO2 Loading (kg-CO_2)/ton-kilometer	Source
Diesel locomotive	0.015	JICA Study Report "The feasibility study on the development of dedicated freight corridor for Delhi-Mumbai and Ludhiana-Sonnagar in India: final report, 2007"
Trailers (maximum capacity of 30 ton, 80% of loading ratio)	0.040	Calculated from "Common Guideline for Calculation of CO_2 Emission in Logistics Sector" prepared by Ministry of Economy and International Trade and Ministry of Land Transport and Infrastructure of the Government of Japan

Source: JICA Study Team

Table 7.6.7 summarizes the reduction of CO_2 emission loading. The reduction volume of CO_2 is calculated from the volume of the railway freight, difference of VOC between the trailer and diesel locomotives and the length between Vientiane and Bangkok which is around 700 kilometers. More detailed information of this CO_2 emission loading study is described in Section 8.2.3.

Table 7.6.7 Reduction of CO_2 Emission by Modal Shift

Item	Unit	2015	2020	2025
Volume of Railway Freight in with-project case $V_{freight}$	ton/year	68,640	195,940	561,600
Reduction Volume of CO_2 Emission, $V_{reduction}$	ton/year	1,191	3,400	9,746

Note: Reduction Volume of CO2 Emission, V reduction, is calculated, using following formula,
V reduction = V freight X (EF trailer –EF locomotive) X L VB/1000

where EF trailer = 0.0398 kg-CO2/ton/km, EF locomotive = 0.015 kg-CO2/ton/km
LVB: Distance between Vientiane and Bangkok, LVB ≈ 700 km

Source: JICA Study Team

7.6.6 Preliminary Archeological and Cultural Study

(1) Introduction

Preliminary cultural (historical and archeological) environment study is conducted in order to describe the current existing cultural resources, which include architectural, historical, and archeological sites, as well as areas of unique importance around the study area, and to qualitatively identify the potential impacts of the proposed project on those cultural resources.
This preliminary archeological and cultural environment study consists of following three steps;

A. Identification of known cultural resources

- Archaeological resources
- Cultural resources related to areas of ecological, scientific, or geological importance (e.g., the conservation of mango tree).
- Local resources of importance to ethnic groups such as burial grounds and cemeteries or areas of unique religious importance
- Historic properties
- Others

B. Identification of potential cultural resources

- A preliminary archaeological reconnaissance shall be conducted in order to identify previously unknown archaeological resources in the study area. Depending of the surrounding environment of the study area, either of following archaeological surveys should be implemented;
- Controlled-exclusive survey
- Uncontrolled-exclusive survey
- Nonexclusive survey
- Predictive survey

C. Determination of significance of cultural resources

Based on the results of identification processes mentioned above, the significance of those resources must be carefully investigated.

(2) Results and Discussion

A. The Dongphosy

It is found that no important historical/archeological and cultural properties exist across the study area. Many old local people, who belong to this area, said that about 40 years ago the Dongphosy has abundance of biodiversity and wildlife, and surrounding communities depended on natural resources of Dongphosy for their livelihood. However, due to its rapid forest degradation, the current forest has only some of old trees.

B. The Villages around Dongphosy

There are three villages (i.e., Dongphosy village, Dong Phonehae village, and Nakouay Tai village). These villages are located around Dongphosy Forest reserve area. Those community people use forest and non-forest products of Dongphosy Forest Reserve for their livelihood. The villagers staying in these villages are classified as the *Lao Loum* (Lowland Lao), consist of biggest of all ethnic group in Lao PDR. The religion of *Lao Loum* group believes the Buddhism; therefore in each village have Buddhism's Temple, and no significant impacts on those temple will be caused by the implementation of this proposed VLP project.

7.6.7 RAP-related Survey

(1) Introduction

It is important to grasp the scale of resettlement caused by the project implementation. As explained previously, existences of several households are recognized within the project site. In order to identify project affected persons (PAPs) and to understand their current living conditions, a preliminary baseline social survey was carried out.

(2) Approach

The preliminary social survey on PAPs was conducted by on-site, face-to-face questionnaire-based approach (the survey period: the middle – the end of April, 2010). Main purpose of this survey is to identify the number of PAPs, their location and their basic social profile.

(3) Major Findings

Within this study, PAPs can be categorized into following two groups: i.e., (i) PAPs with affected houses, and (ii) land owners. The former is defined as person who owns house and land, and live there. While, the latter group is defined as person who has only land and do not live there (i.e., commute there from outside). The major findings of this survey are as follows,

- Eighteen (18) PAPs with affected houses were identified.
- Nine (9) land owners were identified. Some other land owners could not be identified due to lack of information. These people seem to live far away from the project site and to be independent from local communities.

- Vulnerable households were recognized in the PAPs. There are three (3) female-headed households, another three (3) elderly-headed households and six (6) households below poverty line[6]. No ethnic minorities were identified. Note that two of those vulnerable households have permanent land certifications. In Laos, households without proper land certification are regarded as illegal squatters.
- Most of the household had lived or cultivated in the Project Area for less than ten years.
- Main products of those cultivated lands are of agricultural crops and fruits.
- Regarding the land certification, five (5) households have the permanent certification issued by the government, fifteen (15) households have the temporary certification issued by the village leader, and seven (7) households have nothing.

It is noted that the meaning of 'the temporary certification" is that, in case of any development projects, persons/or households with that certification shall move out smoothly before the implementation of that project. Major study results, obtained from this survey are summarized in Table 7.6.8.

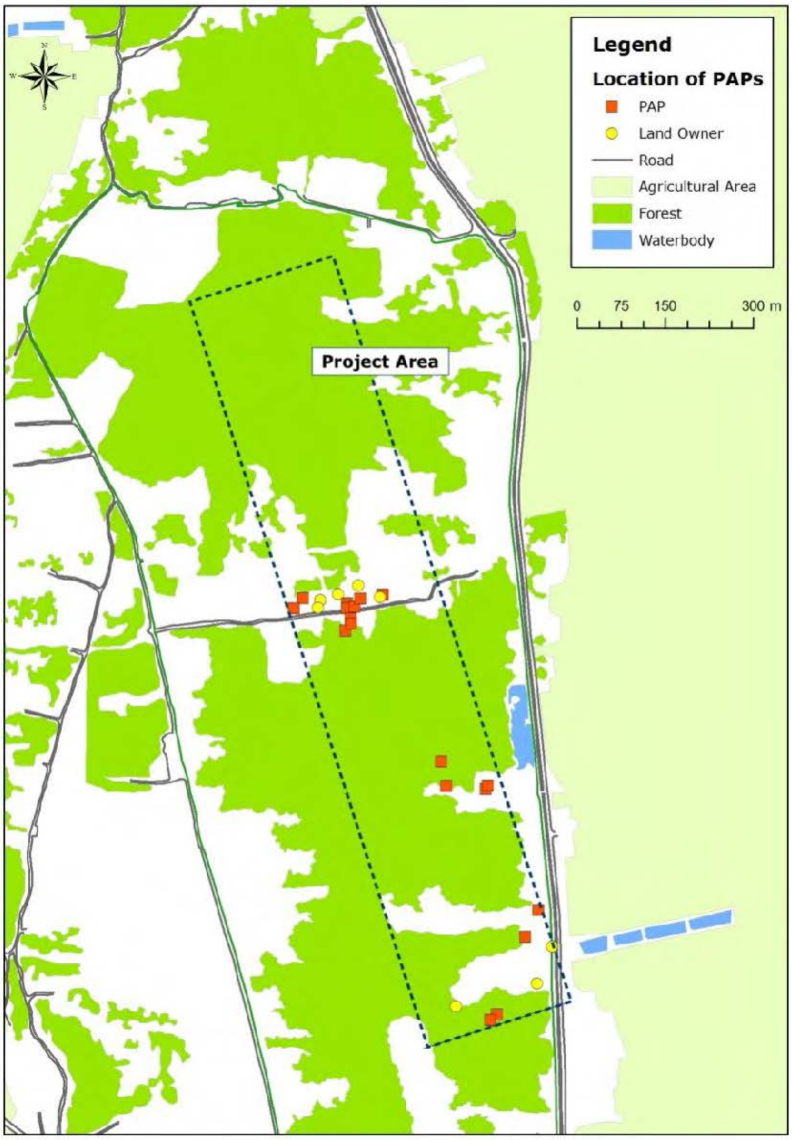
Table 7.6.8 Summary Result of RAP-related Survey

Category	PAPs	Land Owners	Total
Household	18	9	27
Female-headed Household	1	2	3
Elderly-headed Household	1	2	3
Household below Poverty Line	6	0	6
Number of person	89	44	133
Adult	40	21	61
Child	49	23	72
Number of House	18		18
Hut	5	--	5
Wooden House	5	--	5
Concrete and Wooden House	4	--	4
Concrete and Brick House	4	--	4
Size of Land (ha)	8.97	4.20	13.16
Orchard (ha)	4.74	3.88	8.61
Agriculture (ha)	4.07	0.32	4.39
Land for House (ha)	0.16	0.00	0.16
Number of Tree	7,203	2,370	9,573
Fruit Tree	6,642	310	6,952
Others	561	2,060	2,621
Land Certification	18	2	20
Permanent	4	1	5
Temporary	14	1	15
No Certification	0	7	7

Source: JICA Study Team, 2010

Figure 7.6.5 shows the approximate location of PAPs and land owners within the project site.

[6] Poverty line is defined that monthly income per person is under the price of 16kg milled rice which equivalent to 128,000 Kip (1kg=8,000kip) reference from "Country assistance program of Lao PDR", 2006, Ministry of Foreign Affair Japan. Unit price of milled rice reference from local newspaper



Source: JICA Study Team, 2010

Figure 7.6.5 Approximate Location of PAPs and Land Owners

4) Resettlement Costs

A preliminary estimate of overall resettlement costs is calculated based upon the database of PAPs and land owners, made by this survey. The unit cost of the compensation is collected from the wide range of sources such as the interviews with government agencies which have an experience of resettlement and/or relevant data, summarized by MPWT. Basically, the calculation of resettlement cost is based on “Resettlement Planning Document” for Northern GMS Transport Networks Improvement Project in 2010, prepared by MPWT.

In addition, current market prices of relevant items of the resettlement are collected through on-site interviews. From this preliminary interview survey, it is found that there is a notable difference between the official compensation price, used in previous government projects and the current market one. So, the resettlement costs under two different scenarios are calculated for the comparison (Scenario 1: use land prices used in the expropriation negotiation of previous projects, and Scenario 2: Use actual market prices obtained from preliminary on-site interviews).

Table 7.6.9 summarizes overall resettlement cost for Scenario 1. With regard to the land price, same categories and prices, used in the resettlement of the Thanaleng Railway Construction Project are used. Consequently, there are two different prices (i.e., with and without the land title) for the land acquisition.

Table 7.6.9 Resettlement Cost (Scenario 1: Use official compensation unit prices for government project)

Item	Rate (Kip)	Quantity	(unit)	Amount (Kip)	Amount (USD)*
Replacement Cost of Land				1,443,722,000	175311.1625
Land with Certification	20,000	40,152	(sqm)	803,040,000	97,513.15
Land without Certification	7,000	91,526	(sqm)	640,682,000	77,798.02
Replacement Cost of House**				797,350,000	96,822.21
Grade1	400,000	932	(sqm)	372,800,000	45,269.10
Grade2	550,000	381	(sqm)	209,550,000	25,445.66
Grade3	600,000	180	(sqm)	108,000,000	13,114.44
Grade4	650,000	30	(sqm)	19,500,000	2,367.89
Grade5	700,000	125	(sqm)	87,500,000	10,625.13
Compensation for Tree				826,250,000	100,331.54
Fruit Tree	100,000	6,952	(tree)	695,200,000	84,418.14
Others	50,000	2,621	(tree)	131,050,000	15,913.40
Allowance				25,472,000	3,093.06
House Relocating Allowance	192,000	94	(person)	18,048,000	2,191.57
Assistance of Female-head HH	128,000	17	(person)	2,176,000	264.23
Assistance of Elderly-head HH	128,000	14	(person)	1,792,000	217.60
Assistance of Poverty HH	128,000	27	(person)	3,456,000	419.66
Total Direct Cost				3,092,794,000	375,557.98
Management Expenditure (10% of Total Direct Cost)				309279400	37,555.80
Contingencies (10% of Total Direct Cost)				309279400	37,555.80
Total				3,711,352,800	450,669.57

Source: Resettlement Planning Document, 2010, DOR, MPWT, Personal communication of Deputy Director General, Railway Authority (April 2010), and JICA Study Team, 2010

Note:

*: 1.00 USD = 8,235.2 LaoKip (July 2010)

**: Grade of House is defined as follows. Grade1=one-story wooden house with wood or zinc roof, Grade2=one-story concrete and brick house with zinc roof, Grade3=one-story concrete and brick house with tile roof, Grade4=two-story wooden and concrete house with zinc roof, Grade5=two-story wooden and concrete house with tile roof.

Table 7.6.10 summarizes overall resettlement cost for Scenario 2. In this calculation, same unit costs, summarized in previous table except land price, are used. This estimation takes into account of actual land price of surroundings of the project site, collected by on-site, direct interviews held within this survey and/or second information from local newspaper[7].

[7] Vientiane Times, February 18, 2010

Table 7.6.10 Resettlement Cost (Scenario 2: Use actual land market price)

Item	Rate (Kip)	Quantity	(unit)	Amount (Kip)	Amount (USD)*
Replacement Cost of Land				23,491,670,000	2852593.488
Land	285,000	1,648	(sqm)	469,680,000	57,033.24
Agricultural Land	185,000	43,900	(sqm)	8,121,500,000	986,193.75
Orchard	173,000	86,130	(sqm)	14,900,490,000	1,809,366.50
Replacement Cost of House**				797,350,000	96,822.21
Grade1	400,000	932	(sqm)	372,800,000	45,269.10
Grade2	550,000	381	(sqm)	209,550,000	25,445.66
Grade3	600,000	180	(sqm)	108,000,000	13,114.44
Grade4	650,000	30	(sqm)	19,500,000	2,367.89
Grade5	700,000	125	(sqm)	87,500,000	10,625.13
Compensation for Tree				826,250,000	100,331.54
Fruit Tree	100,000	6,952	(tree)	695,200,000	84,418.14
Others	50,000	2,621	(tree)	131,050,000	15,913.40
Allowance				25,472,000	3,093.06
House Relocating Allowance	192,000	94	(person)	18,048,000	2,191.57
Assistance of Female-head HH	128,000	17	(person)	2,176,000	264.23
Assistance of Elderly-head HH	128,000	14	(person)	1,792,000	217.60
Assistance of Poverty HH	128,000	27	(person)	3,456,000	419.66
Total Direct Cost				25,140,742,000	3,052,840.30
Management Expenditure (10% of Total Direct Cost)				2514074200	305,284.03
Contingencies (10% of Total Direct Cost)				2514074200	305,284.03
Total				30,168,890,400	3,663,408.36

Source: Resettlement Planning Document, 2010, DOR, MPWT, Vientiane Times (Feb.18, 2010) and JICA Study Team, 2010

Note:

*: 1.00 USD = 8,235.2 LaoKip (July 2010)

**: Grade of House is defined as follows. Grade1=one-story wooden house with wood or zinc roof, Grade2=one-story concrete and brick house with zinc roof, Grade3=one-story concrete and brick house with tile roof, Grade4=two-story wooden and concrete house with zinc roof, Grade5=two-story wooden and concrete house with tile roof.

5) Discussion and Conclusion

Resettlement is one of the most serious negative social impacts, caused by the project implementation. Therefore, an appropriate resettlement plan is strongly expected.

According to the results of preliminary cost estimations, summarized in previous section, it can be said that there is a significant difference between two scenarios. This is caused by large disparity between the current official compensation price, employed in the land acquisition in previous project and the current land price. The official unit cost of the land price is almost ten times difference. This disparity would detract from PAP's quality of life after the resettlement.

Besides, there is also crucial difference of the land price between PAPs with and without the land certification. The compensation for PAPs without the land title is one third of ones with the land title. According to Land Law (1997), all of the people irrespective of having the land title shall be received "reasonable compensation", who is recognized as PAP before cut-off-date. Within the project site, there are twenty-two (22) households who have the temporary certification or no land title. The temporary certification is issued by the village leader and its validity is quite uncertain. Out of twenty-two (22) households without permanent certification, ten (10) households are classified as vulnerable ones such as female-headed household, elderly-headed household and household below poverty line.

Therefore following actions are strongly recommended for next steps forwarding to the project implementation in terms of resettlement.

- To carefully review the project alignment in order to reduce the number of PAPs as many as possible.
- To conduct the detailed baseline survey for calculation of tangible resettlement cost
- To have comprehensive review of current market prices, regarding the expropriation, covering from the land price to allowance, and adjust official compensation price unit if necessary (e.g., some allowances shall be determined by the market price of the milled rice).
- To take account of special assistance for vulnerable households, in particular who has no land certification.
- To establish a monitoring plan for resettlement.

7.7 Proposed Environmental Management Plan

7.7.1 Impact Assessment

(1) Introduction

Possible environmental impacts regarding environmental factors, listed in Tables 7.5.2 – 7.5.15, are summarized separately. As described in Section 7.6, more detailed studies are carried out for some of identified "Category-A" and "Category-B" environmental factors whereas simple analysis is for "Category-C" and "Category-D" ones within this EIA study.

(2) Descriptions of Impact Assessment

1) Involuntary Resettlement

Several houses/or huts as well as agricultural properties exist across the selected study site (see Section 7.6 for more detailed descriptions). It may be necessary to relocate some of those properties. Note that the relocation site shall be established under careful coordination with relevant agencies such as Vientiane Municipality, MPWT and MAF. Otherwise, it would provide another unorganized community around Dongphosy and would deteriorate the regional amenity of the surrounding community. Within this study, key-directions for an agroforestry-based community development is summarized in Section 7.7.5.

2) Local Economy

Decreases of agricultural income due to the expropriation of agricultural lands may occur. It is essential to prepare appropriate compensation scheme for PAPs prior to the construction phase.

3) Land use and Utilization of local Resources

Due to the land-take of certain amounts of the agricultural land and the set-up of VLP-related facilities, local land-use pattern will be changed. Many development projects (e.g., Golf Course, Industrial park, 450-Year Road) and/or development plans (e.g., Railway Extension from Thanaleng Station) exist around Dongphosy Area. It is essential to keep integrity and harmonization among those development projects/or plans.

4) Social Institutions

Due to the land take of agricultural and the temporal increase of the regional traffic volume, several minor impacts regarding the regional social institution may happen. The proposed project is infrastructure development project, so no major direct impact on the social institutions of local communities will be expected.

5) Existing social infrastructures and services

Due to the temporal increase of regional traffic volume, several minor impacts such as traffic congestion and/or worsening of traffic safety may occur during the construction phase. After construction, the smooth re-organization of the regional transportation system at local feeder roads connecting to VLP-related facilities will be expected to be carried out. So, no major negative impacts on existing social infrastructure and services will be expected.

6) The poor, indigenous of ethnic group

No community of ethnic minorities/nor indigenous people exist around the study site. Several properties of vulnerable people are identified around the study site (see Section 7.6 for more detailed descriptions). So, there may be some negative impact regarding this issue.

7) Misdistribution of benefit and damage

Main purpose of this proposed project is to improve the nationwide logistics system, and the current logistics system will be re-organized in order to boost the GDP of Laos further without avoiding misdistribution of benefit and damage. So, no major direct impact on this issue will be expected. However, due to the creation of VLP, traffic congestions that may cause some degradation of the quality of life in local communities may occur around the study site during the operation.

8) Cultural Heritage

As described in Section 7.6, there is no important cultural heritage around the study area. So, no major negative impact regarding the cultural heritage will be expected.

9) Local Conflict of interests

As mentioned earlier, main purpose of this proposed project is to improve the nation-wide logistics system, and entire quality of life in Lao PDR will be improved without causing any local conflicts of interests. So, no major impact on this issue will be expected.

10)Water Use/Water Right

People of surrounding residential areas around the study site buy bottled-water for drinking and cooking purpose. There is one irrigation channel around the study site, and the water therein is delivered from the Mekong River. In other words, the local irrigation system of the surrounding rice paddy filed is totally independent on the local run-off water but highly depends on irrigation from the Mekong River and the rainfall. So, no major impact on the regional water use/or water right will be expected.

11)Public Health

Construction camp may be set up at the construction yard, and may generate household wastes within daily lives of construction workers. It is essential to prepare proper waste treatment program not to avoid illegal dumping of those household wastes from the construction camp during the construction phase.

12)Infectious Disease

Insect-borne disease such as Malaria and/or Dengue are rampant around the study site during the rainy season. If outbreak of Malaria and/or Dengue may occur at the construction site, the working environment of VLP construction may be deteriorated to some extents. So, there may be some negative impacts regarding infectious disease for construction workers during the construction phase.

13)Accidents

A. Increased traffic levels during the construction for the road material transport.

Due to the delivery of a large amount of the ready-mixed concrete and other road materials to be required for the entire construction, temporal traffic increase or traffic jams are expected to be occurred around the study site. Several material sources such as asphalt, concrete, and aggregate plants and quarries are available around Vientiane. If those deliveries are spread throughout the entire project period, this may not result in significant increases in the road traffic.

B. Risk of Accidental Spill of oil from the oil tank facilities.

Oil tank facilities will be constructed inside of VLP, and it is essential to prepare comprehensive contingency plan just in case of major disasters such as accidental spill of oil and/or fire/explosion.

14)Topography and Geology

Most of the VLP-related facilities will be constructed within the hilly terrain of Dongphosy Forest Reserve, by cutting approximately 1.6 million m^3 of soil. So, it may cause some negative impact regarding the local topography, that may induce the change of local drainage patterns around the study site.

15)Soils and Sedimentation

As mentioned earlier, approximately 1.6 million m^3 of the soil cutting is to be carried out at the hilly terrain of the study site. Although there is no steep hillside around the entire project site, the local annual rainfall around Vientiane is of approximately 1,800 mm and that may cause major run-off, triggering soil erosion and resultant sedimentation at the downstream side of the local drainage system.

16) Groundwater

There are several shallow wells around the study site, and earthwork, in particular, large-scale earth cutting, may cause temporal water quality degradation of the groundwater during the construction period.

17) Hydrological Condition

Within this project, 35 ha of the secondary forest on where slush-and-burn agricultural method is currently popular will be cleared, changing the local run-off patterns around the study site during the rainy season. It is well-known that the forest plays an important role from the viewpoint of the water recharge for surrounding local area. So, there may be some negative impact regarding the local hydrological condition.

18) Coastal Condition

As mentioned earlier, there is no coastline/nor long waterfront around the study area. So, no major negative impact regarding the coastal condition will be expected.

19) Flora/Fauna and Biodiversity

As described in Section 7.6, the current floral condition of the study site is classified as the secondary forest and the slush-and-burn agricultural method is popular therein although the study site itself is located inside of Donphosy Forest Reserve. Based on the biological environmental study, conducted within this study, it is found that no important floral/or faunal species occur around the study area. So, no major impact regarding the current local flora/fauna will be expected. However, it is essential to seek out any mitigation measures that may contribute the "good practice" of the local forest management by implementing this proposed VLP project.

20) Meteorology

As mentioned earlier, 35 ha of the secondary forest on where slush-and-burn agricultural method is currently popular will be cleared. So, no major negative impact regarding the local meteorology will be expected. It is well-known that the local weather condition such as the air temperature, the rainfall pattern and others may be changed if certain amount of the forest area will be cleared. Currently, several development projects are on-going around Dongphosy Forest Reserve, and it is essential to have more detailed comprehensive study on the cumulative impacts of those development project regarding forest effects on the local meteorology. Also, it is essential to seek out any mitigation measures that may contribute the "good practice" of the local forest management by implementing this proposed VLP project.

21) Landscape

There is no scenic place/or townscape to be preserved around the study site. So, no major negative impact regarding the landscape will be expected.

22) Global Warming

A. Possible CO_2 emission reduction after VLP operation starts.

As mentioned previously, the future regional traffic volume around VLP will be increased. Also, it is expected to have certain amount of modal shift between trailer and the railway cargos. More detailed discussions of CO_2 loading due to the vehicular emission is summarized in Sections 7.6.5 as well as 8.2.3 of this main report.

B. CO_2 Capture and Storage effect of Forest

It is well-known that growing forests have some CO_2 capture and storage effects. As discussed in section 7.6, the current floral condition of the study site is classified as the secondary forest, created by a local slush-and-burn agricultural method, and there is no major difference in CO_2 capture and storage effects between "Do-Nothing" and "Do-Project" Scenarios. However, if the study site would be conserved, roughly 2,000 tonC of the carbon are expected to be captured by the forest growth.

23)Air Quality

A. Dust during the construction period

It is likely to have temporal dust problem during the construction period. In general, construction activities of the proposed project would comprise of large-scale earthworks but are scheduled to be done within relatively short period. So, the magnitude of the dust level will not be major during this period. It is recommended that stock piles of sand and soil are well screened from residential areas. Frequent usage of sprinklers would be appropriate during the dry season. Multi-directional fall-out buckets should be used to monitor dust levels during the construction period.

B. Local Air quality degradation around new logistics park

Some local feeder roads connecting to the project routes run through residential area on where current traffic volumes are not so large. The roadside air quality of some local feeder roads may be deteriorated due to the increased traffic volume after the construction. It is important to have periodical roadside air quality monitoring work during the operation phase.

24)Water Quality

Most of the VLP-related facilities will be constructed within hilly terrain of Dongphosy, and there is no major tributary around the study area. So, no major water quality-related impact will be expected. However, temporal water quality degradation, due to the turbid water, to be generated through the rainy season earthwork activities, may occur. Most of run-off water from VLP site would reach surrounding irrigation channel, and both natural and fish ponds, located at the local lowland of Dongphosy. So, it is essential to prepare appropriate waste water treatment facilities at the construction site. Also, it is important to have periodical roadside water quality monitoring work during the construction phase.

25)Soil Contamination

Risk of the soil contamination due to the accidental spill from oil tank facilities, one component of VLP, can not be ignored. It is essential to prepare a comprehensive contingency program for this disaster. Also, the risk of the accidental spill of effluents from the garage section of VLP can not be ignored, either. Proper toxic waste water treatment/or storage facilities shall be established inside of VLP before discharging those effluents into nearest sewerage and/or channels that may connect to surrounding rice paddy.

26)Waste Disposal

A. Preparation of excavated soil dump site

Approximately 1.6 million m^3 of excavated soils and other construction wastes have to be dumped at proper waste disposal sites. Appropriate industrial waste treatment sites should be prepared and be large enough for the treatment of both this excavated soil and construction wastes. It is likely that some of those excavated soil will be used as re-fill and/or embankment materials for other relevant development projects such as the improvement of local feeder roads.

27)Noise/vibration

A. Noise and vibration during the construction period

Since construction activities will result in almost continuous noise from a mobile mechanical plant and others, the order of the magnitude of the noise and the vibration level will be significant to some extents during this period. Applications of special mitigation measures such as noise barriers or silent construction machinery may be considered to alleviate the noise and the vibration impacts around the temple or residential areas.

A. Noise and vibration transmitted from the new VLP system.

Due to the increased future traffic volume circulating to and/from new VLP, the roadside noise environment of several major routes would become worse. Currently, several houses exist around both the study site as well as local roads, to be used for the access roads. So, it may be wise to prepare for the mitigation measures of noise and/or vibration (e.g., set-up the noise barriers in order to lessen the noise and/or vibration impacts on some residential areas.

28)Subsidence

Most of the VLP-related facilities will be constructed within the hilly terrain of Dongphosy and no soft soil exists therein. So, no major subsidence-related impact will be expected.

29)Obnoxious Smell

Several slight obnoxious smells, presumably mixture of household compost and others, are sensed around the study site. It is likely that these points will be renovated and/or removed within the construction of VLP facilities. So, it is expected that entire amenity of the study site will be improved as well as no major negative bad smell-related impact will be arisen.

30)River Bed

As mentioned earlier, there is no major tributary around the study area. So, no major negative impact regarding the river bed will be expected.

7.7.2 Impacts Mitigation

(1) Introduction

The comprehensive, effective measures of the mitigation (i.e., avoidance, reduction, and elimination) of negative impacts for the pre-construction and construction phases of the project, identified in pervious section, are described in this section. It is noted that key directions of mitigation plans for potential negative impacts, evaluated as “A” or “B” within environmental scoping, mentioned earlier, are of concerns. The presented mitigation plan addresses to the potential negative environment impacts caused by the construction works and its operation. The impacts to be caused during the construction period are mostly of a temporary nature, lasting only for the construction period but not for the operation period. Detailed descriptions of each mitigation measure are summarized in Table 7.7.1. In this table, cost effective mitigation measures have been recommended. Principal purposes of this mitigation measure are as follows:

a. Maintenance of comfortable roadside environment throughout the project.
b. Alleviation of impacts of roadside noise/vibration.
c. Preparation of waste water treatment
d. Harmonization of new logistics facilities with surrounding communities and/or environment.
d. Smooth preparation for the expropriation program.
e. Support agroforestry-based community development for PAPs.

Mitigation measures must be incorporated into tender documents prepared under the engineering component of this project in order to ensure that the contractor is obliged to comply with measures in the environmental management plan (EMP). Also, it is essential to incorporate probable working practices into the mitigation program. By doing this, those potential environmental issues can be anticipated and relevant knowledge of potential environmental impacts can be shared among various stakeholders while a comprehensive environmental management program can be established smoothly prior to the construction.

(2) Implementation

Table 7.7.1 summarizes the mitigation measure of negative biophysical and socio-cultural environmental impacts for Vientiane Logistics Park, identified in previous section, respectively. The organizations responsible for implementing and monitoring are identified.

Table 7.7.1 Summary of Mitigation Measures

Element/ Negative Impact	Mitigation Measure	Residual Impact	Responsibility	Monitoring Requirements	Implementation Schedule
Air Quality					
Dust during construction	Vehicles delivering materials shall be covered to reduce spill. Mixing equipment shall be well sealed, and vibrating equipment shall be equipped with dust-remove device. Wind erosion from open land can be controlled by use of following three basic techniques (watering, use of chemical stabilizers, and wind breaks) in addition to vegetation cover. Operators shall pay attention to their health.	Dust levels controlled.	Contractor	Engineer	On-going during construction
Local air quality degradation around Vientiane Logistics Park	Introduce environmentally-friendly vehicle (e.g., hybrid type vehicle), more sophisticated I/M program, traffic regulation, clean fuel policy and others. It is recommended that air quality environmental standards be adhered to.	Air quality level controlled.	Government of Laos	Government of Laos.	After construction
Water Quality					
Risk of hazardous waste material exposure to major tributaries during construction.	Great care must be taken to ensure that potential contaminants do not enter any tributaries while appropriate construction method that would have less risk of water quality degradation shall be selected. Water quality tests for surface/subsurface water shall be conducted periodically. All chemicals (oil, petrol etc.) must be kept in securely bounded areas with a capacity greater than volume of chemical to be stored. Oily wastes must be stored to suitable disposal sites. Contractor must submit written emergency procedures to be followed in case of accidental spillage.	Risk of pollution reduced but not eliminated.	Contractor	Engineer	On-going during construction.
Potential for water quality degradation due to erosion during/and after construction	Appropriate anti-erosion measure shall be implemented for the protection of open-cut slope of VLP and road bank. Water quality tests for surface/subsurface water shall be conducted periodically. Periodical direct observation of regional drainage system such as channel/tributaries/ ponds shall be conducted in order to find out change in color of water as quick as possible. Discharge of untreated turbid water to nearby channel shall be avoided. It is recommended to install sediment ponds to reduce the turbidity of effluents.	Risk of water quality degradation reduced, but not eliminated	Contractor	Engineer to monitor water quality degradation during construction while MPWT during operation.	On-going monitoring during construction. Carry out follow-up monitoring periodically after construction.
Soil and Sedimentation					
Potential for soil erosion during/and after construction.	All earthworks shall be undertaken as far as possible prior to the start of rainy season. All earthworks shall be minimized as small as possible. Disturbed soils must be re-vegetated. Invasive species must be avoided in selection of vegetation. Discharge of untreated turbid water to nearby channel shall be avoided. It is recommended to install sediment ponds to reduce the turbidity of effluents.	Soil erosion minimized, but not eradicated.	Contractor	Engineer to monitor soil erosion during construction while MPWT during operation	On-going during construction. Carry out follow-up monitoring periodically after construction.

Element/ Negative Impact	Mitigation Measure	Residual Impact	Responsibility	Monitoring Requirements	Implementation Schedule
Potential for sedimentation due to erosion during/and after construction	Periodical direct observation of regional drainage system such as channel/tributaries/ ponds shall be conducted in order to find out newly generated sedimentation process as quick as possible.	Sedimentation minimized, but not eradicated.	Contractor	Engineer to monitor sedimentation while MPWT during operation.	Same as above
Waste Disposal					
Preparation of Excavated soil dump site.	Inventory of possible construction wastes shall be summarized. Selection of soil dumping sites shall be well-discussed with relevant agency such as WREA. Soil dumping sites shall be well-spread over entire project site to avoid local traffic congestion.	Illegal dumping of construction material/or soil avoided.	Contractor	Contractor	Before construction
Noise/Vibration					
Noise and vibration during construction period	It is recommended that Environmental Standards for construction sites be adhered to. Mobile equipment shall be in compliance with Lao noise standards. Machinery and vehicles shall be well-maintained in order to keep their noise at a minimum.	Noise/vibration nuisance reduced and controlled.	Contractor	Engineer	On-going during construction
Noise/vibration transmitted from logistics park system.	Vehicular noise can be reduced at source through vehicle construction process, selection of tires and exhaustion system as well as vehicle maintenance. Also, the application of smooth, well-maintained surfaces is effective in reducing frictional noise and vibration. Noise barrier is the most common mitigative measures used. Low noise pavement is also useful mitigative measure.	Same as above	Design Engineer, Government of Laos	Government of Laos	After construction.
Flora/Fauna					
Destruction of vegetation in Dongphosy Forest Reserve.	Planting should be done wherever possible with native species which are likely to require little maintenance and may prove beneficial in maintaining ecosystem integrity with coordination of competent environmental sections of Vientiane Municipality. Topsoil must be removed, segregated, stored, and redistributed with minimum loss or contamination. Topsoil and subsoil may be removed separately and replaced in sequence. In cases where non-native species are deemed essential, careful monitoring should be planned. Key directions of agroforestry-based community development are summarized within this study (see Section 7.7.5 for more detailed description)	Impact on roadside vegetation minimized, not eliminated.	Design Engineer, Contractor	Contractor Local Communities	Before construction.
Accidents					
Worsened traffic accidents	During construction period, trucks delivering materials to site shall thoroughly be checked to ensure that they are road worthy and that brakes are in full working order. Where feasible, trucks shall avoid driving through residential areas. Trucks used for transportation of material shall be routed, where feasible, to avoid residential area.	Risk of accidents reduced but not eliminated.	Contractor	Engineer	On-going during construction
Involuntary Resettlement (Land Take)					

Element/ Negative Impact	Mitigation Measure	Residual Impact	Responsibility	Monitoring Requirements	Implementation Schedule
Land take due to road alignment along new-road route.	Within the long-term framework, approximately 35 ha of agricultural lands will be expropriated for VLP construction Alternative houses/or resettlement sites must be provided prior to the land take. Alternative houses and/or sites shall be located around previous location as close as possible. Within this study, agroforestry-based community development for PAPs is summarized for 'land-to-land" based compensation. Appropriate expropriation programs should be prepared.	Housing rebuilt in alternate location. Appropriate compensation prepared.	Government of Laos.	Government of Laos	Before expropriation begins.
Conflict with on-going local development plans.	There are several development projects around Dongphosy, so that direct interference among all projects must be avoided. Potential cumulative and/or secondary impacts shall be well examined.	All projects coordinated.	Government of Laos	Government of Laos	Planning stage.
Historical and Cultural					
Archaeological discovery of potential sites.	New or additional archaeological and/or historic properties are discovered, damage to those newly discovered ones should be minimized. Typical mitigation measures include limiting the magnitude of the undertaking, modification of undertaking through the re-design, re-orientation of construction, repairing, rehabilitation, or restoration of affected areas, preservation and maintenance operation for involved historic properties, relocation of historic properties and so on. Ministry of Information must be consulted.	Disturbance to potential archaeologica l site minimized.	Design Engineer, Contractor	Government of Laos	Planning stage and On-going during construction.

Source: JICA Study Team

7.7.3 Environmental management

(1) Scope and Objectives

Effective environmental management during pre-construction and construction requires the establishment of effective institutional arrangements for the implementation of the Environmental Management Plan (EMP). In general, any environmental management program should be carried out as an integrated part of project planning and its execution, making a significant and continuous contribution to the overall development of the scheme. It must not be regarded merely as an activity limited to monitoring and regulating activities using a pre-determined checklist of required actions. Rather, it must interact dynamically as the project implementation proceeds, dealing flexibly with environmental impacts – both expected and unexpected as they arise. For this reason, the plan provides for periodic audits, which will evaluate compliance of on-site environmental management practices with the EMP requirements and also to refocus the plan itself in the light of experience and issues arising.

The EMP is concerned with the environmental impacts due to the construction of proposed VLP facilities and these controlling procedures. The main purpose of the EMP is to ensure that the various environmental protection measures selected through the project-planning phase are implemented during the construction phase, so that the environmental degradation and pollution resulting from construction activities will be minimized. Specific objectives of the plan are to:

a. Define organizational and administrative arrangements for the environmental monitoring, including the definition of responsibilities of staff, coordination, liaison and reporting procedures.
b. Discuss procedures for pro-active environmental management, so that potential problems can be identified and mitigation measures to be adopted prior to the construction commencement.

(2) Methodology

The basic approach to prepare the management plan comprises of following parts:

1. Reviews of the mitigation plan.
2. Discussions with engineering staff engaged on the design phase of the project.
3. Experience gained through past relevant environmental monitoring activity.

(3) Key Component of Environmental Management Plan (EMP)

Within the EMP, the Engineer's role is to monitor the activities of the contractors and to take action under the terms of the contract to prevent and minimize the environmental damage. Basically, there are three factors to be considered in order to have an organized and efficient EMP; i.e., (1) the contractors' organization, (2) the resident engineer's organization, and (3) the liaison, coordination and reporting among each sections of the project.

1) Contractors' Organization.

The tender documents should require the contractor to state his/or her environmental policy clearly. The clear specification of the responsibility for the environmental protection within the contractor's organization is a critical factor for the achievement of a good environmental control. So, it is necessary to ask contractors of submission of their proposals for the environmental management. Basically, this proposal must contain following items:

a. Clear statement of their environmental policy.
b. Their own organizational framework, in particular, the assignment of an engineer to take overall responsibility, to manage environmental control facilities on daily basis and to liaise with the Resident Engineer's monitoring team.
c. Principal pollution control facilities, including procedures of the construction wastes disposal, and of contingency plans in the event of facility failures.
d. Proposed environmental monitoring procedures in order to ensure that facilities are operating satisfactorily and problems are being dealt with promptly.
e. Environmental awareness training program for the workforce.

2) Resident Engineer's Organization (REO)

Following arrangement might be necessary when the staffing structure for the project is finalized. Ultimate responsibility for environmental matters within the REO will rest with the Project Manager (PM), and with the Chief Resident Engineer (CRE) being responsible for daily direction and management. It will be necessary to have an Environmental Monitor (EM) who will be able to make occasional visits to sites, and a full-time local Assistant Environmental Monitor (Assistant EM) who will be responsible for daily monitoring of projects. The Environmental Monitor (EM) should have suitable experience in the environmental management.

Followings are the brief description of the responsibilities of each team members.

A. Environmental Monitor (EM)

The EM has to act on two different levels. Firstly, the EM has to give overall advice and define the general procedures which will include environmental reports. Secondly, the EM will be involved in the establishment of the daily monitoring procedures. Followings are major tasks for the EM.

First Level

a. To review and make him/or herself familiar with the EMP, including advice on:
- The environmental management framework.
- Reporting and liaison requirements.
- Key environmental issues.
- Monitoring strategy.
- Data management.
- Environmental control measure.

b. To carry out periodic environmental audits of the project in order to:
- Identify any environmental performance deficiencies and advise how to address these.
- Assess the degree of compliance with the EMP achieved on site.
- Review the continuing relevance of the EMP in the light of experience, and instigate changes where appropriate.
- Review the organization and administrative frameworks for the environmental management.
- Review environmental monitoring data and its management.
- Review environmental problems arisen and how these have been dealt with.
- Propose changes to the environmental management procedures and framework and identify the need for additional measures to control environmental degradation.

c. To provide ad-hoc advice on environmental issues to the PM, CRE and Assistant EM.

Second Level
d. To establish an effective environmental monitoring, sampling and analysis program.
e. To establish routine management, liaison and reporting systems, including the establishment of the environmental database.
f. To evaluate the results of the monitoring program and to advise REs of required action.
g. To prepare routine management reports.
h. To advise the CRE/PM on the contractors' proposals for site establishments in terms of landscape, drainage, erosion control, liquid and solid hazardous waste management, fuel and chemical storage and site restoration.
i. To review the contractors' proposals for pollution control facilities and to advise on its adequacy.
j. To study the mitigation measures proposed by the contractors and to recommend safeguards.
k. To co-ordinate the sampling and analysis program with a nominated laboratory.
l. To liaise and report on a routine basis with the MPWT, WREA and/or DoAF, Vientiane Capital, MAF.
m. To train and support the Assistant EM.
n. To recommend the procurement of the equipment required for the environmental monitoring.
o. To advise on the need for expert assistance.

B. Assistant Environmental Monitor

Followings are fundamental routine tasks for the Assistant EM:

a. To undertake environmental monitoring through site inspections on a daily basis and to notify the EM/or the REs of any problems.
b. To conduct the routine sampling and analysis programs, and to take ad-hoc samples when necessary.
c. To look after the environmental monitoring equipment and to advise the EM or REs of defects, problems or replacement/or additional requirements.
d. To assist the EM in the analysis of results, preparation of reports and with other duties as required.
e. To be responsible for the daily management of the database system to be established.
f. To liaise with the local communities and to act as a channel for their concerns.

Sometimes, the Assistant EM has to take over the tasks f, g, k and l of EM's, summarized earlier.

3) Liaison, Co-ordination and Reporting

A. Liaison with the Contractors

The Assistant EM will attend a weekly site meeting of the relevant contractors' staff and address environmental shortcomings arisen there. From the contractor's side, the attendance of the senior manager and the engineer responsible for the environmental protection would be preferable for this meeting. From the consultant's side, the EM or Assistant EM and the RE/or CRE will attend. These meetings should be minutes.

B. Liaison with Central Government.

As mentioned above, the Assistant EM will prepare a short monthly report for the submission to the relevant agencies such as the MPWT and the WREA, DoAF of Vientiane Capital and/or MAF, and will be available to attend progress meetings when required.

C. Liaison with the Local Community

Liaison with the local community will be important during the construction period in order to ensure that their views are being taken into account and that problems and nuisances such as noise and dust are reduced to the minimum. All complaints must be recorded, and also, these records should show what action was taken, and when, and what monitoring is necessary.

D. Consultant's Internal Co-ordination and Reporting

The Environmental Monitoring Team will prepare a monthly report, which should not be lengthy, but will summarize issues carried over from the previous report, stating whether they have been resolved or are on-going, and new issues arising. This should be included in a general monthly progress report to be submitted to the MPWT. It is not envisaged that formal meetings will be required for the internal management of the environmental program, and that ad-hoc meeting would be adequate.

4) Environmental Management and Audit Program

The first several months of the construction phase will be important for the EMP establishment. It is anticipated that the Program should be audited annually, but that the first audit should be carried out after six months in order to review the establishment of the management systems and procedures. The processes of environmental management should be continuously evolving and improving as the project proceeds.

7.7.4 Environmental Monitoring

(1) Introduction

Main objectives of the environmental monitoring are to provide a continuous feedback on project implementation to identify actual or potential successes/or problems at early stage, and to implement timely adjustments to whole project management work. Monitoring is a continuous assessment of project implementation and must be an integrated part of good management during the construction.

(2) Objectives

The objective of the monitoring system is to assist the project management through:

a. Defining requirements and procedures for the environmental monitoring (type of equipment to be used, monitoring schedule, parameters to be monitored and so on).
b. Identifying targets and objectives for the project implementation.
c. Keeping environmental records for the project evaluation.
d. Identifying problems arising from the project, and figuring out procedures for the environmental remediation in the event of the pollution or similar incidents.
e. Providing readily available results of related environmental analysis for the decision making.

(3) Scope of the Monitoring Plan

The scope of the monitoring plan is:

a. To identify the monitoring tasks to be undertaken by EM during the construction phase.
b. To identify the nature and the schedule of the monitoring.
c. To identify samples to be taken for analysis and parameters to be measured.

(4) Methodology

The basic approach to prepare this monitoring plan has comprised of following components:

a. Reviews of the mitigation plan discussed in previous section, and in particular, of the monitoring requirements identified for the construction phase of the project.
b. Discussions with engineering staff engaged in the project design and planning.
c. Consideration of the environmental monitoring experience.

Agency coordination is addressed, and coordination with the on-going monitoring program such as monthly water quality survey at wells, ponds and the irrigation channel by WREA is vital in the development of post-EIA monitoring system. The monitoring objectives should be related to the anticipated impacts of the action. Comprehensive and/or targeted monitoring can be planned. Several iterations might be necessary to achieve a workable monitoring system.

(5) Environmental Monitoring

The aim of the monitoring plan is to develop a cost-effective approach to monitor the contractors' environmental performance. Certain parameters (e.g., roadside air quality, noise and vibration, surface/subsurface water quality around the project area and so on) can be monitored through measurements, and others can only be monitored through the observation (e.g., tree cut-down, roadkill, unusual death of species). Careful observations made through this monitoring work, established by a forward planning, is a key part for a successful environmental management to prevent problems (or at least to limit their effects).

Baseline data to be summarized in this project will help to define the requirements for the site restoration and provide a basis for the comparison of effects during the construction. Post project audit should be carried out to examine the success of the site restoration and evaluate the effectiveness of the mitigation measures adopted.

(6) Monitoring Requirements

The monitoring requirements of the Monitoring Program were identified in the Mitigation Plan. The Engineer should be responsible for the monitoring the activities of the contractor, and the EM and the Assistant EM should assist the Engineer in the monitoring which requires measurements, based on responsibilities listed in previous chapter.

The monitoring activities can be divided into following two groups; (i) one which can be carried out through the measurement, and (ii) one which will be carried out through observation.

Table 7.7.2 provides more detailed descriptions of the activities to be undertaken for each of the monitoring requirements. It is strongly recommended that corresponding clauses should be developed for the inclusion in the bid documents. In particular, most of community people around Dongphosy Forest Reserve tend to be keen to the roadside environmental degradation such as worsened roadside noise and/or air quality (see Section 7.8.4 for more detailed descriptions). So, it is preferable to have periodical meetings with local communities and to explain each environmental status as one of good practice of the information disclosure and/or public participation. It is noted that the monitoring requirements for the air quality, noise and vibration, groundwater level, and surface and subsurface water quality to be followed will be the responsibility of the EM. Quotation of relevant environmental activities such as periodical air quality and noise surveys, listed in Table 7.7.2, is summarized in Tables 7.7.3 and 7.7.4.

Table 7.7.2 Monitoring Activities and Indicators

Monitoring Issue	Monitoring Method	Positive Indicator
Air Quality	Observations should be made on the level of dust generated during construction activities. Damping down should be carried out if levels are unacceptable. Further details on the method to be used are provided in following sections.	Deposition of dust on surfaces should decrease with increased dampening.
Water Quality	Engineer should monitor the water quality of wells, ponds and irrigation channel during the construction activity.	No accidental spillage of construction wastes into the aquifer and/or ponds nor relevant significant water quality degradation recognized throughout construction period.
Soils and sedimentation (erosion and seepage)	Engineer should make a daily inspection of earthworks, and ensure that slopes are suitably graded. Once earthworks are complete, Engineer should monitor restoration measures implemented by Contractor, such as revegetation or use of gabion mattress as well as occurrence of seepage-related erosion.	Absence of rills, gullies or other erosion features. No significant seepage-related erosion recognized.
Soils and sedimentation (sedimentation)	Engineer should monitor sedimentation of major tributaries and sand-bar generation at down stream side of new routes for safe flood control.	No trace of significant sedimentation and of new sand bar generation. Secure safe river space and make local water flowing smooth.
Waste Disposal	Engineer to ensure waste dumping site for construction waste material, soil, and so on.	No illegal disposal of waste material.
Noise/ Vibration	Noise measurement should be carried out at the boundary and the inside of the work site and at the nearest sensitive receiver. Vibration measurement should be carried out within the residential area.	Noise levels at the nearest sensitive receiver should not exceed the Laotian environmental standards.
Bad Smell	Engineer to ensure that no illegal dumping of household waste from the construction yard nor newly created permanent inundation area on where plants will be forced to be submerged for the long term.	No complaints about the compost smell to be generated from submerged and decayed plants.
Topography and Geology	Engineer should monitor occurrence of newly developed inundation or flooding events around the project site.	No trace of permanent inundation and/or flooding.
	Engineer should monitor regional groundwater level distribution and enhanced consolidation to be caused by groundwater level drawdown, periodically.	No big groundwater level fluctuation. No regional vegetation change and/nor enhanced aquifer consolidation.
Flora/Fauna (Vegetation)	Engineer should ensure that excessive clearance of vegetation is avoided. Contractor must seek approval of Engineer prior to clearance. Re-planting or relocation of trees should be done with the coordination of WREA and/or DoAF of Vientiane Municipality.	Area of vegetation to be cleared minimized. Relocation/or replanting be coordinated with WREA and/or DoAF of Vientiane Municipality.
Flora/Fauna (Birds/wildlife/aquatic species)	Engineer should examine the timing, shaping and sizing operations to avoid breeding or nesting season and trees, protecting key food, cover, and water resources. The number of roadkill and unusual death of aquatic species shall be counted.	No trace of roadkills, unusual death of any species.
Water	Engineer should monitor the water quality of wells located	No significant water quality

Monitoring Issue	Monitoring Method	Positive Indicator
Resources	around the project site as well as the occurrence of dried-up wells to be caused by groundwater level drawdown during the construction period.	degradation and/or dried-up wells recognized throughout construction period.
Accidents (road safety)	Engineer should monitor the condition of trucks arriving at the site and keep a record of night driving.	No road accidents related with project. Night driving kept to minimum.
Accidents (UXOs)	Engineer to ensure that UXOs within the project site cleared completely.	No additional discovery/or hitting of UXO during the construction period.
Relocation (Agroforestry-based community development)	Engineer should inspect the development of agroforestry-based community to ensure certain portions of lands are allocated for vegetation at each household.	Establishment of community-wide green belt, continuous to Donphosy Forest Reserve.
Complaints	Engineer should inspect the record of complaints made by local residents, to be kept by Contractor, and should check that action is taken quickly and that the number of complaints does not rise significantly.	Number of complaints decreases.

Source: JICA Study Team

1) Noise and Vibration

The purpose of the noise and vibration monitoring is to limit nuisance to local residents and to the workforce, and the noise should be measured frequently during the construction. Potential sources of the noise include a heavy construction plant and vehicles. An ad-hoc approach should be taken, depending on the type of activities in progress and their location on site in relation to sensitive receivers. Background noise and vibration level must be measured before the project commencement. Parameters to be monitored for the noise and vibration are Leq (dBA) and L10 (dB), respectively. Remedial measures will be taken when Leq value exceeds the Laotian environmental standard. In Laos, no environmental standards for vibration is established, yet, but it would be likely to have property damage due to the roadside vibration to some extents when the traffic volume will be increased during both construction and operation periods. So, it is wise to use other ISO-based vibration standards such as the one implemented in Japan for the vibration monitoring.

2) Dust

The objective of the dust monitoring is to control nuisance to both local residents and the workforce on site. Monitoring site should be located in areas where there are sensitive receivers. Generally, the dust generation is the most severe along unpaved access roads and at areas where loose materials are handled (e.g., industrial wastes site, stockpiles and so on). Based on those facts, the monitoring station sites should be determined. Parameter to be monitored is PM-10 and/or the weight of the dust accumulated within a specific time period (e.g., 1 week – 1 month). Background dust level must be measured before the project commencement, and remedial measures will be taken where more than 50 % increase of the background dust level occurs or when PM-10 value exceeds the Laotian environmental standard.

3) Groundwater Level

The objective of the groundwater monitoring is to observe a change in the regional water balance during the construction. Several monitoring wells should be installed in order to establish a proper monitoring network, and the monitoring will determine whether there is a severe drawdown/or uprising, that may lead to regional aquifer consolidation/or vegetation change.

4) Groundwater Quality

There are several shallow wells around the study site, and there may be some negative impacts on those wells during the construction phase. Parameters to be monitored include: organoleptic conditions such as color and odor; physico-chemical characteristic such as turbidity, conductivity, sulfate and aluminum content; undesirable substances such as nitrates and hydrocarbons; toxic substances such as chromium, lead and pesticide. Polluted discharge from road surfaces can be assessed either by heavy metal content, oil or suspended matter. Also, spillage of untreated household effluents can be detected by BOD, COD, Coli-form, grease and other common parameters.

5) Surface Water Quality

It is essential to have periodical water quality tests during the construction phase of the project in order to check the water quality pumped from excavations and discharges from construction sites, and to monitor the effects of any localized pollution due to human activities and spills. In particular, intense water quality monitoring program should be implemented around the project site of VLP. Monitoring of the ambient water quality will determine whether there are likely to be problems for downstream uses, whereas monitoring of the effluents will help to identify the source of the problem and the remedial action. Parameters to be monitored should reflect the type of contaminants likely to be detected. For example, contamination caused by the concrete may be detected through increased pH levels.

6) Agroforestry-based Community Development

It is essential to prepare a proper on-site supervising and/or surveillance program in order to establish a well-managed agroforestry-based community development as well as to avoid/or lessen the occurrence of disorganized, new slam around Dongphosy Forest Reserve. As described in Section 7.7.5 later, a concept similar to the agroforestry-based vegetation at the country side in Laos exists and common already. So, community development itself (e.g., allocation of household-based vegetation and its vegetation type) would not take relatively long time nor huge man power, and it is expected that this newly created community-wide green-belt would become continuous to the green zone of the reforestation area of Dongphosy Forest Reserve. However, it is recommendable to assign a special trained-personnel/or field officer in the regional office for the periodical on-site check of the status (e.g., direct observation of community development, number of faunal species observed within this newly-created community, occurrence of any damages on the fence and so on) while keeping a good liaison with community people.

(7) Implementation and operation of monitoring program

In general, implementing the monitoring system requires considerable efforts in obtaining specific inter-agency agreement and necessary funding. This step mainly involves data collection, analysis, and evaluation. Impact evaluation will involve the pre-determination of criteria to be used for the interpretation. These criteria should be based on legal, institutional limits, professional judgements and/or public inputs. Development of appropriate response plans to impact trends can be time-consuming and technically difficult, and may require considerable coordinating efforts. It is important that such plans be developed prior to implementation of the monitoring system. It is also very important that periodical summary reports be prepared in order to document the finding and resultant response to the post-EIA (or EIS) monitoring program.

(8) Manpower and Budgeting

It is envisaged that the Engineer will carry out the environmental monitoring program as a part of the contract throughout entire construction work. The EM will be employed on a full-time basis. Also, the Assistant EM will be full-time, and will report to the Engineer, and the EM. The cost of implementing the monitoring plan will include the full-time salary of the EM and Assistant EM. It may be necessary to employ an international environmental expert for the initial training of EMs and subsequently to attend at audit time.

(9) Environmental Management Costs

Environmental protection costs are of two types: (i) sub-components of VLP facilities (e.g., drains, vegetation, fence and other relevant facilities), and (ii) technical support and management. Generally, the cost of direct environmental protection measure such as drains and fence construction works is included within the estimation of the direct construction cost. So, here, the cost for the later item is summarized as environmental management costs, and is usually included within the administration cost.

The environmental technical support for the project consists of following five components: (1) hiring environmental personnel, (2) local consultation, (3) training and co-ordination meeting, (4) facilitation, and (5) periodical environmental survey.

From the economical points of view, it is strongly recommended to carry out periodical on-site monitoring such as roadside air quality, noise and water quality survey not by another contracted survey company but by EMs themselves. Besides, those survey instruments manufactured recently are very portable and accurate, so that the feedback of those survey results to environmental monitoring program will be quick.

Mainly, the environmental management cost to be associated with this VLP construction project consists of following two components: i.e., (1) periodical environmental monitoring activities around the study area, and (2) the supervising activities of the agroforestry-based community development. Periodical environmental monitoring activities cover from water quality survey of the surface water (e.g., ponds and irrigation channel) and the groundwater (e.g., wells located around the study area) to the roadside noise survey. The annual cost of the proposed environmental monitoring program excluding the cost of on-site supervision of agroforestry-based community development, described later, would be of USD 116,200.00/year (see Table 7.7.3). Entire VLP construction work would take roughly several years, so it can be assumed that relevant environmental monitoring activities summarized within its environmental program will be and/or must be carried out continuously/or periodically during this period. Thus, the total cost of this environmental monitoring work would be of USD 581,000.00.

Table 7.7.4 summarizes the cost estimate to be required for the on-site supervision of agroforestry-based community development activity. In addition, relevant monitoring activities such as periodical site inspections will be required for at least five years after the community development is completed. The construction and relevant monitoring and follow-up work would cost USD 105,400.00. As a total, whole environmental cost to be associated with this bridge construction project would be of USD 686,400.00.

Table 7.7.3 Cost Estimates of Environmental Program for VLP Construction Project

Item	Unit Price [US$]	Quantity	Amount [US$]
Hiring Environmental Staff			
Environmental Monitor	48,000.00	1 person/yr	48,000.00
Assistant EM	24,000.00	1 person/yr	24,000.00
Short-Term Consultation Services			
Contractor Crew Briefing on-site		L.S.	1,000.00
Base Technical Support and Assistance			
Periodical water quality survey (6 pts x 10 parameters, monthly)	1,200.00	12 times	14,400.00
Periodical groundwater quality survey (4 pts x 10 parameter, monthly)	800.00	12 times	9,600.00
Periodical air quality survey (2 pts x 2 parameters, monthly)	1,100.00	12 times	13,200.00
Periodical Roadside noise survey (2 pts x daytime only & monthly)	500.00	12 times	6,000.00
Total			116,200.00

Source: JICA Study Team

Table 7.7.4 Cost Estimate of the Agroforestry-based Community Development

Item	Unit Price [US$]	Quantity	Amount [US$]
Development Phase			
Local Management		1 person over 12 months	2,400.00
Management and Supervision		1 person over 12 months	12,000.00
Capacity Development for local staff			10,000.00
Development and production of educational materials (e.g., leaflets, fence, signboard and others)		L.S.	4,000.00
Sub Total			28,400.00
Monitoring and follow-up Phase			
Local Management	5,000.00	1 person/half year over 5 years	25,000.00
Management and Supervision	10,000.00	1 person/half year over 5 years 2 times	50,000.00
Community Development-related Social Survey	1,000.00		2,000.00
Sub Total			77,000.00
Total			105,400.00

Source: JICA Study Team

7.7.5 Possible Contribution to the Forest Management of Dongphosy Forest Reserve

Within the proposed VLP project, approximately 35 ha of bush and secondary forest area on where activities of illegal encroachments are observed will be cleared. Also, either of monetary /or land-based compensation shall be prepared for PAPs, identified within the proposed VLP project site. Upon considering the current tendency of the suburban development of Vientiane Capital, it can be easily guessed that the human pressure on this forest reserve will be more intensified, so that, it will be more difficult to control further illegal encroachment therein.

As mentioned earlier, DoAF, Vientiane Capital is planning to set up the reforestation zone, located at the northern half of the current forest reserve in order to revive the degraded Dongphosy Forest

Reserve.

One of possible contribution to the future forest management of Dongphosy Forest Reserve from this proposed VLP project is to set up a "proto-type" reforestation area, to be created through the proposed "agroforestry-based" community development, adjacent to this reforestation zone.

Within this "proto-type" reforestation area, the human settlement is allowed to some extents, by creating a small-scale community (e.g., 20 – 30 households) that co-exist with the forest in harmonized ways. To make this initiative more feasible, the application of Agroforestry that grow several different species and each floral species interact one another in positive ways (e.g., the interaction between shade trees/tolerant trees and sun trees/intolerant trees) would have vital role. Also, it is important not to take invasive species among those Agroforestry-based green belts. Figure 7.7.1 shows the successful application example of "Agroforestry-based forestation" across the world.

Application of Agro-forestry (Mexico) (Source: http://www.windfarm.co.jp/producer_mexico/archives/000245.html)

Application of Agro-forestry (Brazil) (Source: http://www.wildlife.or.jp/hp/amazon/amazon-photo/Agro-forestry/agrof.htm)

Concept of Agro-forestry (Source: http://www.windfarm.co.jp/producer_mexico/archives/000245.html)

Application of Agro-forestry (Peru) (Source: http://www.arcoiris.jp/Agro-forestry.html)

Figure 7.7.1 Application of Agro-forestry

Mixed plantation of various fruit trees and edible plants at an individual house level are very common across the South East Asia, and it is called as "food trees" in some parts of Lao PDR (see Figure 7.7.2). If certain portion of each newly settled land is to be allocated for this Agroforestry-based community, the total area of the secondary forest across this "proto-type" community will not be negligible. In the long term, the regional ecological continuity will be maintained while significant deterioration of regional biodiversity will be avoidable as long as adequate land management is implemented.

In additions, existence of temples with various tree vegetation that are common to be seen across this country (see Figure 7.7.2) would be important to make a proposed "prototype" reforestation area more habitable.
By setting up this agroforestry-based community, adjacent to the reforestation zone of Dongphosy Forest Reserve, it would be possible to solve both resettlement of 30 PAPs, identified in Section 7.6.7, and on-going local forest degradation of Dongphosy Forest Reserve.


House with various fruit tress (part 1), located near Site A


House with various trees (part 2), located near Site A


Forest inside of temple (1)


Forest inside of temple (2)

Source: JICA Study Team

Figure 7.7.2 House with "Food Trees" around Vientiane

Followings are key directions for the successful implementation of this proposed agroforestry-based community development program.

- Based on the review of similar past community forest development projects, it is reported that introduction of several incentives would play vital role for the long-term sustainable agroforestry community development. Those incentives are classified as social one (e.g., provision of the land certification) as well as financial ones (e.g., selling of non-forest products to nearby market).

- To achieve this, it would be beneficial to prepare relevant educational and capacity development programs for the community people in order to achieve deep understanding of the importance and of this project to them and strengthen their motivation to participate this community development project. It would be better to implement these education and C/D programs at the early planning stage of this agroforestry-based forest development program. Also, it is essential to carry out periodical monitoring activity in order to check progress of this community development (see Table 7.7.2).
- Candidate site for this community development project shall be established in the vicinity of reforestation area. Land owned by Lao Railway, including VLP candidate site is adjacent to this reforestation area within Dongphosy Forest Reserve. So, it would not be difficult to find out appropriate site for this agroforestry-based community development while establishing the ecological continuity to the reforestation area of Dongphosy Forest Reserve.

7.7.6 Outline of the draft Resettlement Action Plan

(1) Introduction

In the project site, the current status of households living therein and their legal status are studied (see Section 7.6.6). Decree on Compensation and Resettlement of People Affected by Development Projects stipulates in Article 6 as follows, "All Affected People, regardless of land use right, will be entitled to compensation for lost assets (structures, crops, trees) at replacement cost, and provided with other assistance during the transition period, and economic rehabilitation assistance to ensure that they are not worse off due to the project". Therefore, prior to the construction phase, it is necessary to formulate a resettlement action plan for those households and examine compensation schemes for them.

Technical Guidelines on Compensation and Resettlement in Development Projects shows an outline of Resettlement Action Plan as shown in Table 7.7.5. The project owner is required to submit a resettlement action plan to WREA prior to the project implementation because the WREA's approval of the plan is one of the conditions for obtaining the Environmental Compliance Certificate.

Table 7.7.5 Outlines of Resettlement Action Plan

	Items	Main contents
1	Introduction	- Description of project components - Summary description of adverse impacts and asset acquisition - Identification of principal stakeholders including social groups vulnerable to impoverishment or debilitation - Indicate measures taken to minimize adverse impacts
2	Census and socioeconomic survey results	- Review of socio-economic characteristics of project affected persons (PAPs) - Categories and numbers of PAPs by type and degree of impacts
3	Compensation entitlement criteria	- Description of objectives of compensation policy - Eligibility criteria for PAPs, including "cut-off date, if necessary - Description of compensation entitlements and other forms of assistance for each category of PAPs - Description of specific measures to mitigate adverse impacts on vulnerable groups (if relevant) - Entitlement matrix consistent with above"

	Items	Main contents
4	Relocation plan (if necessary)	- Review of suitability of alternative relocation sites - Site selection criteria - Review of environmental protection and management at resettlement sites - Preliminary relocation options of PAPs - Review of options for provision of shelter, infrastructure and social services - Review of consultation procedures with PAPs in selection of resettlement alternatives during implementation - Socio-economic data regarding host population, if applicable
5	Income restoration measures (as necessary)	- Description of eligibility criteria for income restoration measures - Feasibility analysis of any alternative income restoration programs - Institutional arrangements to finance and manage income restoration programs
6	Public participation, consultation, disclosure and grievance redress mechanism	- Public consultation exercises conducted during the RAP preparation with providing the details, concluding gender-specific consultation and information disclosure - Description of opportunities for PAPs to participate in resettlement planning and implementation - Procedures adopted for filling complaints, review and decision-making - Procedures for disclosing RAP and resettlement information on compensation and resettlement options to PAPs in a form and language that PAPs can understand
7	Organizational setup	- Administrative set-up and plan for training and capacity building as required
8	Monitoring and supervision	- Listing of performance monitoring indicators - Institutional responsibilities and procedures for internal project monitoring - Discussion of role of community-based organizations and non-benefit organizations - Content and frequency of monitoring reports
9	Cost estimates and budget	- Estimate of aggregate costs for each type of asset losses - Estimated costs for income restoration programs, administration, supervision and monitoring - Statement of financial responsibility for all resettlement-related costs - Physical and price contingencies
10	Implementation arrangements	- Timetable for implementing all resettlement activities, tied to overall sub-project timetable - Procedure for implementation or delivery of key elements

Source: Technical Guidelines on Compensation and Resettlement in Development Projects (2005), STEA

(2) Expropriation Procedure

In order to fulfill components listed above, the Project Owner will be required to do the followings described in Table 7.7.6.

Table 7.7.6 Further Actions Required to Project Owner for Finalizing Resettlement Action Plan

Items	Actions required for fulfilling the item	Description of the present situation
1. Census and socioeconomic survey results	- Exercising census and socio-economic baseline survey of all people and/or households affected by Project (PAPs) - Establishing the cut-off date for entitlement eligibility - Preparing inventory of assets of PAPs and/or households to be affected	Around thirty (30) houses were identified in and around Project Area. When Project Area is finalized, survey is necessary to clarify their profiles and legal status.
2. Compensation entitlement criteria	- Establishing categories of PAPs by assessing impacts on PAPs by Project - Examining and determining methodologies for assessment of compensation for PAPs' assets	People who made their livelihoods by cultivating grasslands were identified.

Items	Actions required for fulfilling the item	Description of the present situation
3. Relocation plan (if necessary)	- Practicing consultation among the Project Owner, PAPs and stakeholders in process of formulating relocation plan - Determining criteria for relocation and provision of replacement land which may be able to satisfy with PAPs' original land uses of agriculture land, residential land, housing and shops, and so on - Selecting sites for PAP's relocation by conducting assessment and feasibility studies of alternative sites - Calculating administrative relocation cost - Determining types and standards for facilities inside relocation sites and designing the layout of sites	Refer to description on 1 of this table.
4. Income restoration measures (as necessary)	- Planning an economic rehabilitation plan for restoring income and livelihood to be lost by Project - Implementation of plan - Institutional set-up for practicing activities proposed in plan	Refer to description on 2 of this table.
5. Public participation, consultation, disclosure and grievance redress mechanism	- Setting up grievance redress mechanism - Establishing grievance redress committee	Project Owner needs to discuss with local authorities how to coordinate information disclosure process after clarifying profiles of people living in Project Area and determining compensation systems
6. Organizational setup	- Establishing internal monitoring and reporting systems - Establishing external monitoring and evaluation systems by independent organizations throughout RAP implementation process and implementing systems	Project Owner needs to establish a special unit which is responsible for preceding entire resettlement process This unit will be also responsible for monitoring and supervision till completion of resettlement process and for grievance redress.
7. Monitoring and supervision		
8. Cost estimates and budget	- Estimating resettlement costs, covering formulating resettlement plan, compensation, relocation, income restoration, and administrative costs (monitoring costs may be included) - Forming annual budget fulfilling cost estimated in the whole process of resettlement implementation	Project may need relocations of people living in Project Area, therefore budget for relocations may be necessary to be kept by Project Owner.
9. Implementation arrangements		Unit mentioned above will be responsible for this action.

Source: JICA Study Team, with reference to Technical Guidelines on Compensation and Resettlement in Development Projects (2005), STEA

7.8 PUBLIC PARTICIPATION AND STAKEHOLDER MEETING

7.8.1 Introduction

(1) Outline

Within this VLP-related environmental and social studies, two (2) stakeholder meetings are held, based on JICA Guideline (see Table 7.8.1). Major objectives of these stakeholder meetings are to enhance the public participation from various stakeholders, establish comprehensive information disclosure, share common knowledge and understanding about proposed VLP project among stakeholders, and to support a smooth establishment of the project consensus. Summary of each stakeholder meeting is described in following section, separately.

Table 7.8.1 Schedule of Stakeholder Meeting.

	Date	Place	Main Topics
1	May 21, 2010 (Fri)	Conference Room of Thanaleng Station, Vientiane	1. Project Outline of VLP 2. ToR of VLP-related environmental and social studies. 3. Progress of VLP-related environmental and social studies

			4. JICA Guideline for Environmental and Social Considerations
2	July, 30, 2007 (Fri)	Same as above	1. Review Summary of 1st stakeholder meeting. 2. Results of Post-Meeting Survey 3. Progress of VLP-related environmental and social studies. 4. Current Status of Environmental License Application

Source: JICA Study Team

Beside these stakeholder meetings, a questionnaire-based public opinion survey, regarding the proposed VLP project, was conducted to encourage positive public participation and to disseminate VLP-related information among all stakeholders to achieve project consensus smoothly (see Section 7.6 for its survey schedule). Within this survey, 200 interviews were conducted at four (4) communities around Dongphosy Forest Reserve.

7.8.2 Information Disclosure

The information disclosure at the planning stage is important and would play vital role for any development projects. The importance of this process is also stressed out within JICA Guideline. After each stakeholder meeting, following information and/or material are disclosed for the public review purpose (see Table 7.8.2). Prior to this information disclosure process, a public notice that indicates the outline of this public review process was advertized on both Vientiane Mai (Lao) and Vientiane Times (English). Also, those information are put at the MPWT's website for the same disclosure period (http://www.mpwt.la.gov).

Table 7.8.2 Information Disclosure

	Descriptions
1st Stakeholder Meeting	
Public Review	June 11, 2010 – July 11, 2010
List of information	1. Presentation materials used at each stakeholder meeting 2. Contents of Q/A sessions (English) 3. Lists of Attendants 4. Photo Records 5. Post-meeting survey results
# of Info Request	3
2nd Stakeholder Meeting	
Public Review	August 12, 2010 – September 11, 2010
List of information	1. Presentation materials used at each stakeholder meeting 2. Contents of Q/A sessions (English) 3. Lists of Attendants 4. Photo Records 5. Post-meeting survey results
# of Info Request	2 (as of August 20, 2010)

Source: JICA Study Team

7.8.3 Summary of Stakeholder Meeting

(1) 1st Stakeholder Meeting

1) Outline of 1st Stakeholder Meeting

1st stakeholder meeting was held on May 21, 2010 at Thanaleng Station, Vientiane. Table 7.8.3 summarizes the outline of this 1st meeting. Registration started at 8:30 a.m. of May 21, and the meeting itself started at 9:00 a.m. of this morning. Originally, 50 stakeholders were selected from various organizations/agencies/schools/ NGOs/groups/communities and others, and then, invitation letters were sent to those selected stakeholders two weeks before this meeting. It turned out that 57 people attended at the 1st stakeholder meeting (see Appendix C).

Table 7.8.3 Outline of 1st Stakeholder Meeting

(1) Registration
(2) Opening Remarks
(3) Project background and Outline of Vientiane Logistics Park (VLP)
(4) ToR and Progress of VLP-related environmental and social studies.
(5) Explanation of JICA Guideline for Environmental and Social Considerations
(6) Q/A Session
(7) Post-meeting survey
(8) Closing Remarks

Source: JICA Study Team

2) Summary of Minutes of Meeting

During entire Q/A sessions, there were 9 questions and/or comments about this proposed VLP project (see Table 7.8.4). Minutes of meeting including a detailed descriptions of this Q/A session are attached in Appendix D. Also, photo records are attached in Appendix E.

Table 7.8.4 Categorization of Questions

Topics	# of Question
Compensation	
Compensation schemes to be applied for VLP	1
Environment	
Potential Environmental Impacts	1
Progress of VLP-related environmental studies	1
ToR of biological environmental study	1
Project General	
Motion of project title change	1
Project site	1
Implementation schedule	1
Coordination with on-going railway project	1
Coordination with other on-going development activities.	1
Total	9

Source: JICA Study Team

In order to evaluate overall achievement of this first stakeholder meeting, a simple questionnaire survey was conducted for all participants after all questions and answers session process was ended. There were 45 respondents for this post-meeting survey.

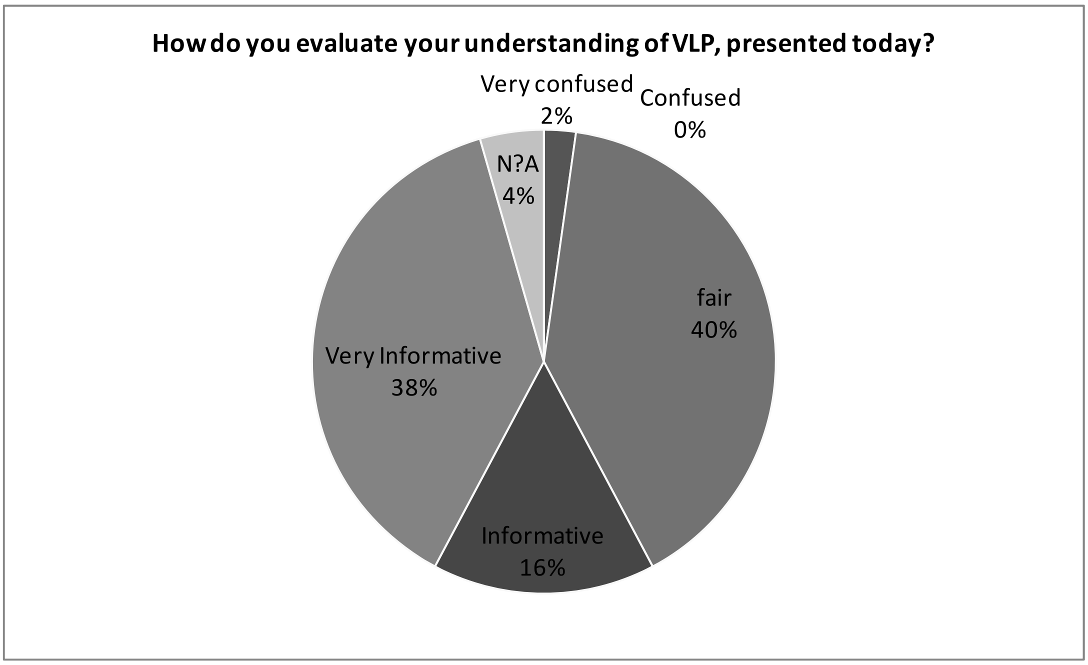
98 % of respondents (i.e., 42 persons) said they understood the outline of proposed VLP project, presented within this first stakeholder meeting fairly (see Figure 7.8.1). 40 percents (18 persons) said the proposed VLP project would cause negative environmental impacts on the surrounding environment (see Figure 7.8.2), and 60 percents (27 persons) said their situations would be improved if VLP project is implemented (see Figure 7.8.3). Also, 78 percents (35 persons) said they wished to have proposed VLP projects (see Figure 7.8.4). Lastly, 78 percents (35 persons) said they understood and/or got familiar with concepts and policy of JICA Guidelines for Social and Environmental considerations by attending this first stakeholder meeting (see Figure 7.8.6).

From this post-meeting survey, 38 comments about this VLP project are obtained (see Table 7.8.5 and Appendix D).

Table 7.8.5 Summary of Comments (Post-Meeting Survey: 1st stakeholder meeting)

Category	# of Comments
Engineering and Project Outline	14
Environment	6
Social/Cultural	4
RAP/Compensation	6
Others	8
Total	38

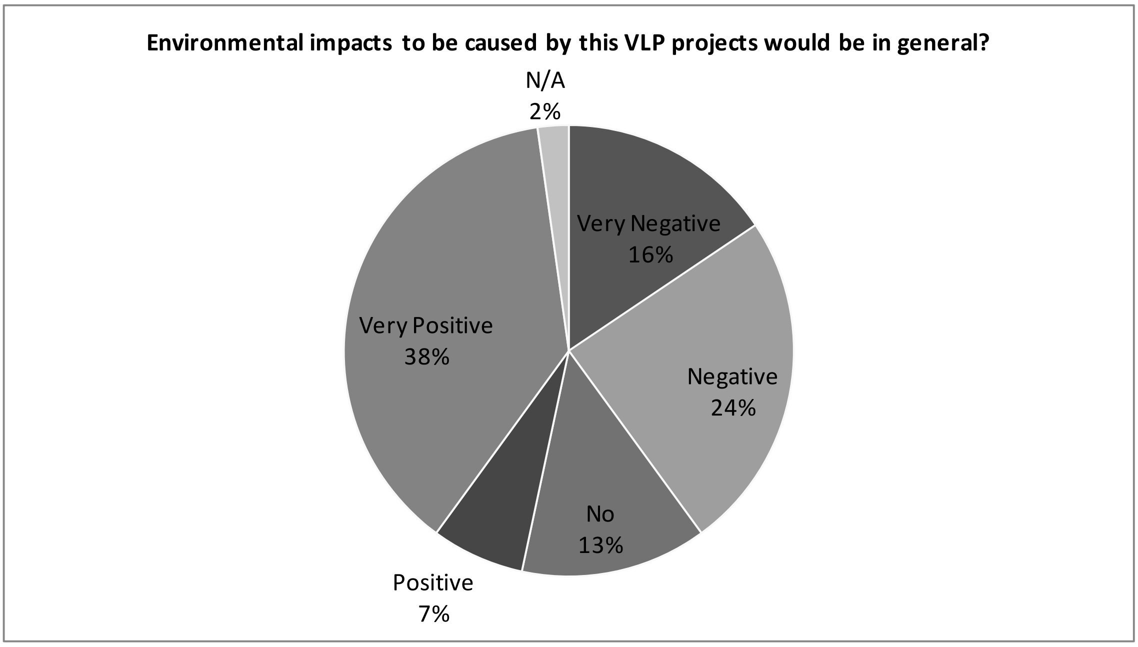
Source: JICA Study Team



Note: This survey was conducted at 2nd stakeholder meeting, held on May 21, 2010.

Source: JICA Study Team

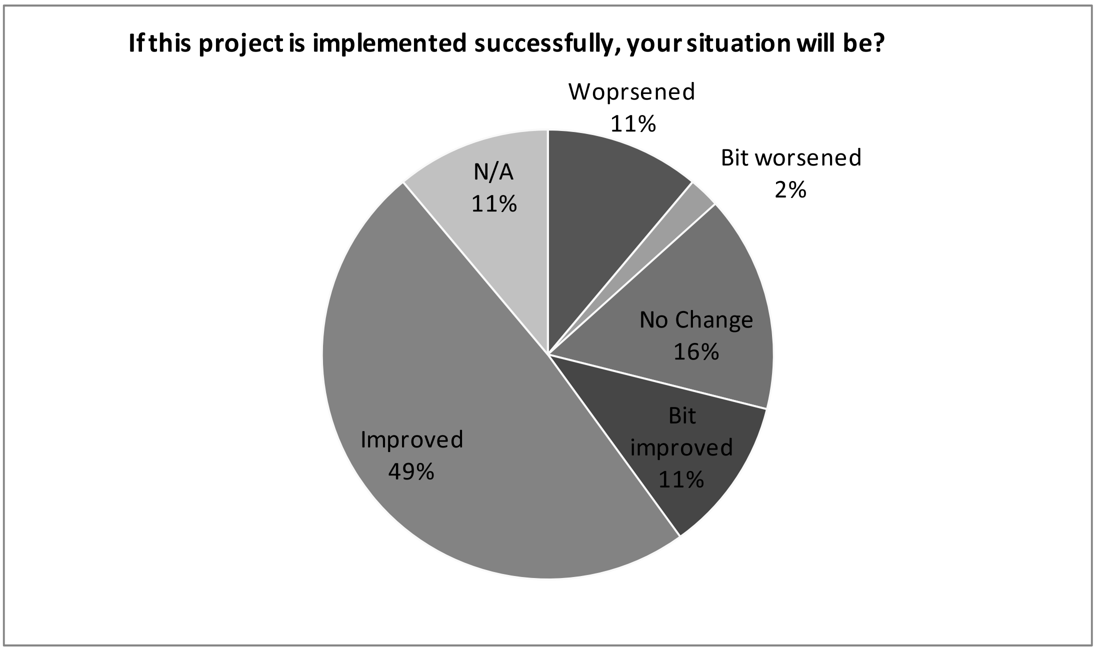
Figure 7.8.1 Post-Meeting Questionnaire Survey: Understanding of VLP Project



Note: This survey was conducted at 2nd stakeholder meeting, held on May 21, 2010.

Source: JICA Study Team

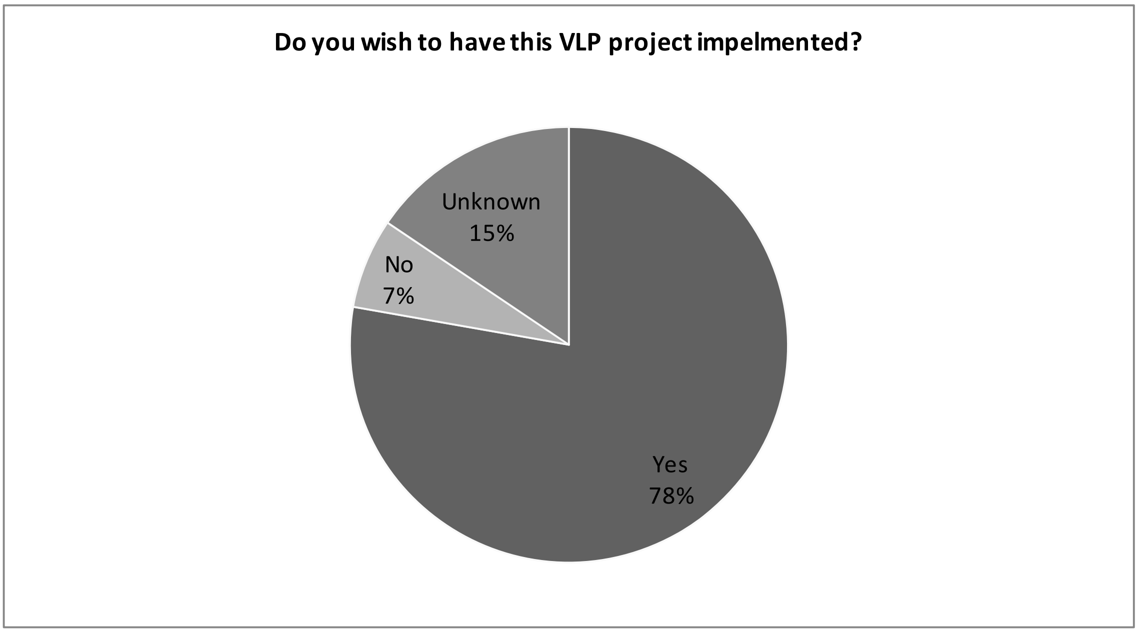
Figure 7.8.2 Post-Meeting Questionnaire Survey: Environmental Impacts



Note: This survey was conducted at 2nd stakeholder meeting, held on May 21, 2010.

Source: JICA Study Team

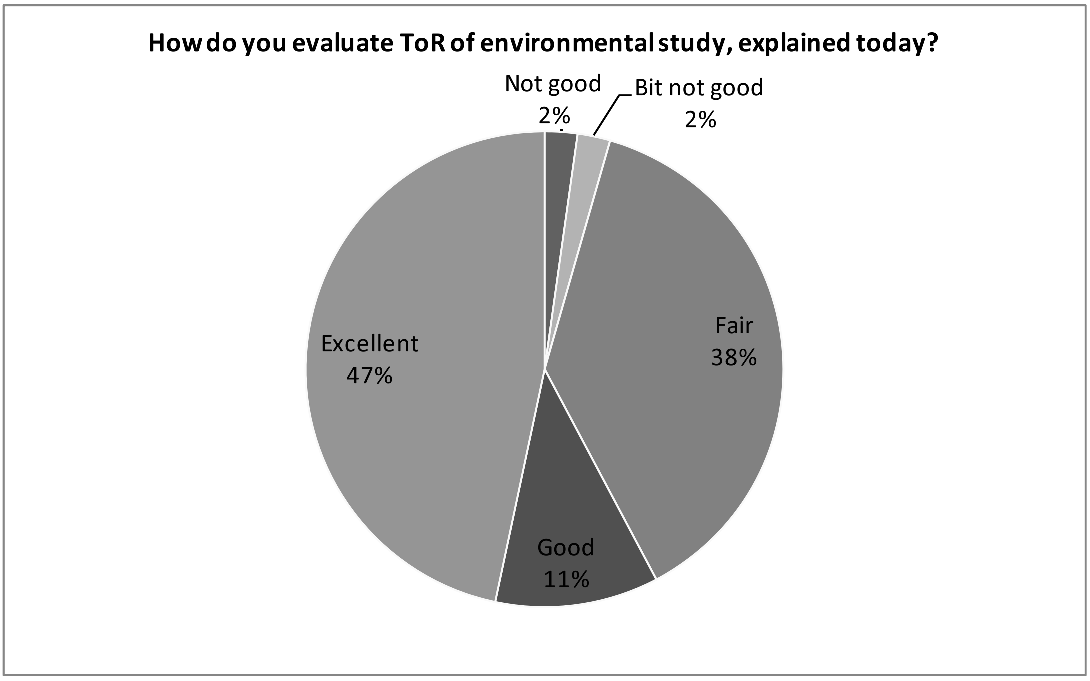
Figure 7.8.3 Post-Meeting Questionnaire Survey: Future situation



Note: This survey was conducted at 2nd stakeholder meeting, held on May 21, 2010.

Source: JICA Study Team

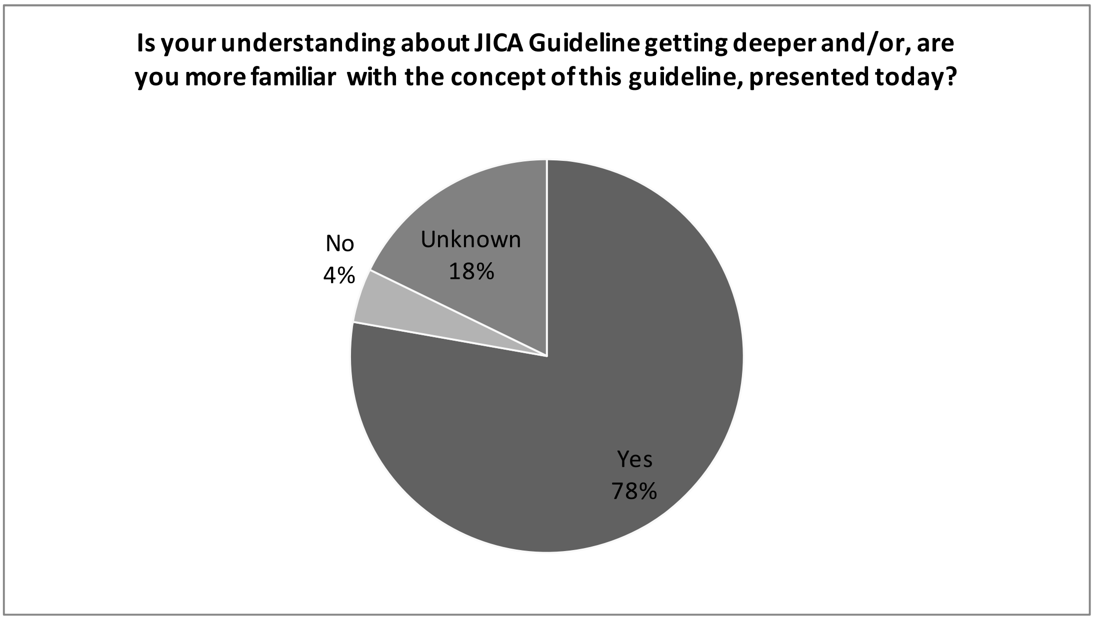
Figure 7.8.4 Post-Meeting Questionnaire Survey: Project Supporting



Note: This survey was conducted at 2nd stakeholder meeting, held on May 21, 2010.

Source: JICA Study Team

Figure 7.8.5 Post-Meeting Questionnaire Survey: ToR of VLP-related Environmental Studies



Note: This survey was conducted at 2nd stakeholder meeting, held on May 21, 2010.
Source: JICA Study Team

Figure 7.8.6 Post-Meeting Questionnaire Survey: Understanding of JICA Guideline

(2) 2nd Stakeholder Meeting

1) Outline of 2nd Stakeholder Meeting

2nd stakeholder meeting was held on July 30, 2010 at Thanaleng Station, Vientiane. Table 7.8.6 summarizes the outline of this 2nd meeting. Registration started at 8:30 a.m. of July 30, and meeting itself started at 9:00 a.m. of this morning. In addition to the list of 57 stakeholders, selected in previous 1st stakeholder meeting, several new stakeholders were added, and then, invitation letters were sent to those stakeholders. It turned out that 46 people attended at this 2nd stakeholder meeting (see Appendix F). It is noted that most of invitees from local community residents attended whereas not from government officials, in particular from MPWT and NGOs.

Table 7.8.6 Outline of 2ndt Stakeholder Meeting

(1) Registration
(2) Opening Remarks
(3) Review of Post-Meeting survey of 1st stakeholder meeting
(4) Project Outline
(5) Progress of VLP-related environmental/social studies.
(6) Survey Results of Social Study #2 (200 interviews-based).
(7) Survey Results of Social Study #1 (RAP-related)
(8) Current Status of Environmental Approval Process
(9) Coffee Break
(10) Question and Answer Session
(11) Post-Meeting Survey
(12) Closing Remarks

2) Summary of Minutes of Meeting

During entire Q/A sessions, mainly there were eight discussion topics about VLP projects (see Table 7.8.7). Minutes of meeting including a detailed description of this Q/A session are attached in Appendix G. Also, photo records are attached in Appendix H. Compared with previous question and answer session of the 1st stakeholder meeting, the number of comments and questions from local community people was relatively increased due to the sudden absence of government high-ranking officials.

Table 7.8.7 Categorization of Questions

Topics	# of Question
Environment	
Future EIA application and studies	1
Cultural impact study	1
Compensation	
Compensation scheme	5
Others	
Liaison with other competent office	1
Total	8

Source: JICA Study Team

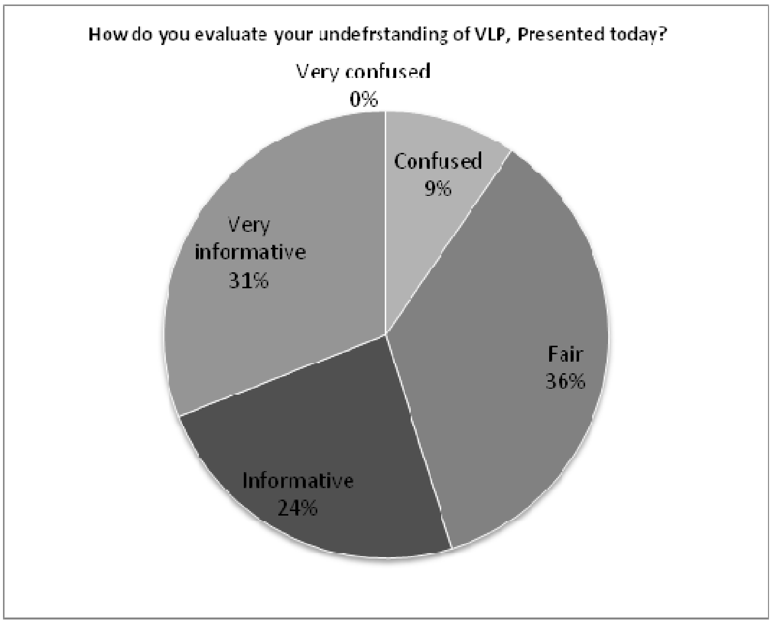
In order to evaluate overall achievement of this 2nd stakeholder meeting, as done in previous stakeholder meeting, a simple questionnaire survey was conducted for all participants after all questions and answers session process was ended. There were 42 respondents for this post-meeting survey.

91 % of respondents (i.e., 38 persons) said they understood the outline of proposed VLP project, presented within this meeting fairly (see Figure 7.8.7). Compared with previous result, only 7 percents (3 persons) said the proposed VLP project would cause negative environmental impacts on the surrounding environment (see Figure 7.8.8), this time, and 66 percents (28 persons) said their situations would be improved if VLP project is implemented (see Figure 7.8.9). Also, 81 percents (34 persons) said they wished to have proposed VLP projects (see Figure 7.8.10). All respondents are satisfied with study results and progress of VLP-related environmental and social studies (see Figure 7.8.11) and provide positive evaluations for two stakeholder meetings held so far (see Figure 7.8.12). From this post-meeting survey, 29 comments about this VLP project are obtained (see Table 7.8.8 and Appendix G).

Table 7.8.8 Summary of Comments (Post-Meeting Survey: 2nd stakeholder meeting)

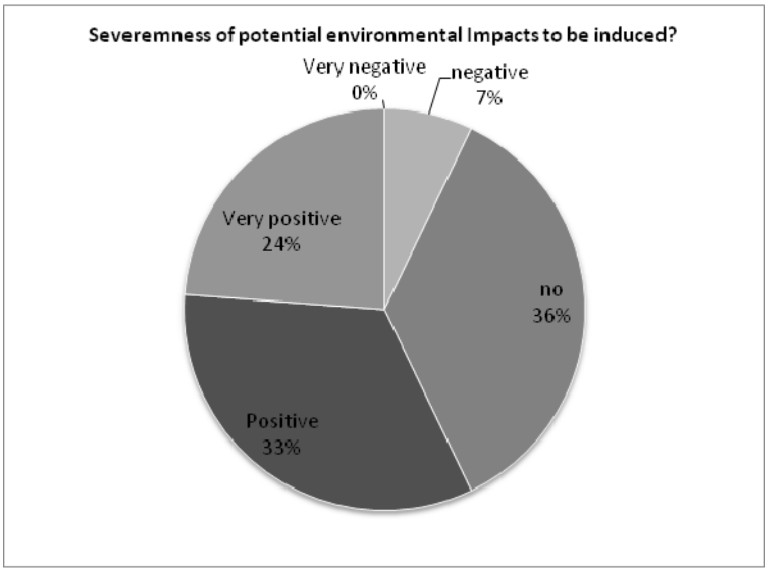
Category	# of Comments
Project Support	13
EIA/Environment	5
RAP/Compensation	10
Others	1
Total	29

Source: JICA Study Team



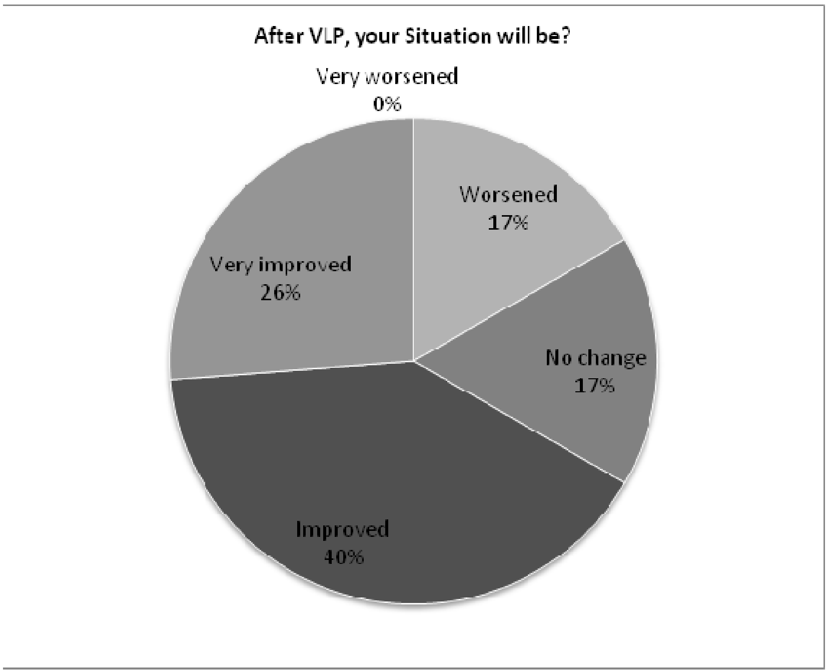
Note: This survey was conducted at 2nd stakeholder meeting, held on July 31, 2010.
Source: JICA Study Team

Figure 7.8.7 Post Questionnaire Survey: Understanding of VLP Project



Note: This survey was conducted at 2nd stakeholder meeting, held on July 31, 2010.
Source: JICA Study Team

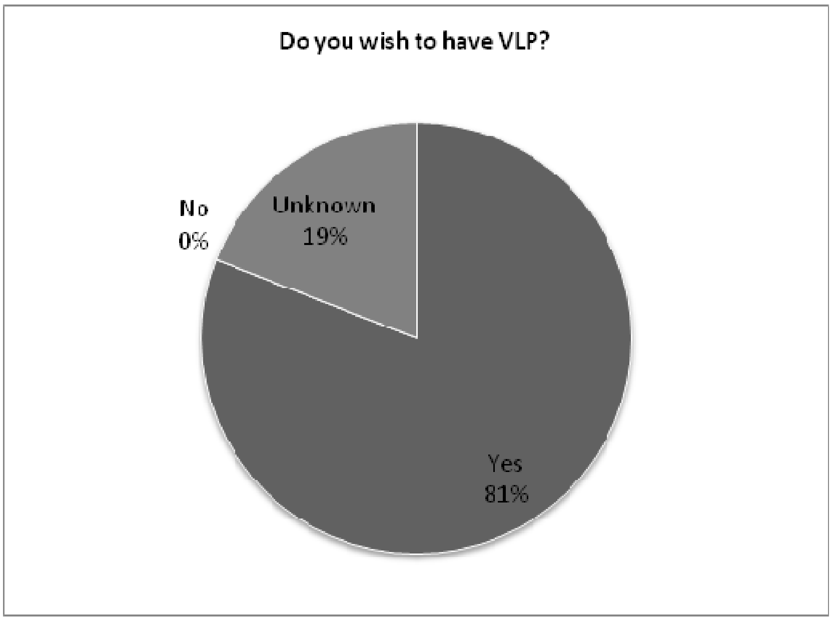
Figure 7.8.8 Post-Meeting Questionnaire Survey: Environmental Impacts



Note: This survey was conducted at 2nd stakeholder meeting, held on July 31, 2010.

Source: JICA Study Team

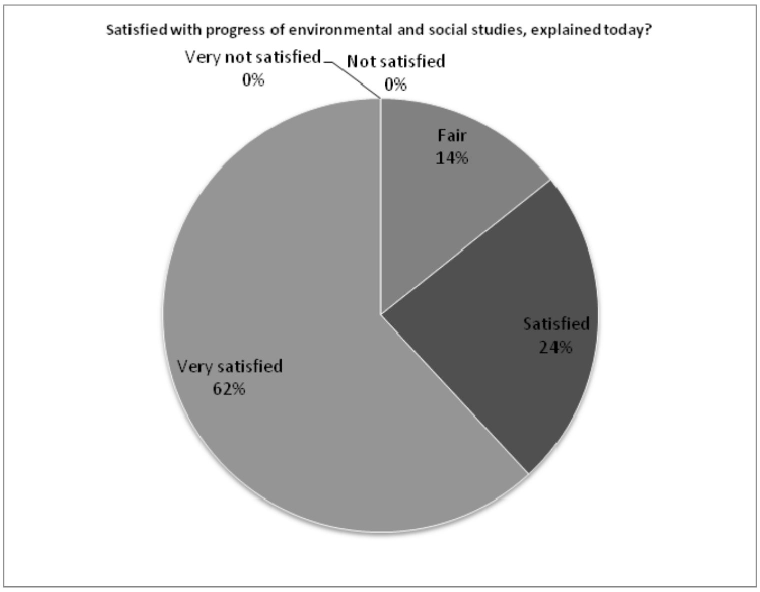
Figure 7.8.9 Post-Meeting Questionnaire Survey: Future situation



Note: This survey was conducted at 2nd stakeholder meeting, held on July 31, 2010.

Source: JICA Study Team

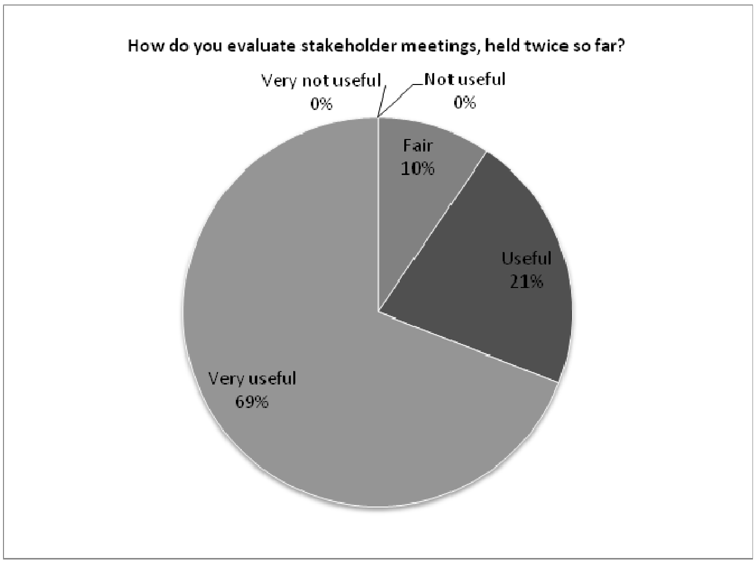
Figure 7.8.10 Post-Meeting Questionnaire Survey: Project Supporting



Note: This survey was conducted at 2nd stakeholder meeting, held on July 31, 2010.

Source: JICA Study Team

Figure 7.8.11 Post-Meeting Questionnaire Survey: Evaluation of VLP Env./Social Study



Note: This survey was conducted at 2nd stakeholder meeting, held on July 31, 2010.

Source: JICA Study Team

Figure 7.8.12 Post-Meeting Questionnaire Survey: Evaluation of Stakeholder Meeting

7.8.4 Public Opinion Survey

(1) Introduction

The community participation plays an important role for a proper infrastructure project planning and management. It is essential to examine variety of aspects of the proposed VLP project based on the current community's needs or priority. A socio-cultural survey regarding the implementation of proposed VLP project as well as past development projects is to be carried out in order to grasp the public opinion about this proposed project as well as current concerns about Dongphosy Forest Reserve from nearby community properly.

(2) Study Methods

Here, a questionnaire-based socio-cultural survey is conducted. Before starting the interview, the outline of the proposed VLP project is conducted, and then brief question and answer session is followed. After these processes, an individual interview using the questionnaire sheet is conducted (note that the questionnaire sheet used for this survey is attached in Appendix I). Basically, this questionnaire consists of three parts, covering from resident backgrounds, opinions about past and on-going infrastructure developments project around Dongphosy Area, and local concerns about Dongphosy Forest Reserve. Within this public opinion survey, totally 200 household interviews are conducted around the project sites (see Figure 7.8. 13).

(1) Dongphosy Village	50 households (HHs)
(2) Dong Phonghae Village	50 HHs
(3) Nakhouy Tai Village	50 HHs
(4) Xienda	50 HHs

Photo records of interviews at each survey sites are attached in Appendix G.

Note that orange-colored rectangular shaped box, drawn in the middle of the map, indicates the VLP project area.

Source: JICA Study Team

Figure 7.8.13 Four (4) Interview Sites for this Public Opinion Survey

(3) Discussions

All survey results and Figures are attached in Appendix K. Most of interviewees have lived there more than 20 years (72 %, 76 %, 82 5 and 84 % of Dongphosy, Dong Phonghae, Nakhouy Tai and Xienda, respectively, see Figure K2 of Appendix K). Most popular occupation is farmer (see Figure K1 of Appendix K) and their working places are located within their vicinities (see Figure K4).

Most of interviewees did not know the VLP project before this interview (72 %, 80 %, 70 % and 62 % of Dongphosy, Dong Phonghae, Nakhouy Tai and Xienda, respectively, see Figure K7), but all of them support the proposed VLP project unconditionally and conditionally (see Figure K12). Note that "conditional support" for the proposed VLP project means that all interviewees would support this project if it is guaranteed that appropriate compensations for the land expropriation is to be carried out.

Most of them feel that implementation of the proposed VLP project may lead to more improvement of local infrastructure, availability of more services, more educational opportunities and more employment opportunities whereas percentage showing the environmental concerns tend to be relatively smaller (see Figure K13).

Most of current local environmental concerns are roadside noise (48 %, 32 %, 36 % and 50 % of Dongphosy, Dong Phonghae, Nakhouy Tai and Xienda, respectively, see Figure K16), air quality (66 %, 68 %, 60 % and 78 % of Dongphosy, Dong Phonghae, Nakhouy Tai and Xienda, respectively, see Figure K16) and vehicular emission (48 %, 32 %, 40 % and 56 % of Dongphosy, Dong Phonghae, Nakhouy Tai and Xienda, respectively, see Figure K16). It is noted that one of main local unpaved road runs through the middle of Xienda Village, so that people of Xienda Village tends to show more environmental concerns for the roadside environment such as the noise, the air quality and the vehicular emission. Most of those environmental concerns are categorized into the worsened roadside environment, the traffic safety and the deforestation (see Figure K21). This may be due to the fact that constructions of several large infrastructure development projects were conducted around Dongphosy recently and regional traffic conditions are getting worse due to frequent circulations of heavy vehicles. Upon considering this result, the monitoring program of periodical roadside air quality and noise survey during the construction phase is proposed within this project (see Table 7.7.3).

Speaking of Dongphosy Forest Reserve, almost half of them know the local forest around the Thanaleng Station is reserved as the forest reserve area (40 %, 42 %, 54 % and 56 % of Dongphosy, Dong Phonghae, Nakhouy Tai and Xienda, respectively, see Figure K8), and most of them said the devastation of the current local forest condition around Dongphosy Forest Reserve is severe (70 %, 66 %, 84 % and 68 % of Dongphosy, Dong Phonghae, Nakhouy Tai and Xienda, respectively, see Figure K11). This may be due to the fact that recent illegal encroachments, occurred inside of Dongphosy Forest Reserve became very severe. Most of them have used forest products of Dongphosy Forest Reserve before (50 %, 60 %, 54 % and 68 % of Dongphosy, Dong Phonghae, Nakhouy Tai and Xienda, respectively, see Figure K9), but current use of forest products around Dongphosy Forest Reserve is not so popular. Only 22 %, 34 %, 20 % and 42 % of Dongphosy, Dong Phonghae, Nakhouy Tai and Xienda community people are still using those products, respectively (see Figure K10). These results indicate that daily lives of local communities do not highly depend on nearby community forest (i.e., do not strongly need timber/or non-timber products), and they may obtain other income (e.g., nearby factories or office jobs in Vientiane).

More detailed information of study results of this questionnaire-based public opinion survey is described in Technical Report.

(4) Conclusions

Within this study, stakeholder meetings are held at the conference room of Thanaleng Station twice. Most of PAPs, identified within RAP-related study (see Section 7.6.7 for more detailed information) as well as various governmental organizations such as MPWT and WREA attended this stakeholder meeting. In addition, the public opinion survey regarding the proposed VLP project is conducted in order to encourage a broad public participation from surrounding communities of VLP as well as to deepen the understanding and establish the project consensus smoothly.

From this compound public participation program, implemented within this study, it is found that most of local community people, including PAPs show conditional supports for the proposed VLP project. One of the most concerns they have is the compensation scheme, to be applied for the VLP project. Also, they show concerns for local environment such as the roadside noise and air quality.

Another series of public meetings, in particular, expropriation-related ones, are to be held before starting the construction of proposed VLP. As summarized in Section 7.7, it is essential to have public meetings periodically in order to make interaction among various stakeholders active, make the proposed VLP project more adaptable and acceptable to the local environment while achieving wide and smooth project consensus. It is strongly recommended that corresponding clauses shall be developed for the inclusion in the bid document.

7.9 Conclusions and Recommendation

7.9.1 Conclusions

Throughout this environmental and social study, it was found that current forest condition around the study site, inside of Dongphosy Forest Reserve, is getting worse due to the on-going development projects such as the construction of the golf course as well as rampant illegal encroachment activities therein. The selected site of this proposed VLP is located near existing Thanaleng Station, partially stepped into the reforestation zone, allocated within the future development plan of Dongphosy Forest Reserve. So, it would be essential to prepare environmental management program in order to establish a regional ecological continuity and harmonization in future.

Current local floral condition across Dongphosy Forest Reserve is classified as the “secondary forest” and illegal invasion and/or encroachment inside of this forest reserve become one of urgent problems to be solved. Also, a traditional slash-and burn agricultural method is common. No important site-specific floral/faunal species occur, but the ecological continuity to surrounding biological environment such as the wetland and the marsh of Houay Makhiao and the floodplain of the Mekong River, consisting of one of important riverine bird areas in Lao PDR, exists. In other words, there are nearby abundant genes/seeds outside resources. Some habitats of Dongphosy may be cleared due to the construction of VLP, but if certain part of Dongphosy Forest Reserve is conserved and the regional environment of those conserved area is kept at least habitable for any species, seeds can be supplied to, or small animals can migrate from those outside resources to Dongphosy Forest Reserve. So, it can be said that certain VLP-related forest management program has potential to revive original floral/or faunal condition within relatively short term.

Throughout a series of discussion with DoAF, Vientiane Capital, it is found that the northern half of Dongphosy Forest Reserve is planned to be used as the reforestation area although any specific reforestation programs as well as effective measures to prevent illegal invasions to the forest reserve are not figured out yet.

Although the proposed project will not cause significant negative impacts on this forest reserve, the restoration and/or the conservation of this forest reserve is one of important and challenging points for the EMP of the proposed VLP project. So, special care shall be taken to mitigate the further degradation of the regional forest condition while establishing consolidated working framework for the implementation of the proposed "agroforestry"-based community development with appropriate manpower and budget.

"Agroforestry"-based forest management initiative, presented in this study, is to revive regional green belt and sustain the local biodiversity, using the traditional knowledge, common to be seen in Lao PDR as well as Southeast Asia. Note that key components of the local restoration and/or conservation of the forest reserve is to establish well-coordinated link among MPWT, DoAF, MAF, National University of Lao PDR and local environmental NGOs while undertaking education concerning forest and biodiversity conservation for the general community.

Throughout two stakeholder meetings and the public opinion survey, conducted within this study, a project-related information disclosure as well as a proper public involvement were achieved. By these participating processes, local people of communities surrounding the study area are getting familiar with this proposed VLP project while their understanding of VLP project got deeper and widened. In general, most of surrounding communities including PAPs show support for the implementation of VLP project while PAPs show great concerns for the compensation scheme and its price.

Preliminary cost estimation of VLP-related expropriation is conducted, and the estimated cost is varied between approximately 3,711 million and 30,169 million KIP (or 451 thousand USD and 3,663 thousand USD) within this study. In general, it takes some times to change the compensation scheme to some extents which all stakeholders would be satisfied. So, it may be a good idea to proceed "land-to-land" based expropriation (i.e., the project owner prepare new lands for PAPs) to proceed entire VLP project successfully.

Also, it is found that local community people around Dongphosy have concerns for local environment such as roadside noise and air quality. To approach those concerns in constructive ways, it is essential to prepare a comprehensive environmental management program while establishing good liaisons among the project owner (i.e., MPWT), WREA, local communities and others for the successful implementation of VLP project.

7.9.2 Recommendations and Near Future Tasks

(1) Development of EMP for VLP project: It is quite essential to establish comprehensive and effective environmental mitigation/management programs during the project-planning phase of this project. Within this study, key directions and/or principles for the development of a comprehensive EMP are summarized. Based on that information and engineering results of D/D to be held after this feasibility study, the action plan for the implementation of EMP shall be developed before D/D will start. Also, it is recommended to carry out more detailed impact assessment studies such as the prediction of roadside noise and air quality during the construction phase as well as development of proper waste treatment program after the detailed

design and the construction schedule of this proposed VLP project are finalized.

(2) In particular, Agroforestry-based forest management plan, summarized within this study, will be a big challenge to improve the future regional forest condition around Dongphosy further. To proceed this initiative, it is essential to have close liaison/or joint working framework with relevant governmental organizations such as Department of Agriculture and Forest, Vientiane Capital and Ministry of Agriculture and Forest. Of course, IUCN and WCS, two key local environmental NGOs, and Department of Forest, National University of Lao PDR, have vast knowledge and research experiences of the eco-system around Vientiane Capital. Participation of those environmental NGOs and the local institute would be vital for the successful implementation of this EMP regarding the l environment.

(3) It is found that most of community people around the project site show concerns for the recent degradation of the local environment such as the roadside noise and air quality after several development projects were implemented. It is essential to have good liaison between the project owner and local communities surrounding VLP. To achieve this, it is recommended to have public meetings periodically in order to make interaction among various stakeholders active, make the proposed VLP project more adaptable and acceptable to the local environment while achieving wide and smooth project consensus during both construction and operation phases.

(4) Environmental Approval Process: As mentioned in Section 7.6.3, WREA concluded that the proposed VLP project need a full-scale EIA study based on 2010 EIA Law in July 2010. Also, they found that most of EIA-level environmental and social studies, conducted by JICA, would be applicable for the preparation of the EIA report, to be used for the official environmental approval process in Lao PDR (WREA, 2010). According to the 2010 EIA Law, the EIA report to be used for the environmental license application shall be prepared by consultants registered at WREA as well as ToR for relevant environmental and social studies must be approved by WREA. So, it is important to have a series of EIA-ToR discussion between MPWT and WREA and finalize the ToR of EIA study by reflecting the major study results of JICA Study Team promptly.

(5) Resettlement Action Plan: In order to make implementation of the VLP project successful one, the preparation of an appropriate resettlement action plan is one of the key factors. To achieve this, three major actions are necessary to be taken. Firstly, the number of PAPs shall be minimized by carefully reviewing the project layout as much as possible. Secondly, a reasonable compensation program shall be established for all of the PAPs. Comprehensive review of current market prices covering from the land price to allowance is useful for adjusting the official compensation price unit if necessary. In addition, a land-for-land-based compensation is worth for considering for vulnerable households. Finally a monitoring system shall be established in order to check the sufficiency of the compensation by monitoring the living quality of PAPs after the resettlement and/or relevant compensation processes are completed. This kind of monitoring system is also useful for providing data and information, to be feedback to next RAP for other new development projects.

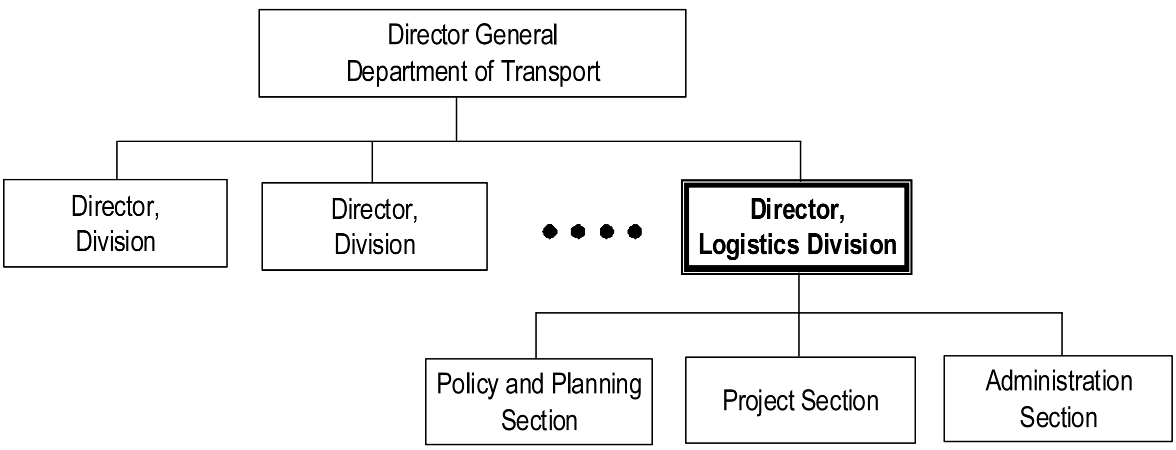
CHAPTER 8 PRELIMINARY IMPLEMENTATION PLAN

8.1 Implementation Body

As described in Chapter 6, Department of Transport of Ministry of Public Works and Transport will be the project owner and implementation body of the VLP project. Logistics Division is recommended to be newly established under the Department of Transport who will dedicate policy, planning and administration of logistics including logistics park development project. After establishment, the Logistics Division should be responsible for planning and implementing VLP, SLP and CLP projects with the following tasks:

- Project preparation (EIA, land acquisition, detailed design and tender documentation, management plan)
- Coordination with other agencies concerned
- Financing planning
- Selection of VLP-MC

Major tasks of Logistics Division will shift from logistics park development to realization of other actions under the national logistics strategy, and shift to be the organization which takes care of managing and supervising logistics parks and logistics businesses in the logistics parks.



Source: JICA Study Team

Figure 8.1.1 Logistics Division in MPWT (same as previous figure 6.2.1)

8.2 Implementation Schedule

Implementation process is divided into the following four stages: preparatory stage, design stage, construction stage and operation stage. As indicated in Figure 8.2.1, it takes 64 months to complete VLP from commencement of the preparatory stage.

8.2.1 Preparatory Stage

This stage starts with building of consensus to develop VLP, and Lao PDR Government will establish organization for the management of VLP project. The government will also have to investigate and decide financing plan, and carries out a procedure for financial arrangement. Preparation to start design works is also important work in this stage. This stage may take 12 months period. The followings are the major works during this stage:

- Consensus building for development of VLP
- Determination of financing plan
- Determination of project owner
- Preparation of loan application
- EIA and Land Acquisition
- Compilation of TOR and tender documents for selection of consultants
- Procedure for financial arrangement

8.2.2 Design Stage

The government will take consultant section works including finalization of TOR and tender). The selected consultant will conduct detailed design for access road, land preparation, building, facilities and utilities. In the end of the detailed design, the consultant will prepare bid documents for contractors. Total months for the design stage will be 29 months with contract negotiation and concurrence process from donor. The followings are the major works during this stage:

- Short list and finalization of TOR of consultants
- Selection of consultants (including tender, contract negotiation, concurrence from donor etc.)
- Detailed design
- Preparation of bid documents

8.2.3 Construction Stage

The selected contractor will start construction of access road, and conducting land preparation and building and facility works. On the way of the construction works, the consultant will prepare bid documents and select operators. After clearance of the construction works, machines and equipment for operator will be installed. This stage may take 23 months period. The followings are the major works during this stage:

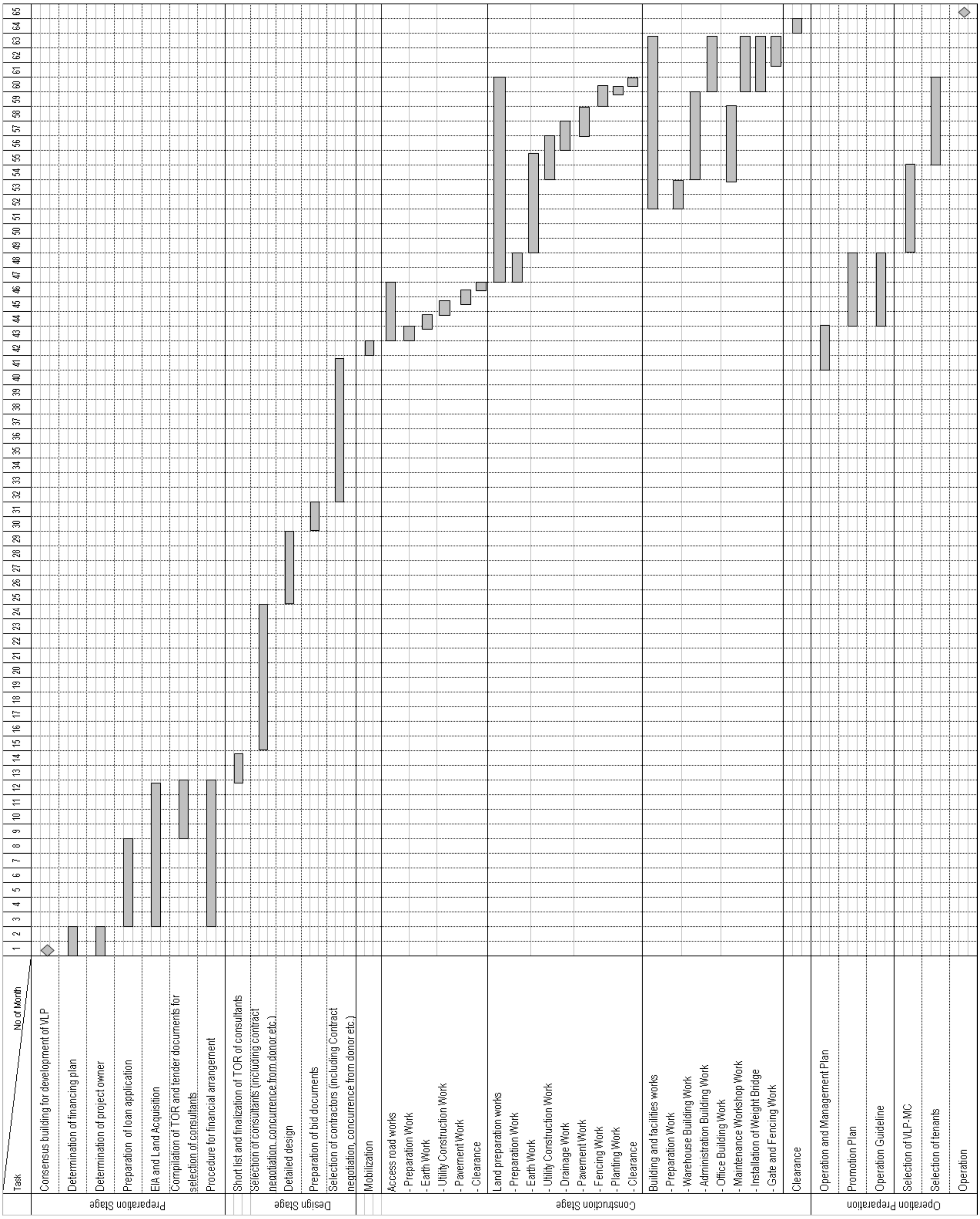
- Selection of contractors (including Contract negotiation, concurrence from donor etc.)
- Mobilization

- Access road works
- Land preparation works
- Utility construction Work
- Building and facilities works
- Gate and fencing works
- Machine installations
- Clearance

8.2.4 Operation Preparation Stage

In parallel with construction, project owner will select a company or a group which will work as VLP-MC. Selected VLP-MC will select tenants of VLP who directly provides logistics services to users. Selected tenants will install necessary machines and equipment for transshipment service, etc before starting operation of VLP. Total months in this stage will be 12 months. The followings are the major works during this stage:

- Selection of VLP-MC
- Selection of tenants
- Operation



Source: JICA Study Team

Figure 8.2.1 Implementation Schedule

8.3 Project Package for Implementation

8.3.1 Project Lots

The VLP consists mainly of three components such as VLP itself, access road and rail facility. The VLP project can be divided into two project lots from sequence of construction and work volume and characteristics of works. Lot 1 includes VLP and access road construction, while Lot 2 is for railway construction. Table 8.3.1 shows work item, components and their brief spec. and quantity by lot.

Table 8.3.1 Work Item, Components and quantity by Lot

Lot No.	Work Item	Contents	Summary (Quantity)	Cost (US$)
Lot 1	Civil Works of VLP	• Preparatory Work • Earth Work • Pavement • Utilities (Drainage, Waste Water, Water, Electricity, Telecommunication) • Green • Others	• Working Area: 40ha of a hill (including railway construction area) • Earth Volume: 1,278,300m3 of Excavation, 10,600m3 of Filling (including earth work of railway construction) • Pavement: 23ha including a road within a park area • Drainage: 4.9km • Waste Water: 1.4km pipes and a treatment plant • Water supply: 5.3km pipes and a water tank • Electricity: 1.6km for 22kv, 400m for 400/220v, 4 transformers and 340 poles for electricity and light • Telecommunication: 1,000m of telecommunication line • Tree Planting and Green: 1.7ha • Fencing: 1.4km	12,326,195
	Building Construction of VLP	• Warehouse • Office • Maintenance Shop • Parking • Weighbridge • Gate	• Container Freight Station (CFS): 20,000m2 • Truck Terminal: 3,000m2 • Office next to Warehouses: 6,200m2 • Administration Office: 2,400m2 • Maintenance Shop: 1,200m2 • Parking: 410m2 of parking area with roofs • Weighbridge: 6 • Gate: 3 gates (each gate has 2entrances and 2 exits)	8,384,640
	Access Road Construction	• New Road Construction	• Length & Width: L=1.6km, W=14.5m • Working Area: 2.4ha • Earth Volume: 42,200m3 of Excavation, 10,200m3 of Filling • Pavement: 18,700m2 • Drainage: 3,300m of concrete ditch • Street Light: 65 poles	2,546,050
		• Road Improvement	• Length & Width: L=1.4km, W=15.0m • Removal of Existing Pavement: 21,000m2 • Pavement: 16,100m2 • Drainage: 2,800m of concrete ditch, 80m of culvert	
	Sub-Total			23,256,885
Lot 2	Railway Construction	• Track Works • Drainage Works • Signal & Telecom.	• Track: 810tonnes of rail, 8,700 of sleepers, 9,300m3 of ballast • Drainage: 8,500m of concrete ditch • Signal & Telecom.: 12 sets of switch control, 11 sets of hand operation point, 2 sets of radio base station, 1 set of antenna tower, 1 set of DC power supply system, 20 sets of portable radio • Others	3,324,202
Total				26,581,087

Source: JICA Study Team

8.4 Required Consultants Service

8.4.1 Necessity and Scope of Consultant Service

VLP is proposed to provide high quality and capacity of logistics services in Vientiane in accordance with increased volume of freight cargo through the friendship bridge in future. VLP is also an indispensable facility to implement the national logistics strategy of "integration of cargo flow" and "business stimulation". Accordingly, the success of VLP depend only on the construction and operation of VLP but also on the mitigation of empty return cargo as well as the realization of competitive and transparent logistics market and participants (domestic and foreign logistics businesses). Looking at the current capacity of Lao government and relevant private businesses in Laos, it unfortunately seems not to be achieved by their own capacity. It is therefore necessary to have a consultant to technically support Lao Government to carry out VLP with relevant institutions.

In this regard, there seems to be at least two aspects of consultant services to be attached such as:

- Consultant service for VLP development (hard component)
- Consultant service for management, operation and necessary institutions (soft component)

(1) Consultant service for VLP development (hard component)

The consultant will be responsible for all technical matter to construct VLP and provide with technical advices to the project owner (maybe MPWT) for their division makings. The scope of the consultants for this purpose is listed up below:

- Review of capacity and demand
- Basic design
- Detailed design
- Cost estimate
- Preparation of tender documents
- Tender management and evaluation supports
- Construction supervision (check of shop drawings, control of construction schedule, coordination between project owner and contractors, cost management, quality control, liaison to JICA etc.)

(2) Consultant service for management, operation and necessary institutions (soft component)

The consultant will be responsible for developing proposals on necessary institutions, organization and schemes to efficiently operate VLP as well as to sufficiently perform along the national logistic strategy (of mitigation of empty return cargo as well as the realization of competitive and transparent logistics market and participants), and for assisting MPWT to take necessary actions to realize them. The scope of the consultants for this purpose is listed up below:

- VLP Operation and management plan

- VLP promotion plan
- Supports to set-up organization of VLP
- VLP operation guideline
- Preparation of tender documents for VLP management company
- Tender management and evaluation supports for VLP management company
- Advice on management and operation after operation of VLP

8.4.2 Anticipated Inputs of Consultants

(1) Anticipated Consultants and their TOR

The following experts shall be at least considered to be included in the consultant tem to carry out the scope of service described in the previous section. There are

- Team Leader
- Deputy Team Leaders (hardware, software, and local)
- Railway Engineer (foreign)
- Highway Engineer (foreign and local)
- Water Supply and Drainage Engineer (foreign and local)
- Architect (for VLP facility) (foreign and local)
- Cost Estimator (foreign and local)
- Document Specialist (foreign)
- Resident Engineer (for construction supervision) (foreign and local)
- Transport Planner (foreign and local)
- Environmental Specialist (foreign and local)
- Economist (foreign and local)
- Organization Specialist (foreign and local)
- Operation and Management Specialist (foreign and local)
- Investment Promotion Specialist (foreign and local)

Table 8.4.1 TOR by Expert for VLP Project

Experts	Foreign/Local	TOR
Team Leader	F	• Overall management of study Team • Liaison to project owner and donor • Review of capacity and demand • Basic design • Detailed design • Cost estimate • Preparation of tender documents • Tender management and evaluation supports • Construction supervision

Experts	Foreign/Local	TOR
		• VLP Operation and management plan • VLP promotion plan • Supports to set-up organization of VLP • VLP operation guideline • Preparation of tender documents for VLP management company • Tender management and evaluation supports for VLP management company • Advice on management and operation after operation of VLP
Deputy Team Leader (soft)	F	• Assistance to Team Leader • Review of capacity and demand • VLP Operation and management plan • VLP promotion plan • Supports to set-up organization of VLP • VLP operation guideline • Preparation of tender documents for VLP management company • Tender management and evaluation supports for VLP management company • Advice on management and operation after operation of VLP
Deputy Team Leader (local)	L	• Assistance to Team Leader • Review of capacity and demand • Basic design • Detailed design • Cost estimate • Preparation of tender documents • Tender management and evaluation supports • Construction supervision
Railway Engineer	F	• Review of capacity and demand • Basic design • Detailed design • Cost estimate • Preparation of tender documents
Highway Engineer	F	• Review of capacity and demand • Basic design • Detailed design • Cost estimate • Preparation of tender documents
Highway Engineer	L	• Review of capacity and demand • Basic design • Detailed design • Cost estimate • Preparation of tender documents
Water Supply and Drainage Engineer	F	• Review of capacity and demand • Basic design • Detailed design • Cost estimate • Preparation of tender documents
Water Supply and Drainage Engineer	L	• Review of capacity and demand • Basic design • Detailed design • Cost estimate • Preparation of tender documents
Architect (for VLP facility)	F	• Review of capacity and demand • Basic design

Experts	Foreign/Local	TOR
		• Detailed design • Cost estimate • Preparation of tender documents
Architect (for VLP facility)	L	• Review of capacity and demand • Basic design • Detailed design • Cost estimate • Preparation of tender documents
Cost Estimator	F	• Cost estimate • Preparation of tender documents
Cost Estimator	L	• Cost estimate • Preparation of tender documents
Document Specialist	F	• Preparation of tender documents • Tender management and evaluation supports • Preparation of tender documents for VLP management company
Resident Engineer (for construction supervision)	F	• Tender management and evaluation supports • Construction supervision • Preparation of tender documents for VLP management company
Resident Engineer (for construction supervision)	L	• Tender management and evaluation supports • Construction supervision • Preparation of tender documents for VLP management company
Transport Planner	F	• Review of capacity and demand
Transport Planner	L	• Review of capacity and demand
Environmental Specialist	F	• Advice on EIA • Environmental Mitigation Measures • Monitoring
Environmental Specialist	L	• Advice on EIA • Environmental Mitigation Measures • Monitoring
Economist	F	• VLP Operation and management plan • VLP promotion plan • Preparation of tender documents for VLP management company • Tender management and evaluation supports for VLP management company • Advice on management and operation after operation of VLP
Economist	L	• VLP Operation and management plan • VLP promotion plan • Preparation of tender documents for VLP management company • Tender management and evaluation supports for VLP management company • Advice on management and operation after operation of VLP
Organization Specialist	F	• VLP Operation and management plan • Supports to set-up organization of VLP • VLP operation guideline
Organization Specialist	L	• VLP Operation and management plan • Supports to set-up organization of VLP • VLP operation guideline
Operation and Management Specialist	F	• VLP Operation and management plan • Supports to set-up organization of VLP • VLP operation guideline
Operation and Management Specialist	L	• VLP Operation and management plan • Supports to set-up organization of VLP • VLP operation guideline

Experts	Foreign/Local	TOR
Investment Promotion Specialist	F	• VLP Operation and management plan • VLP promotion plan • VLP operation guideline • Preparation of tender documents for VLP management company • Tender management and evaluation supports for VLP management company • Advice on management and operation after operation of VLP
Investment Promotion Specialist	L	• VLP Operation and management plan • VLP promotion plan • VLP operation guideline • Preparation of tender documents for VLP management company • Tender management and evaluation supports for VLP management company • Advice on management and operation after operation of VLP

Note: F: Foreign expert, L: Local expert

Source: JICA Study Team

(2) Work Volume by Expert

To carry out the consultant service above described, the following inputs shall be taken into account as shown in Table 8.4.2. Approximately 50 MM of foreign exports and 70 MM of local experts shall be necessary for carrying out the "hard component", while approximately 35 MM of foreign exports and 20 MM of local experts shall be necessary for carrying out the "soft component". Accordingly foreign expert shall be required 85 man-months of total inputs, while the local consultants shall be required 90 man-months of total inputs

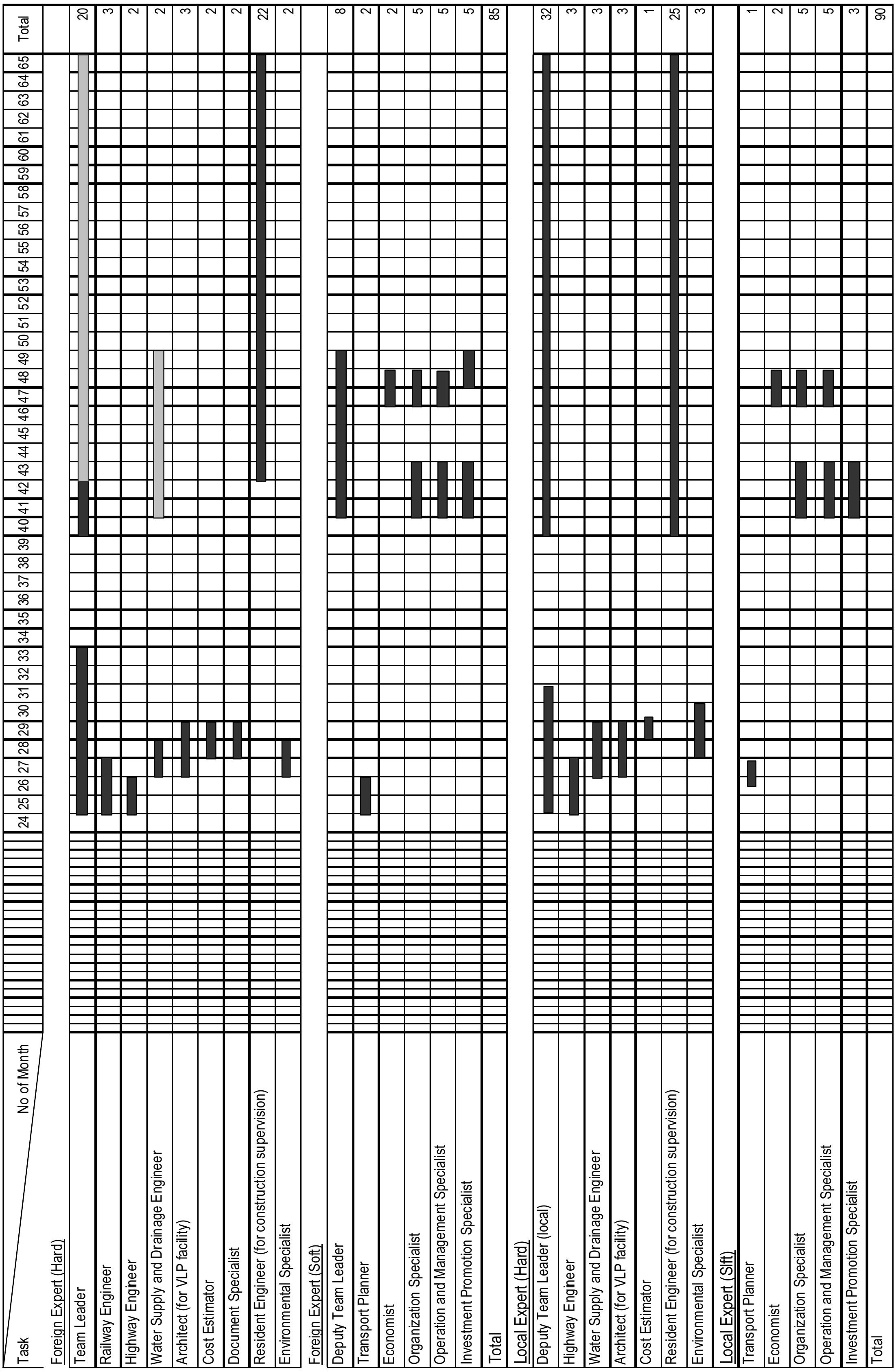
Table 8.4.2 Anticipated Inputs for "Hard Component" and "Soft Component" of VLP Project

	VLP Development (Hard Component)		VLP Relevant Institutions (Soft Component)	
	Foreign	Local	Foreign	Local
Team Leader	12		8	
Deputy Team Leader		32	8	
Railway Engineer	3			
Highway Engineer	2	3		
Water Supply and Drainage Engineer)	2	3		
Architect (for VLP facility)	3	3		
Cost Estimator	2	1		
Document Specialist	2			2
Resident Engineer (for construction supervision)	22	25		
Transport Planner			2	1
Environmental Specialist	2	3		2
Economist			2	2
Organization Specialist			5	5
Operation and Management Specialist			5	5
Investment Promotion Specialist			5	3
Total	50	70	35	20

Source: JICA Study Team

(3) Anticipated Consultants Input Schedule

Consultant assignment schedule is temporarily taken into account as shown in Table 9.4.2.



Source: JICA Study Team

Figure 8.4.1 Consultant Assignment Schedule (Temporary)

CHAPTER 9 ECONOMIC AND FINANCIAL APPRAISAL

9.1 Operation and Effect Indicators for VLP Project

The following items are set as indicators to assess performance and effect of the VLP Project.

- Cargo handling volume (tons/day),
- Number of handling trucks and trailers (vehicles/day)
- Number of wagons of freight train (cars/day)
- Handling volume at warehouse (tons/day)

Figures in Table 9.1.1 indicate performance in 2009 and targets in 2018.

Table 9.1.1 Operation and Effect Indicators for VLP Project

	Unit	2009	2018	Remarks
Cargo handling volume	Ton/day	818	2,233	Figure in 2009 comes from existing Tanaleen Warehouse. Figure in 2018 is estimated from demand forecast in 2015 (1,585 ton/day) and in 2025 (4,971 ton/day) (Table 4.3.12).
No of handling trucks and trailers	Vehicles/day	65	168	Estimated from cargo handling volume in 2009, 2015 and 2025, and under an assumption that vehicle transport volume is 24 tons for full loading and 12 tons for mixed loading. Nos of vehicles are 137 in 2015 and 317 in 2025 (Table 4.3.15 and Table 4.3.16).
No of wagons of freight train	Cars/day	NA	29	Estimated from no of wagons in 2015 (17 cars) and in 2025 (106 cars). No of cargos are calculated from handled volume of railway (288 ton/day in 2015 and 2,412 tons/day in 2025, Table 4.3.12).

Source: JICA Study Team

9.2 Financial Analysis

9.2.1 Introduction

In this section, financial feasibility of VLP Development Project was first analyzed followed by the financial analysis of the 3 organizational bodies of VLP. The organizational bodies consist of Project Owner, VLP-MC and Tenants, and roles of each body are explained in Chapter 6. In order to assess financial feasibility, the discount cash flow method was adopted and Financial Internal Rate of Return (FIRR) was used as an evaluation indicator (IRR method).

9.2.2 Basic Assumptions

JICA Study Team set the following basic assumptions.

(1) With-project and without-project

In “with-project” case, the VLP development project is conducted, and activities at Thanaleng Warehouse are perfectly substituted by the VLP. On the other hand, in the “without-project case” the VLP development project is not conducted, and the Thanaleng Warehouse will be used at current capacity in the future.

(2) Conditions to calculate project revenue

Based on demand forecast in Chapter 4, the JICA Study Team calculated the number of 2 axle trucks, 3 axle trucks and trailers at VLP in 2015 and 2025. The freight volume and number of vehicles in other years were interpolated, and financial revenue was calculated annually.

(3) Implementation Schedule

The implementation schedule presented in section 6.8 was used in this analysis. The JICA Study Team assumes that the consensus building for development of VLP will start in January 2011, and the construction works of VLP will be completed in January 2015. From February 2015, the VLP will start full operations.

(4) Project Life

The project life is 20 years after the start of operations, assuming 20 years contract period for VLP-MC. That is to say operation of the project will start in February 2015 and end in December 2034.

(5) Price

The project cost as of November 2009 was used in this analysis. The exchange rate was determined from the average rate in the 3rd quarter of 2009: USD 1.00 is equivalent to JPY 93.57, LAK 8,507.61 and THB 33.84.

9.2.3 Financial Analysis of VLP Development Project

At first, Financial Internal Rate of Return of VLP project was calculated under the assumption that the project implementation body is a single unit (project FIRR). In this case, project revenue and cost items indicated in Table 9.2.1 were used to calculate IRR.

Table 9.2.1 Cash Inflow and Cash Outflow to Calculate Project FIRR

Cash Outflow	Construction Cost of VLP Investment Cost for Cargo Trans-shipment O&M Cost for VLP
Cash Inflow	Revenue from Transport Operators

Source: JICA Study Team

(1) Project Revenue

Major revenue from VLP project is from trans-shipment charges and storage charges which are disbursed from transport operators to Tenants. Unit tariffs of trans-shipment and storage are set as indicated in Table 9.2.2. These tariffs are gleaned from tariffs used in Lat Krabang and Leam Chabang Port in Thailand.

The trans-shipment charges consist of lift-on/lift-off charges and stuffing/unstuffing charges. In case of a trailer with imported cargo, the containers[1] are trans-shipped to another trailer or trucks at VLP. If the containers are trans-shipped to another trailer, the lift-on/lift-off charge is collected twice when containers are lifted off and then lifted on. In addition to the lift-on/lift-off charge, stuffing/unstuffing charge is collected twice when cargo inside the container is trans-shipped. In the case of a truck which has imported cargo, the cargo is trans-shipped to another truck at VLP. In this case, only stuffing/unstuffing charge will be collected twice when cargo is unloaded and loaded.

The storage charge consists of storage charge at warehouse, cold storage, heavy bulk cargo area and general cargo CY area. Extra cargo movement charge is collected when cargo is moved from/to warehouse and cold storage. Other revenue items are parking fees and container wash charges. All vehicles which use VLP pay a parking fee which is THB33 per vehicle.

The 4th column and 5th column of Table 9.2.2 indicate volumes of tariff items and revenues in 2015 and 2025. Total revenue will amount to USD 3,874,000 in 2015 and USD 8,252,000 in 2025.

Table 9.2.2 Tariff Items and Revenue in 2025

Tariff Items	Unit Price (THB)	Handling Volumes in 2015	Handling Volumes in 2025	Revenue in 2015 (USD 000)	Revenue in 2025 (USD 000)
Lift-on/lift-off charge	400 per 20' container	25 containers per day	108 containers per day	154	664
Stuffing/unstuffing charge	1,200 per 20' container	107 containers per day	206 containers per day	1,918	3,577
User charge of warehouse	10 per ton	737 tons per day	1,841 tons per day	283	707
Extra cargo movement (warehouse)	350 per 20' container	123 containers per day	307 containers per day	641	1,603
User charge of cold storage	110 per ton	82 tons per day	205 tons per day	346	865
Extra cargo movement (cold storage)	350 per 20' container	14 containers per day	34 containers per day	71	178
Parking fee	33 per vehicle	132 vehicles	314 vehicles	22	53
General cargo storage charge	160 per 20' container per day[2]	76 containers per day	190 containers per day	93	234
Heavy bulk storage charge	160 per 20' container per day[3]	14 containers per day	35 containers per day	17	43
Container wash charge	300 per 20' container per day	37 containers per day	37 containers per day	328	328
Total	-	-	-	3,874	8,252

Source: JICA Study Team

(2) Project Expenditure

Annual disbursement of the total development cost which includes the total construction cost,

[1] It is assumed that a trailer has two 20' containers.
[2] Containers and cargo which are placed at CY will be charged from the 4th day of storage.
[3] Containers and cargo which are placed at bulk cargo area will be charged from 4th day of storage.

administration cost, consultancy cost and contingency is indicated in Table 5.6.1. The development cost was distributed as indicated in Table 9.2.3 under project implementation plan presented in Figure 6.7.1.

Table 9.2.3 Annual Disbursement of VLP Development Cost

Unit: USD 000

Item	1	2	3	4	Total	Remarks
Total Construction Cost			13,291	13,291	26,581	-
Administration Cost	199	199	199	199	797	3% of Total Construction Cost
Consultant Cost		1,116	372	372	1,861	7% of Total Construction Cost
Contingency		112	1,366	1,366	2,844	10% of Total Construction Cost and Consultant Cost
Total of Financial Cost	199	1,427	15,228	15,228	32,083	-

Source: JICA Study Team

Table 9.2.4 Investment Costs for Trans-shipment

Unit: USD 000

Items	Unit Price	Numbers (Unit)	Total
Crane	300	4	1,200
Forklift	30	30	900
Reach Stacker	450	2	900
Cold Storage	700	4	2,800
Total	-	-	5,800

Source: JICA Study Team

Other items to be invested in by VLP are cranes, forklifts and cold storage units purchased by Tenants as indicated in Table 9.2.4. The investment amounts to USD 5,800 in the final year of the construction, and this trans-shipment equipment will be replaced every 10 years.

As regards operation and maintenance expenditure, other major items are personnel expense of the VLP-MC and the Tenants, and diesel fuel for canes and forklifts which are used by the Tenants. These costs are calculated in Table 9.2.5. Annual cost of these items amounts to USD 583,300. The other item is utility charge at the working area of the Tenants and public space inside the VLP. Utility costs at working area of the Tenants are included in indirect costs, which are assumed to be 30% of personnel expenses and diesel fuel costs. It amounts to USD 517,000 per year. Utility costs at public space of VLP are assumed to be 1% of total development cost. The cost amounts to USD 320,800 per year.

Table 9.2.5 Operation and Maintenance Costs

	Unit Price (USD 000/year)	Persons	Amount (USD 000)	Remarks
Manager	100.0	3	300.0	
Assistant Manager	24.0	6	144.0	
Office Staff	6.0	24	144.0	
Operator	6.0	80	480.0	
Worker	2.4	200	480.0	
Diesel fuel			174.6	USD 0.7 x 4 liter x 7 hours x 260 days x 34 cranes/forklifts
Sub-total			1,772.6	
Total cost including indirect cost utility charges, etc)			2,239,4	30% of indirect cost

Source: JICA Study Team

(3) Calculation of Project FIRR

Table 9.2.6 indicates annual revenue, annual expenditure and net cash flow to calculate FIRR. The following assumptions were applied when revenue and cost items were listed.

- Operations in VLP will start in February 2015.
- In the final year of operation, a residual value (USD 9.1 million) of VLP was listed. The amount was calculated from amount of land preparation works (USD 12.3 million), railway works (USD 3.3 million) and access road works (USD 2.5 million) with an assumption that the lifetime of the land preparation works is 40 years[4].
- Revenue amount increases from 2015 to 2025 in accordance with increase in handling volume. After 2025, the revenue would remain constant. On the other hand, O&M costs remain constant during the operation and maintenance period.

As indicated in the final row of Table 9.2.6, calculated project FIRR is 6.8%.

Table 9.2.6 Calculation of Project FIRR

(Unit: USD 000)

Years from Start of Construction	Years from Start of Operations	Cash Inflow	Cash Outflow			Net Cash Flow
		Revenue	Develop-ment Cost	Investment for Trans-shipment Equipment	O&M Costs	
1			199			-199
2			1,427			-1,427
3			15,228			-15,228
4			15,228	6,050		-21,278
5	1	3,874			2,560	1,314
6	2	4,159			2,560	1,599
7	3	4,452			2,560	1,892
8	4	4,800			2,560	2,240
9	5	5,154			2,560	2,594
10	6	5,552			2,560	2,992
11	7	5,990			2,560	3,430
12	8	6,481			2,560	3,921
13	9	7,011			2,560	4,451
14	10	7,594		6,050	2,560	-1,016
15	11	8,252			2,560	5,692
16	12	8,252			2,560	5,692
17	13	8,252			2,560	5,692
18	14	8,252			2,560	5,692
19	15	8,252			2,560	5,692
20	16	8,252			2,560	5,692
21	17	8,252			2,560	5,692
22	18	8,252			2,560	5,692
23	19	8,252			2,560	5,692
24	20	8,252	-9,098		2,560	14,790
				Project FIRR		6.8%

Source: JICA Study Team

4 The sum of land preparation work (USD 12.3 million), railway work (USD 3.3 million) and access road work (USD 2.5 million) is USD18.2 million. USD18.2 million x 20 / 40 = USD9.1 million.

(4) Sensitive Analysis

The following items are risks of the projects:

- Fluctuation of cargo handling volume which would bring about fluctuation in annual revenue,
- Increase and decrease in operation and maintenance costs, and
- Shortage of project cost

Table 9.2.7 shows changes in Project FIRR that would arise from these risks; they are manifested as increases in annual revenue, annual expenditure and investment expenditure

Table 9.2.7 Results of Sensitivity Analysis

Cases	Increase in Annual Revenue (10%)	Decrease in Annual Revenue (10%)	Increase in Annual Expenditure (10%)	Decrease in Annual Expenditure (10%)	Increase in Investment Expenditure (10%)	Decrease in Investment Expenditure (10%)
Project FIRR	8.3%	5.2%	6.3	7.4	6.0	7.7

Source: JICA Study team

Increase in annual revenue would make a large impact on the Project FIRR. It would increase to 8.3% for a 10% increase in annual revenue. On the other hand, the impact of annual expenditure is limited. The Project FIRR would drop by 0.8% for a 10% increase in investment expenditure.

9.2.4 Financial Analysis for Project Owner, VLP-MC and Tenants

In this section, the FIRRs of the Project Owner, the VLP-MC and the Tenants are calculated separately. It is assumed that Tenants consist of two private companies in this analysis. Cash outflow and cash inflow items for the Project Owner, the VLP-MC and the Tenants are compiled in Table 9.2.8, Table 9.2.9 and Table 9.2.10, respectively. These tables indicate that the FIRRs of the Project Owner, the VLP-MC and Tenants depend on the annual amount of concession payment, which is paid from the VLP-MC to the Project Owner, and lease fees which are disbursed from Tenants to VLP-MC.

Table 9.2.8 Cash Outflow and Cash Inflow for Project Owner

Cash Outflow	Construction Cost of VLP
Cash Inflow	Concession payment from VLP-MC

Source: JICA Study Team

Table 9.2.9 Cash Outflow and Cash Inflow for VLP-MC

Cash Outflow	Concession payment to Project Owner, Utility cost for public space
Cash Inflow	Lease fee from Tenants

Source: JICA Study Team

Table 9.2.10 Cash Outflow and Cash Inflow for Tenants

Cash Outflow	Investment Cost for Trans-shipment Equipment, Lease fee to VLP-MC
Cash Inflow	Revenue from Transport Operators

Source: JICA Study Team

Table 9.2.11 indicates cash inflow, cash outflow and net cash flows to calculate FIRR for the Project Owner. Concession payment from VLP-MC, which is expressed as "Revenue", was set as USD 2.3 million annually. Cash outflow is construction cost of VLP in Table 9.2.6. Calculated FIRR for the Project Owner is 5.4%.

Table 9.2.11 Calculation of FIRR for Project Owner

Unit: USD 000

Years from Start of Construction	Years from Start of Operations	Cash Inflow	Cash Outflow	Net Cash Flow
1			199	-199
2			1,427	-1,427
3			15,228	-15,228
4		2,300	15,228	-12,928
5	1	2,300		2,300
6	2	2,300		2,300
7	3	2,300		2,300
8	4	2,300		2,300
9	5	2,300		2,300
10	6	2,300		2,300
11	7	2,300		2,300
12	8	2,300		2,300
13	9	2,300		2,300
14	10	2,300		2,300
15	11	2,300		2,300
16	12	2,300		2,300
17	13	2,300		2,300
18	14	2,300		2,300
19	15	2,300		2,300
20	16	2,300		2,300
21	17	2,300		2,300
22	18	2,300		2,300
23	19	2,300		2,300
24	20	2,300	-9,098	11,398
		FIRR for Project Owner		5.4%

Source: JICA Study Team

FIRRs of the Project Owner, the VLP-MC and the Tenants depend on concession fee from the VLP-MC to the Project Owner and lease fees from the Tenants to the VLP-MC. If the VLP-MC and the Tenants were a single body, cash inflow, cash outflow and net cash flow would be indicated as shown in Table 9.2.12. Calculated FIRR for the single body would be 11.7%.

Table 9.2.12 Calculation of FIRR for Combination of VLP-MC and Tenants

Unit: USD 000

Years from Start of Construction	Years from Start of Operations	Cash Inflow	Cash Outflow		Net Cash Flow
		Revenue	Investment for Trans-shipment Equipment	O&M Costs	
1					0
2					0
3					0

Years from Start of Construction	Years from Start of Operations	Cash Inflow	Cash Outflow		Net Cash Flow
		Revenue	Investment for Trans-shipment Equipment	O&M Costs	
4			6,050		-6,050
5	1	3,874		4,860	-986
6	2	4,159		4,860	-701
7	3	4,452		4,860	-408
8	4	4,800		4,860	-60
9	5	5,154		4,860	294
10	6	5,552		4,860	692
11	7	5,990		4,860	1,130
12	8	6,481		4,860	1,621
13	9	7,011		4,860	2,151
14	10	7,594	6,050	4,860	-3,316
15	11	8,252		4,860	3,392
16	12	8,252		4,860	3,392
17	13	8,252		4,860	3,392
18	14	8,252		4,860	3,392
19	15	8,252		4,860	3,392
20	16	8,252		4,860	3,392
21	17	8,252		4,860	3,392
22	18	8,252		4,860	3,392
23	19	8,252		4,860	3,392
24	20	8,252		4,860	3,392
		FIRR for the single body			11.7%

Source: JICA Study Team

Table 9.2.13 indicates changes in the FIRRs of the Project Owner and the single body (combination of the VLP-MC and the Tenants) in accordance with increase/decrease of concession payment from the single body[5]. If the single body would pay USD 2.9 million per year, the FIRR of the Project Owner would increase to 7.9%, and the FIRR of the single body would drop to 6.7%. On the contrary, if the single body would pay USD 1.7 million per year, the FIRR of the Project Owner would drop to 2.8%, and the FIRR of the single body would increase to 17.1%. When the existing Tanaleen ICD was operated by a private company during 1998 and 2008, monthly concession fee was 200,000 Baht per month per hectare. When VLP-MC and tenants disburse USD2.3 million of transfer to the project owner, the amount per month per hectare is around 220,000 Baht. Considering modernization of facilities and difference in price, a concession payment of USD2.3 million per year would be reasonable.

Table 9.2.13 Change of FIRRs for Project Owner and VLP-MC

Annual Concession payment (USD 000)	1,700	1,900	2,100	2,300	2,500	2,700	2,900
FIRR for Project Owner (%)	2.8	3.7	4.6	5.4	6.3	7.1	7.9
FIRR for the single body (%)	17.1	15.2	13.4	11.7	10.0	8.3	6.7

Source: JICA Study team

The same trade-off relation is observed between the VLP-MC and the Tenants. If the Tenants consisted of two private companies which handle the same volume and have the same size of trans-shipment facility, cash inflow, cash outflow and net cash flow of the VLP and a tenant would

[5] Since lease fee from the Tenants to the VLP-MC is money transaction between these bodies, it is offset in this calculation.

be as indicated in Table 9.2.14 and Table 9.2.15. In this case, a tenant would disburse USD 1.3 million to the VLP-MC per year.

Table 9.2.14 Calculation of FIRR for the VLP

Unit: USD 000

Years from Start of Construction	Years from Start of Operations	Cash Inflow	Cash Outflow		Net Cash Flow
		Revenue	Investment for Trans-shipment Equipment	O&M Costs	
1					0
2					0
3					0
4			250		-250
5	1	2,920		2,876	44
6	2	2,920		2,876	44
7	3	2,920		2,876	44
8	4	2,920		2,876	44
9	5	2,920		2,876	44
10	6	2,920		2,876	44
11	7	2,920		2,876	44
12	8	2,920		2,876	44
13	9	2,920		2,876	44
14	10	2,920	250	2,876	-206
15	11	2,920		2,876	44
16	12	2,920		2,876	44
17	13	2,920		2,876	44
18	14	2,920		2,876	44
19	15	2,920		2,876	44
20	16	2,920		2,876	44
21	17	2,920		2,876	44
22	18	2,920		2,876	44
23	19	2,920		2,876	44
24	20	2,920		2,876	44
		FIRR for VLP-MC			12.1%

Source: JICA Study Team

Table 9.2.15 Calculation of FIRR for Combination of VLP-MC and Tenants

Unit: USD 000

Years from Start of Construction	Years from Start of Operations	Cash Inflow	Cash Outflow		Net Cash Flow
		Revenue*	Investment for Trans-shipment Equipment	O&M Costs	
1					0
2					0
3					0
4			2900		-2,900
5	1	637		992	-515
6	2	780		992	-373
7	3	926		992	-226
8	4	1,100		992	-52
9	5	1,277		992	125
10	6	1,476		992	324
11	7	1,695		992	543
12	8	1,940		992	788
13	9	2,205		992	1,053

Years from Start of Construction	Years from Start of Operations	Cash Inflow	Cash Outflow		Net Cash Flow
		Revenue*	Investment for Trans-shipment Equipment	O&M Costs	
14	10	2,497	2900	992	-1,555
15	11	2,826		992	1,674
16	12	2,826		992	1,674
17	13	2,826		992	1,674
18	14	2,826		992	1,674
19	15	2,826		992	1,674
20	16	2,826		992	1,674
21	17	2,826		992	1,674
22	18	2,826		992	1,674
23	19	2,826		992	1,674
24	20	2,826		992	1,674
		FIRR for a tenant			11.7%

Note: Lease fee from a tent to the VLP-MC (USD 1.3 million per year) is excluded.

Source: JICA Study Team

In these tables, it is assumed that the VLP-MC and a tenant have the organizations and trans-shipment facilities as indicated in Table 9.2.16, Table 9.2.17 and Table 9.2.18. A tenant disburses USD 2.9 million for investment of trans-shipment equipment every 10 years and USD 992,000 for operation and maintenance every year. The VLP-MC disburses USD 250 million for office equipment every 10 years and USD 2.9[6] million for operation and maintenance every year

Table 9.2.16 Investment Cost of a Tenant for Trans-shipment Equipment

Unit: USD 000

Items	Unit Price	Numbers (Unit)	Total
Crane	300	2	600
Forklift	30	15	450
Reach Stacker	450	1	450
Cold Storage	700	2	1,400
Total	-	-	2,900

Source: JICA Study Team

Table 9.2.17 Operation and Maintenance Costs of a Tenant

Item	Unit Price (USD 000/year)	Persons	Amount (USD 000)	Remarks
Manager	100.0	1	100	
Assistant Manager	24.0	2	48	
Office Staff	6.0	8	48	
Operator	6.0	40	240	
Worker	2.4	100	240	
Diesel fuel			87	USD 0.7 x 4 liter x 7 hours x 260 days x 17 cranes/forklifts
Sub-total			763	
Total cost including indirect cost utility charges, etc)			992	30% of indirect cost

Source: JICA Study Team

6 Sum of lease fee (USD2.3 million), O&M costs (USD225,000) and utility cost for public space (USD320,800).

Table 9.2.18 Operation and Maintenance Costs of the VLP

	Unit Price (USD 000/year)	Persons	Amount (USD 000)	Remarks
Manager	100.0	1	100	
Assistant Manager	24.0	2	48	
Office Staff	6.0	8	48	
Sub-total			196	
Total cost including indirect cost utility charges, etc)			255	30% of indirect cost

Source: JICA Study Team

The key figures used to set appropriate rates for concession fee and lease fee are opportunity costs of capital which are expressed by interest rates for the Project Owner, the VLP-MC and the Tenants. Since the Project Owner is a government entity, government bond rate is the most appropriate indicator. However, the government of Lao PDR has not issued government bonds and as such, this particular indicator is not available. Therefore, it could be possible to use loan rates from international financial institutions such as IMF and World Bank instead.

On the other hand, VLP-MC and the Tenants, which would be established by private companies or joint ventures, would raise part of their investment costs from loans from private financial institutions.

Table 9.2.19 shows interest rates for USD LIBOR (6 months) which is a base lending rate of the World Bank and ADB, USD SIBOR (3 months), and USD loan (3 to 6 years) from commercial banks in Lao PDR. The interest rates for USD LIBOR and USD SIBOR are very low yet the USD loan rate at commercial banks is nearly 10%. Therefore it is necessary to secure an FIRR of more than 10% for the VLP-MC and the Tenants.

The government of Lao PDR can procure a soft loan from international financial institutions. For example, Yen Loan to Lao PDR provides very soft conditions: 0.01% of interest rate and 40 years of loan period (with a 10 year grace period).

Table 9.2.19 Interest Rates of LIBOR, SIBOR and USD in Lao PDR

	Rate (%)
USD LIBOR (6 month) as of 30 June 2010	0.75250
USD SIBOR (3 month) as in June 2010	0.54
USD Loan of Commercial Banks (3 to 6 years)	9.10

Source: BBA LIBOR Web Page, Singapore MAS Web Page and Bank of Lao PDR Web Page

9.3 Economic Analysis

9.3.1 Introduction

The objective of Economic Analysis is to assess economic effect of VLP Project from the perspective of the national economy, and to clarify economic feasibility of the project. Discount cash flow method was adopted in this analysis, and Economic Internal Rate of Return (EIRR) was used as an evaluation indicator (IRR method).

9.3.2 Basic Assumptions

As regards the basic assumptions for this economic analysis, the same assumptions used in 9.1 were applied for this economic analysis. Economic benefit of the project is expressed by the difference between economic benefits of “with-project” case and “without-project” case.

9.3.3 Economic Benefits

(1) Assessment of the economic effects

By implementing the VLP project, the following economic effects will be realized:

- Creation of value added at VLP,
- Opportunity cost of cargo,
- Opportunity cost of vehicles (trucks and trailers),
- Reduction of Vehicle Operation Costs (VOC) which comes from modal shift from trailers to train cars,
- Reduction of CO_2 emission due to modal shift from trailers to train cars, and
- Stable provision of consumer goods and production goods to Lao people and Lao companies,
- Improvement of investment environment by reducing logistics costs in Vientiane Cpital, and
- Development of logistics industry in Vientiane Capital.

Out of these economic effects, items excluding stable provision of goods are identified as economic benefits. Detailed explanation of each economic benefit and its amount is presented in the following sections. Stable provision of consumer and production goods is very important from the viewpoint of steady national economic development; however, it is not regarded as an economic benefit due to complexity of calculation.

(2) Creation of Value Added

After completion of VLP, quality of service will improve and handled volume will increase. The amount is calculated from incremental amount of value added.

Additional revenue and expenditure of cargo handling service was analyzed in section 9.2.3. Incremental volume of value added was calculated from annual revenue minus annual O&M costs and estimated value added at existing Thanaleng Warehouse.

Expected value added will be USD 8.3 million in 2025. From existing service and proportion of handling volume at Thanaleng Warehouse, value added at the existing warehouse was estimated to be USD 1.7 million, 20% of the value added in 2025. Therefore, additional value added would be USD 6.6 million in 2025. It would increase from USD 3.1 million in 2015, and remain at the same level between 2025 and 2034.

(3) Opportunity Cost of Cargo

If VLP is not developed, the number of trucks and trailers coming to Thanaleng Warehouse would exceed its capacity. Currently it takes 0.75 hours for a truck or a trailer to load and unload cargo, but it would take more time if the number of trucks increases in the future. As a result, trucks and trailers would have to wait longer to load and unload. In this situation, waiting time for trucks and trailers and their cargo is a loss of opportunity cost. If VLP were to be completed, such opportunity cost would be recovered.

Table 9.3.1 Number of Trucks and Trailers and Opportunity Cost of Cargo

Item	Unit	2015	2020	2025
No. of Trucks (2 axles)	Vehicles/day	6	12	24
No. of Trucks (3 axles)	Vehicles/day	101	134	181
No. of Trailers	Vehicles/day	25	48	108
Difference in waiting time between 'with-project' and 'without-project' case	Hours/vehicle	0.47	6.83	23.25
Unit Opportunity Cost of Cargo (2 axles)	USD/hr	0.39	0.39	0.39
Unit Opportunity Cost of Cargo (3 axles)	USD/hr	1.08	1.08	1.08
Unit Opportunity Cost of Cargo (Trailers)	USD/hr	2.73	2.73	2.73
Time Value of Cargo	USD 000	22	499	3,032

Source: JICA Study Team

Table 9.3.1 indicates the number of trucks and trailers, difference in waiting time between 'with-project' and 'without-project' cases, unit of time value of cargo and total time value of cargo. The 2nd to 4th rows show those figures for different vehicle types (2-axle trucks, 3-axle trucks and trailers) in 2015, 2020 and 2025. The 5th row shows difference in waiting time between 'with-project' and 'without-project' cases. The Queue Method is applied to measure the time. The 6th to 8th row show unit opportunity costs of cargo calculated from the OD survey conducted by the JICA Study Team. The last row shows total time value of cargo. It will increase from USD 22,000 in 2015 to 3.0 million in 2025 in accordance with increase in differences in waiting times as number of trucks and trailers increase. Since capacity of VLP was set to meet freight demand in 2025 and unit opportunity cost of cargo is constant, opportunity cost of cargo will remain at the same level after 2025.

(4) Opportunity Cost of Vehicles

As well as cargo, the difference in waiting times for trucks and trailers between 'with-project' case and 'without-project' case was also identified as an economic benefit of the project. Table 9.3.2 indicates unit opportunity cost of vehicles. Some parameters such as number of trucks and trailers, and difference in time saving are the same as is the case for the opportunity cost of cargo. Unit opportunity cost of trucks and unit opportunity cost of trailers will increase in same manner as in the ADB Transport Sector Strategy Study. Unit opportunity cost of trucks/trailers will continue to increase after 2025 at an annual rate of 3.7%. The opportunity cost will be USD 1.50/hour for a trailer, USD 1.27/hour for a 3-axle truck and USD 0.83/hour for a 2-axle truck in 2034.

The 4th row of the table indicates total time value of vehicles. It will increase from USD 10,000 in 2015 to USD 1.8 million in 2025. After 2025, the time value will continue to increase due to increase in unit opportunity cost for vehicles.

Table 9.3.2 Opportunity Cost of Vehicles

Item	Unit	2015	2020	2025
Unit Opportunity Cost of Trucks (2 axles)	USD/hr	0.41	0.50	0.60

Unit Opportunity Cost of Trucks (3 axles)	USD/hr	0.63	0.76	0.91
Unit Opportunity Cost of Trailers	USD/hr	0.75	0.90	1.08
Total Time Value of Vehicles	USD 000	10	268	1,795

Source: JICA Study Team

(5) Reduction in VOC

Currently Thanaleng Warehouse handles only vehicle cargo. However, VLP will handle railway cargo as well as vehicle cargo. Therefore, reduction in VOC caused by modal-shift from vehicle transportation to railway transportation are included as one of economic benefits of the project.

Table 9.3.3 VOC Reduction by Modal Shift

Item	Unit	2015	2020	2025
Volume of Railway Freight in 'with-project' case	tons/day	288	-	2,412
No. of Trailers Transformed from Railway Freight in 'without-project' case	Vehicles/day	11	31	90
Unit Opportunity Cost (Difference between Vehicle Freight and Railway Freight)	USD/hr	3.3	4.0	4.8
Total VOC Reduction	USD 000	254	757	2,277

Source: JICA Study Team

Table 9.3.3 shows VOC reduction by modal shift. The second row shows volume of railway freight (the sum of imports and exports) in the 'with-project' case. The third row shows the number of trailers in the 'without-project' case. It was calculated from an assumption that each trailer would carry 24 tons of cargo which would have been transported by railway had the VLP been developed. Unit opportunity cost in the fourth row was calculated from opportunity cost of trailer and cargo used in the previous sections, and percentage of VOC reduction by transition to railway transportation. In the case of Thailand, ratio of VOC for railway transportation to road transportation is 15.3%[7]. Therefore, it was assumed that 80% of VOC would be saved by the modal shift from trailer to railway in this analysis. The fifth row indicates total VOC reduction calculated from number of trailers, unit opportunity cost and average travel time of trailers (31.9 hours according to OD survey). The VOC reduction would increase from USD 254,000 in 2015 to USD 2.3 million in 2025.

9.3.4 Economic Cost

(1) Estimation of Economic Investment Cost

Economic investment cost was calculated from financial investment cost presented in section 5.6. Contingency of the financial investment cost was excluded, and the non-trade portion of the investment cost was converted by use of standard conversion factor (hereinafter referred to SCF). According to "Study on Integrated Distribution Center in Savannakhet and Vientiane in Lao PDR", conducted by JETRO, the SCF was calculated as 96.4%: this value was applied in this analysis.

Table 9.3.4 indicates economic investment cost of VLP Development Project. Total economic investment cost is USD 28.9 million, 91% of the financial investment cost. Annual cost was

[7] VOC of road transport is USD0.066 per ton-kilometer. On the other hand, VOC of railway is USD0.0101 per ton-kilometer. The information comes from "Assessment of Modal Competitiveness and Traffic Potential of Rehabilitated, Railway in Cambodia, Final Report, January 2004"

distributed in accordance with Project Implementation Schedule presented in section 6.7.

Table 9.3.4 Economic Investment Cost of VLP Project

Unit: USD 000

Items	1	2	3	4	Total
Construction Cost			13,137	13,137	26,273
Administration cost	199	199	199	199	797
Cost for Consultant Service		1,116	372	372	1,861
Annual Total Cost	199	1,316	13,708	13,708	28,931

Source: JICA Study Team

The other investment items were cargo trans-shipment equipment such as cranes, forklifts and reach stacker. The investment amount is the same as that in Table 9.2.4, and would be replaced every 10 years.

(2) Operation and Maintenance Costs

Operation and maintenance (hereinafter referred as O&M) costs for economic analysis consisted of O&M costs of VLP-MC. Most O&M cost items are the same items used in the financial analysis indicated in Table 9.2.5; however, the personnel cost for workers (unskilled labor) was handled differently. Salaries for workers (around 200 persons in total) were excluded from operation and maintenance costs because monthly salaries for workers (USD 200 per month) were higher than minimum wage (638,000 kips), and the VLP project would generate new employment which exceeded the economic cost for unskilled labor. O&M costs of VLP-MC will be disbursed every year after starting operations in 2014.

9.3.5 Calculation of EIRR

Table 9.3.5 indicates economic benefit, economic cost, net cash flow and EIRR.

Table 9.3.5 Cash Flow for Calculation of EIRR

Years since Start of Construction	Years since Start of Operations	Economic Benefit				Economic Cost			Net Cash Flow
		Opportunity Cost of Cargo	Opportunity Cost of Vehicle	Reduction in VOC	Value Added	Economic Construction Cost	Investment Cost for Trans-shipment	O&M Costs	
1						199			-199
2						1,316			-1,316
3						13,708			-13,708
4						13,708	6050		-19,758
5	1	22	10	254	3,099			2,529	857
6	2	39	19	316	3,327			2,529	1,173
7	3	65	33	393	3,562			2,529	1,523
8	4	115	59	489	3,840			2,529	1,974
9	5	211	111	608	4,124			2,529	2,525
10	6	499	268	757	4,441			2,529	3,437
11	7	1,883	1,035	942	4,792			2,529	6,124
12	8	2,100	1,178	1,174	5,185			2,529	7,109
13	9	2,357	1,348	1,464	5,609			2,529	8,249
14	10	2,664	1,551	1,825	6,075		6050	2,529	3,537
15	11	3,032	1,795	2,277	6,602			2,529	11,177
16	12	3,032	1,862	2,301	6,602			2,529	11,268
17	13	3,032	1,932	2,326	6,602			2,529	11,362

Years since Start of Construction	Years since Start of Operations	Economic Benefit				Economic Cost			Net Cash Flow
		Opportunity Cost of Cargo	Opportunity Cost of Vehicle	Reduction in VOC	Value Added	Economic Construction Cost	Investment Cost for Trans-shipment	O&M Costs	
18	14	3,032	2,004	2,352	6,602			2,529	11,460
19	15	3,032	2,078	2,378	6,602			2,529	11,561
20	16	3,032	2,156	2,406	6,602			2,529	11,667
21	17	3,032	2,236	2,435	6,602			2,529	11,776
22	18	3,032	2,319	2,465	6,602			2,529	11,889
23	19	3,032	2,405	2,496	6,602			2,529	12,006
24	20	3,032	2,495	2,528	6,602	-8,980		2,529	21,108
								EIRR	12.5%

Source: JICA Study team

The 4th to 6th columns show economic benefits calculated in section 9.3.3, while the 7th to 9th columns indicate economic costs calculated in section 9.3.4. In the final year of operation, USD8.98 million of residual value is listed[8].The 10th column shows net cash flow. Calculated EIRR from the net cash flow is 12.5%.

9.3.6 Reduction in CO2 Emissions by Modal Shift

In accordance with modal shift from trailer to railway, CO_2 emission will decrease as well as VOC. Discharge volumes of CO_2 from a trailer and a diesel locomotive are as indicated in Table 9.3.6.

Table 9.3.6 Discharge Volumes of CO_2

	Discharge Volume (kg-CO_2)/ton-kilometer	Source
Diesel locomotive	0.015	JICA Study Report "The feasibility study on the development of dedicated freight corridor for Delhi-Mumbai and Ludhiana-Sonnagar in India: final report, 2007"
Trailers (maximum capacity of 30 tons, 80% loading ratio)	0.040	Calculated from "Common Guideline for Calculation of CO_2 Emission in Logistics Sector" prepared by Ministry of Economy and International Trade and Ministry of Land Transport and Infrastructure of the Government of Japan

With regards to a price of CO_2, "Nikkei - JBIC Carbon Quotation Index (http://www.joi.or.jp/carbon/h_index.html)" was applied. As of 28th June 2010, carbon quotation was JPY 1,463.4 per ton. Table 9.3.7 indicates reduction in CO_2 emissions and its economic value. Reduction volume of CO_2 was calculated from volume of railway freight, difference in VOC between trailer and diesel locomotives and length between Vientiane and Bangkok which is around 700 kilometers.

Table 9.3.7 Reduction in CO_2 Emissions by Modal Shift

Item	Unit	2015	2020	2025
Volume of Railway Freight in 'with-project' case	ton/year	68,640	195,940	561,600
Reduction in Volume of CO_2 Emissions	ton/year	1,191	3,400	9,746
Economic Value of VOC Reduction	USD 000	19	53	152

Source: JICA Study Team

[8] The residual value is calculated from the same idea with the financial analysis. USD17.96 million x 20 / 40 = USD8.9 million.

Economic value of VOC reduction indicated in the third row increases from USD 19,000 in 2015 to USD 152,000 in 2025. Total amount of economic value of VOC reduction from 2015 to 2034 amounts to USD 2.1 million.

9.4 Conclusion of Financial Analysis and Economic Analysis

9.4.1 Financial Analysis

(1) Project FIRR

Project FIRR for scenario where VLP Project was conducted by a single implementation body, is 6.8%. Since loan rate of US dollar for 3 to 6 years is 9.1%, the project would not be financially attractive if a private company developed and operated the facility. In addition to that, VLP Project also faces a significant risk because the amounts of annual revenue and expenditure are huge in comparison with initial investment. Therefore, the project should be conducted under cooperation between public sector and private sector.

(2) FIRR for Project Owner

FIRRs for Project Owner and VLP-MC depend on concession payment from the VLP-MC to the Project Owner every year. If the VLP-MC disbursed USD 2.3 million annually, FIRR for Project Owner would be 5.4%. If the Project Owner were a government entity that procured development funds from international institutions, the FIRR would be enough to justify the VLP Project.

(3) FIRRs for VLP-MC and Tenants

FIRR for VLP-MC is 12.1%, and FIRR for a tenant is 11.7%, respectively. In order to attract VLP-MC and Tenants, who are private companies or joint ventures, a certain level of FIRR is needed. As mentioned above, loan rate for US dollar for 3 to 6 years is 9.1%. Considering risk factors, an FIRR higher than 10% is favorable to attract private sector. Both FIRRs exceed 10%, and the components of VLP-MC and Tenants are financially feasible.

9.4.2 Economic Analysis

Calculated EIRR is 12.5%, which is higher than opportunity cost of capital of 12%. Therefore, the VLP Development Project is viable from an economic perspective.

9.4.3 Recommendation of Financing

As described above, the VLP Development Project would not be financially feasible if a loan from a private financial institution were used. However, the project would be financially feasible if a soft loan were applied. One major candidate for the soft loan is the Yen loan. The loan condition of the Yen loan for Lao PDR is the most favorable; an interest rate of 0.01% and a 40 year loan period (with 10 year grace period). If the yen loan were applied for the project, the project would move towards accomplishment.

CHAPTER 10 CONCLUSIONS

VLP project is rationalized by the Lao National Logistics Strategy, Social and Economic Development Plan of Vientiane Capital and urgent requirements for improvement on the current shortage of functional ICD facilities in Vientiane.

VLP should be developed with “Triple Multi” development concept i.e., (1) Multi-Modality, (2) Multi-Activity, and (3) Multi-Service; so as to perform the roles of (1) interface for international trade, (2) provision of transport options, (3) support to further industrialization of Vientiane, (4) efficient domestics hub, and (5) logistics business incubation.

It is appropriate for VLP to be located in the north-eastern area of Thanaleng Station in the Dongphosy forest, given that certain fitting environmental measures are taken into consideration.

VLP will handle around 4,960 tons/day of cargo in 2025 by both truck and railway. It is expected to have daily traffic of approximately 320 trucks and 15 trains. VLP will provide CIQ, storage, inventory management, trans-shipment and Multi-modal transport services with container yard, container freight station, truck terminal, etc. VLP will be provided with railway siding lines together with coupling and decoupling yard, access road and necessary utilities. Total area of VLP will be 30 ha. The construction cost for VLP is approximately USD 26.0 million, with USD 5.6 million required to cover miscellaneous costs; for a total project cost of USD 31.6 million.

Private sector participation is essential to realising good management and operations in VLP. The Lao Government shall assign the project owner of VLP who will then assign the VLP management company to take care of operations and management of VLP. Actual logistics business will be done by tenants who will be selected by the VLP management company.

In regard to economic and financial feasibility, VLP is a viable project in terms of the national economy. The EIRR, which is 13.0%, exceeds the opportunity cost of capital (12%). The FIRRs for VLP-MC and tenants are 18.3% and 15.2%, respectively, which are high enough to incite the interest of the private sector. In order to secure participation of the private sector, Lao PDR Government should prepare measures to mitigate project risks. The FIRR for project owner is 0.7%: it would be financially feasible if a soft loan such as yen loan were used for the project.

Accordingly, it can be said that the VLP project is a financially, technically and environmentally feasible project.

APPENDIX

Following 12 appendices are attached,

Appendix A	List of Bird Species observed around Mekong Floodplain including Dongphosy Forest Reserve
Appendix B	Locations and Photo Records of VLP Candidate Sites
Appendix C	List of Participants of 1st Stakeholder Meeting
Appendix D	Minutes of Meeting of 1st Stakeholder Meeting
Appendix E	Photo Records of 1st Stakeholder Meeting (held on May/21/10, Thanaleng Station, Vientiane)
Appendix F	List of Participants of 2nd Stakeholder Meeting
Appendix G	Minutes of Meeting of 2nd Stakeholder Meeting
Appendix H	Photo Records of 2nd Stakeholder Meeting (held on July/30/10, Thanaleng Station, Vientiane)
Appendix I	Questionnaire Sheet for Public Opinion Survey
Appendix J	Photo Record of Public Opinion Survey
Appendix K	Results of 200 interviews-based Public Opinion Survey
Appendix L	Study Results of EIA-Level Environmental Study

Appendix A List of Bird Species observed around Mekong Floodplain including Dongphosy Forest Reserve

Table A1 List of Bird Species observed around Mekong Floodplain including Dongphosy Forest Reserve

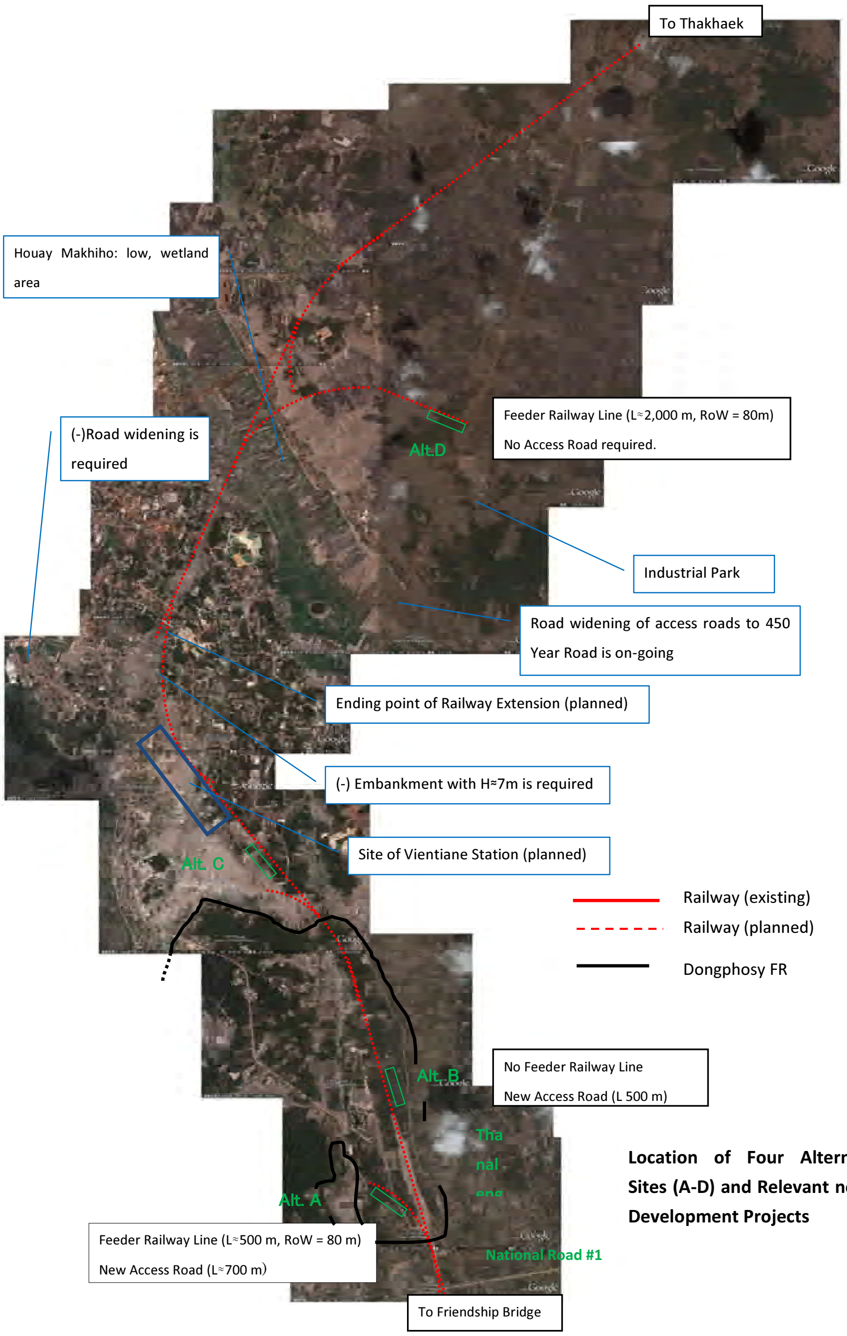
	English Name	Scientific Name
1	Lesser Whistling-duck	*Dendrocygna javanica*
2	Barred Buttonquail	*Turnix suscitator*
3	Buttonquail sp(p).	N/A
4	4-note barbet sp.	N/A
5	Indian Roller	*Coracias benghalensis*
6	Common Kingfisher	*Alcedo atthis*
7	White-throated Kingfisher	*Halcyon smyrnensis*
8	Black-capped Kingfisher	*Halcyon pileata*
9	Halcyon sp(p)	N/A
10	Green Bee-eater	*Merops orientalis*
11	Blue-tailed Bee-eater	*Merops philippinus*
12	Bee-eater sp(p)	N/A
13	Chestnut-winged Cuckoo	*Clamator coromandus*
14	Eurasian / Oriental Cuckoo	N/A
15	Cuculus sp	N/A
16	Plaintive Cuckoo	*Cacomantis merulinus*
17	Asian Emerald Cuckoo	*Chrysococcyx maculates*
18	Greater Coucal	*Centropus sinensis*
19	Lesser Coucal	*Centropus bengalensis*
20	Coucal sp.	N/A
21	Swiftlet sp(p).	N/A
22	Needletail sp(p).	N/A
23	Asian Palm Swift	*Cypsiurus balasiensis*
24	Fork-tailed Swift	*Apus pacificus*
25	Asian Barred Owlet	*Glaucidium cuculoides*
26	Spotted Dove	*Streptopelia chinensis*
27	Red Collared Dove	*Streptopelia tranquebarica*
28	Peaceful Dove	*Geopelia striata*
29	Slaty-breasted Rail	*Gallirallus striatus*

	English Name	Scientific Name
30	Crake sp(p).	N/A
31	Pintail / Swinhoe's Snipe	N/A
32	Common Snipe	*Gallinago gallinago*
33	Snipe sp	N/A
34	Green Sandpiper	*Tringa ochropus*
35	Wood Sandpiper	*Tringa glareola*
36	Greater Painted-snipe	*Rostratula benghalensis*
37	Black-winged Stilt	*Himantopus himantopus*
38	Little Ringed Plover	*Charadrius dubius*
39	Black Baza	*Aviceda leuphotes*
40	Black-shouldered Kite	*Elanus caeruleus*
41	Eurasian Marsh Harrier	*Circus aeruginosus*
42	Pied Harrier	*Circus melanoleucos*
43	Harrier sp(p)	N/A
44	Shikra	*Accipiter badius*
45	Common Buzzard	*Buteo buteo*
46	Common Kestrel	*Falco tinnunculus*
47	Chinese Pond Heron	*Ardeola bacchus*
48	Little Heron	*Butorides striatus*
49	Von Schrenck's Bittern	*Ixobrychus eurhythmus*
50	Cinnamon Bittern	*Ixobrychus cinnamomeus*
51	Brown Shrike	*Lanius cristatus*
52	Burmese Shrike	*Lanius collurioides*
53	Red-billed Blue Magpie	*Urocissa erythrorhyncha*
54	Ashy Woodswallow	*Artamus fuscus*
55	Black-winged Cuckooshrike	*Coracina melaschistos*
56	Ashy Minivet	*Pericrocrotus divaricatus*
57	ARS Minivet	N/A
58	Pied Fantail	*Rhipidura javanica*
59	Black Drongo	*Dicrurus macrocercus*
60	Ashy Drongo	*Dicrurus leucophaeus*
61	Lesser Racket-tailed Drongo	*Dicrurus remifer*
62	Spangled Drongo	*Dicrurus hottentottus*
63	Black-naped Monarch	*Hypothymis azurea*
64	Asian Paradise-flycatcher	*Terpsiphone paradisi*
65	Blue Rock Thrush	*Monticola solitarius*
66	Eurasian Blackbird	*Turdus merula*
67	Asian Brown Flycatcher	*Muscicapa dauurica*
68	Yellow-rumped Flycatcher	*Ficedula zanthopygia*
69	Red-throated Flycatcher	*Ficedula parva*
70	Hainan Blue Flycatcher	*Cyornis hainanus*
71	Blue flycatcher sp.	N/A
72	Grey-headed Canary Flycatcher	*Culicicapa ceylonensis*
73	Siberian Rubythroat	*Luscinia calliope*
74	Siberian Blue Robin	*Luscinia cyane*
75	Rufous-tailed / Siberian Blue Robin	N/A
76	Oriental Magpie Robin	*Copsychus saularis*
77	Common Stonechat	*Saxicola torquata*
78	Chestnut-tailed Starling	*Sturnus malabaricus*
80	Small starling sp(p)	N/A
81	Common Myna	*Acridotheres tristis*
82	White-vented Myna	*Acridotheres cinereus*
83	Barn Swallow	*Hirundo rustica*
84	Red-rumped Swallow	*Hirundo daurica*
85	Stripe-throated Bulbul	*Pycnonotus finlaysoni*
86	Streak-eared Bulbul	*Pycnonotus blanfordi*

	English Name	Scientific Name
87	Black Bulbul	*Hypsipetes leucocephalus*
88	Zitting Cisticola	*Cisticola juncidis*
89	Bright-headed Cisticola	*Cisticola exilis*
90	Rufescent Prinia	*Prinia rufescens*
91	Grey-breasted Prinia	*Prinia hodgsonii*
92	Plain Prinia	*Prinia inornata*
93	Japanese White-eye	*Zosterops japonicus*
94	Asian Stubtail	*Urosphena squameiceps*
95	Lanceolated Warbler	*Locustella lanceolata*
96	Rusty-rumped Warbler	*Locustella certhiola*
97	Oriental Reed Warbler	*Acrocephalus orientalis*
98	Thick-billed Warbler	*Acrocephalus aedon*
99	Common Tailorbird	*Orthotomus sutorius*
100	Dark-necked Tailorbird	*Orthotomus atrogularis*
101	Dusky Warbler	*Phylloscopus fuscatus*
102	Radde's Warbler	*Phylloscopus schwarzi*
103	Yellow-browed Warbler	*Phylloscopus inornatus*
104	Greenish Warbler	*Phylloscopus trochiloides*
105	Pale-legged Leaf Warbler	*Phylloscopus tenellipes*
106	Eastern Crowned Warbler	*Phylloscopus coronatus*
107	Blyth's Leaf Warbler	*Phylloscopus reguloides*
108	Grey-crowned Warbler	N/A
109	Abbott's Babbler	*Malacocincla abbotti*
110	Puff-throated Babbler	*Pellorneum ruficeps*
111	Babbler sp(p).	N/A
112	Striped Tit Babbler	*Macronous gularis*
113	Rufous-winged Bushlark	*Mirafra assamica*
114	Oriental Skylark	*Alauda gulgula*
115	Thick-billed Flowerpecker	*Dicaeum agile*
116	Scarlet-backed Flowerpecker	*Dicaeum cruentatum*
117	Ruby-cheeked Sunbird	*Anthreptes singalensis*
118	Olive-backed Sunbird	*Nectarinia jugularis*
119	Little Spiderhunter	*Arachnothera longirostra*
120	House Sparrow	*Passer domesticus*
121	Plain-backed Sparrow	*Passer flaveolus*
122	Eurasian Tree Sparrow	*Passer montanus*
123	White Wagtail	*Motacilla alba*
124	Citrine Wagtail	*Motacilla citreola*
125	Yellow Wagtail	*Motacilla flava*
126	Richard's Pipit	*Anthus richardi*
127	Paddyfield Pipit	*Anthus rufulus*
128	Olive-backed Pipit	*Anthus hodgsoni*
129	Red-throated Pipit	*Anthus cervinus*
130	White-rumped Munia	*Lonchura striata*
131	Scaly-breasted Munia	*Lonchura punctulata*

Source: Duckworth, personal communication, 2010

Appendix B Locations and Photo Records of VLP Candidate Sites



Location of Four Alternative Sites (A-D) and Relevant nearby Development Projects

<table>
<tr><th>Alternative A</th><th>Alternative B</th></tr>
<tr><td>
Traces of soil excavation around VLP candidate site</td><td>
Current floral condition at VLP candidate site (part 1)</td></tr>
<tr><td>
Houses located around VLP candidate site</td><td>
Current floral condition at VLP candidate site (part 2)</td></tr>
</table>

<table>
<tr><th>Alternative C</th><th>Alternative D</th></tr>
<tr><td>
Rice field and hut around VLP candidate site</td><td>
On-going construction of 450-Year Road near VLP candidate site.</td></tr>
</table>

	
Pond located around VLP candidate site	Swamps and wetland areas around VLP candidate site

Alternative E

Cargo handling area of existing Thanaleng Truck Terminal

Heavy Truck going out from existing Truck Terminal

Appendix C. List of Participants of 1st Stakeholder Meeting

Date: May 21st 2010

Venue: Conference Room of Railway Station, Thanaleng

Table C1 List of Attendance (Central/Local Governments and Others)

No	Name and Surname	Position	Organization
1	Mr. Mr. SoneSack Nansana	Deputy of Dept	Rail-way Organization, MPWT
2	Mr. Saythavy Yeangvannavong	Head of Assessment Department	MPI
3	Mun Manothong	Teacher	Vientiane High school
4	Ms. Khamsamay Orndavong,	Engineer of the Environmental Department	ESIA Department, WREA
5	Mr. HoumPhun Phaduangdeth	Engineer	Institution of PWT
6	Mr. KhamKorng	Engineer	Water Resource and Environment Research Institute, WREA
7	Mr. Khammone Jommanyvong	Deputy of PWT Division	DPWT
8	Mr. Kongsavanh	Engineer	Ministry of Mines and Energy
9	Mr. Sychanh Phuangsunti	Guard	NaKouy-Tay village
10	Ms. Kaysone	Vice-village chief	Dongphonhea village
11	Ms. Phuangphet	Village chief	Dongphosy
12	Mr. Sorng Jerchalycha	Engineer	IUCN
13	Mr. Khamsamay Soukphengsy	Deputy of Reserve Forest Resource	DoAF-VTC
14	Mr. KhamPhet Sysamout	Deputy of Management	Railway Authority, MPWT
15	Dr. Bounta Ornnavong		MPWT
16	Mr. Khamthideth Manykham	Engineer	MPWT
17	Dr. Takanori Hayashida	Environmental Expert	JICA Study Team
18	Mr. Kuniomi Hirano	Environmental Expert	JICA Study Team
19	Mr. Phasasone Thavonesouk	Administrator	MEK Consultant
20	Dr. Phousy.	Water Quality Specialist	MEK Consultant
21	Ms. Souksakhone.	Social-cultural Consultant	MEK Consultant
22	Ms. Phethnakhon.	Social-cultural Consultant	MEK Consultant
23	Mr. Bounsouk.	Team leader, ESS Specialist	MEK Consultant
24	Mr. Phoummyxay	GIS consultant	MEK Consultant
25	Mr. Soutchay Leuxaysombath	Staff	Ministry of National Defence
26	Mr. Bounsay Khamsong	Deputy of Property Management Office, VTC	Department of Finance

Table C2 List of Attendance (Communities)

No	Name and Surname	Position	Organization
1	Mr. Bou	Farmer	Thanaleng village
2	Mr. Boalay	Farmer	NaKhouy-tay V.
3	Mr. Noon	Farmer	Dongphosy V.
4	Mr. Tom Sengphachanh	Farmer	NaKhouy-tay V.
5	Mr. Hongkham	Farmer	NaKhouy-tay V.
6	Mr. Khampha Syna	Retired staff	Ministry of Security Police
7	Mr. Anousack Keochaleun	Staff	Development bank
8	Ms. Sengla	Staff	Mittaphab hospital
9	Mr. Sengphokham	Retailer	
10	Mr. Phunsamone	Village-Chief	NaKouy-tay V.
11	Mr. Som	Farmer	Dongphosy V.
12	Mr. Inpeng	None	Phonsavang V. Chanthabouly D.
13	Ms. Phouthone	None	Nongtha-Neua
14	Mr. Boun	Farmer	Dongphosy village
15	Mr. Vixieng	Retailer	Dongphonhea V.
16	Ms. Khamphun	Farmer	Dongphonhea V.
17	Mr. Leua	Farmer	Dongphosy V.
18	Mr. Pheng	Farmer	Dongphosy V.
19	Ms. Bungorn Syvaly	Farmer	NaKouy-tay V.
20	Mr. BounOum	Farmer	NaKouy-tay V.
21	Mr. Phousady	Farmer	Dongphosy village
22	Mr. LamNgeun Vatthanalay	Staff	Security Police , VTC
23	Mr. Somsack Vilaythong	None	Ngongtha-Neua
24	Mr. Bounphet	Staff	Mittaphab hospital
25	Mr. Mon	Staff	Mittaphab hospital
26	Mr. Synuan	Farmer	Dongphonhea V.
27	Mr. Thongkhunh	None	Dongphonhea V.
28	Mr. Oula	Farmer	Dongphosy V.
29	Mr. Bounchanh	Retired staff	Thanaleng
30	Mr. Xiew Meuangtha	Farmer	NaKouy-tay V.
31	Mr. SomChay	Farmer	NaKouy-tay V.

Appendix D. Minutes of Meeting of 1st Stakeholder Meeting

Date and Time: 8:30 a.m. – 11:30 a.m., Friday , 21st May 2010

Venue: Conference Room of Thanaleng Railway Station Office

Meeting Subjects:

1.Presentation on the Project background and outline of VLP project
2. Explanation on Environmental and Social Study (ESS) of the VLP project
3. Questions and Answers Session

Firstly, MPWT and JICA Study Team have presented the general outline of this VLP project. Then, the progress of on-going environmental and social studies was explained by MEK consultant. After these presentations, floor was moved to question and answer session. Followings are summaries of this Q/A session, held among all stakeholders:

Q1: Mr. Sonesack N.Nhansana, Deputy Director of Railway Authority (MPWT) and Mr. Sorng Jerchalycha, Engineer of IUCN, proposed to change a project name to be another suitable one with its objective.

A (MPWT): This motion is acknowledged, and will be considered by relevant agencies and/or groups such as MPWT, JICA and others. Dr. Bounta further explained the term “LOGISTICS” currently only use by military agencies and the concept of logistics has not been widely known by industries. Thus, for the time being the Steering Committee agreed to use that name in Lao language which derived from military (logistics = palathikarn).

Q2: Mr. Khamsamay Soukphengsy, Deputy Director of Reserve Forest Resource (DoAF-VTC) asked if the project area is located within the approved location of 59 ha.

A (MPWT): Mr. Sonesack N.Nhansana, Deputy Director of Railway Authority (MPWT): Basically, the project area is located within the approved area of 59 ha.

Q3: Mr. Saythavy Yeangvannavong, Head of Assessment Department (Vientiane DPI) asked the implementation schedule of this project.

A (MPWT): The implementation schedule (tentative one) is attached within the hand-out, circulated today. Based on this information, actual implementation may vary between 2011 and 2014.

A: Mr. Sonesack N.Nhansana, Deputy Director of Railway Authority (MPWT): Specific funding for entire VLP project is not figured out, yet. However, we will proceed this VLP project step by step.

Q4: Mr. Sonesack N.Nhansana, Deputy Director of Railway Authority (MPWT) has shown concerns on on-going several railway-related programs such as this VLP project (JICA) and the railway extension by Thai Company (NEDA). He also asked if integration of those projects will be established or not. Also, he asked about project integrity with other railway-related development projects such as the railway extension by either of China or Thai Companies.

A (MPWT): Dr. Bounta Ornnavong and Mr. Saythavy Yeangvannavong, Head of Assessment Department (Vientiane DPI) explained that those two projects have been already coordinated each other. Basically, Thai (NEDA) will follow JICA Master Plan Report, so that they will not overlap.

Q5: Local persons showed their concerns on several different development projects around the Dongphosy area.

A1: Mr. Saythavy Yeangvannavong, Head of Assessment Department (Vientiane "DPI"), showed his sympathy. He mentioned that local persons might be confused with several different projects in their area. These projects are very important and prioritized ones for the entire nation. So, we need and expect local community people to have positive attitudes and understanding of all projects. Our Prime Minister has already approved about 10 project including Golf course (A=500 ha), Trading center, agricultural area, Malaysia investment in Dongphosy area.

A2: Mr. Sonesack N.Nhansana, Deputy Director of Railway Authority (MPWT) also showed his concern. He mentioned that many development projects are on-going around Dongphosy area, and several departments and organizations got involved within those complicated situations for various purposes. However, all of them are the officially approved ones by the government, and help from local communities would be very important to proceed these projects.

II. Environmental and Social issues:

Q1: Ms. Khamsamay Orndavong, Engineer of the Environmental Department (WREA) has asked if the proposed project will cause any significant negative impacts on surrounding environmental and social condition, based on the updated ESIA regulation, issued on Feb. 2010. Also, she asked the specific type and magnitudes of those adverse impacts.

A1 (Mr. Bounsouk Souksavath, MEK): This study is not EIA study for the environmental license application process of VLP project. However, ToR of this on-going environmental and social studies is compatible with the updated ESIA regulation, issued on Feb.2010.

A2 (MPWT): This environmental and social study is based on the JICA guideline. Main purposes of this study are to conduct comprehensive relevant environmental and social studies, identify critical environmental issues while seeking out directions for suitable mitigation programs. Note that this environmental study is funded by JICA. After this environmental study is completed, then, using this study result, MPWT will have a study of IEE or EIA, abiding by updated regulations of WREA and/or relevant regulations.

C1 (MEK): Dr. Phousy, a member of local consultant team, has briefly explained the baseline water quality condition (surface and subsurface water), obtained through the 1st campaign of on-going environmental study. He mentioned that local waters around the study site are drinkable and in good condition and can be used for their daily lives. However, he would not strongly recommend local community people to have direct drink of those waters. It would be better to boil raw water before drinking. Within this environmental study, I would like to assess the potential effect, regarding the water quality, to be occurred during/after construction period.

Q3: Mr. Sorng Jerchalycha, Engineer of IUCN asked the outline of flora/fauna study, in particular, the study result regarding the biodiversity around Dongphosy area. Also, he asked if the Consultant has coordinated with the Department of Industry and Forest of VTE.C.

A1 (Mr. Bounsouk Souksavath, MEK): Several specialists and experts from the DoF of NUOL are members of this environmental study. Currently, those flora/fauna-related studies are on-going. In their studies, a detailed and the latest baseline condition of the existing biodiversity across the study area are expected to be delineated. Note that they get involved with many projects of the related organizations including the DoIF-VTE.C

A2: Mr. Sonesack N.Nhansana, Deputy Director of Railway Authority (MPWT) mentioned on the Dongphosy area is currently not a dense forest which it may not have any important flora and fauna therein.

III. Compensation and Land acquisition:

Q1 : Some residents of local communities and the potential affected persons showed their concern for the land acquisition and resultant compensation. They are also concerned if a special committee for the asset estimation of agricultural products will be established before the construction of VLP will start.

A (Mr. Bounsouk Souksavath, MEK): If the proposed project will be officially decided to be implemented and some of those private properties will be affected, the rational compensation and the land acquisition process will be prepared by MPWT, abiding by relevant laws and regulations.

A: Mr. Sonesack N. Nhansana, Deputy Director of Railway Authority (MPWT) mentioned that Dongphosy area is an officially-declared, reserved forest area on where no private lands and/or buildings shall exist. So, technically speaking, it should have no severe impacts on any private properties of local communities surrounding Dongphosy Forest Reserve since the project site is 100 percent government land.

But somehow, several encroachments occur across the project site, so that it will certainly has the compensation committee if the proposed project will be implemented. The land compensation will also be estimated the value based on the actual condition and the regulation of Lao PDR, MPWT and DPWT. During the early 3.5 km railway construction project (5 years ago), unit price of 20,000 LAK per square meters for the rice paddy was applied for its compensation. At that time, the compensation committee comprised of VTE, Railway authority and other relevant agencies. Anyway, due to several reasons such as recent economic growth, this unit price may be changed for the latest compensation negotiation table.

End of Questions and Answers Session

Appendix E. Photo Records of 1st Stakeholder Meeting (held on May/21/10, Thanaleng Station, Vientiane)

Appendix F. List of Participants of 2nd Stakeholder Meeting

Date: July 30, 2010

Venue: Conference Room of Railway Station, Thanaleng

Table F1 List of Attendance

No	Name	Position	Organization/Community
1	Mr. Mouk	Farmer	Dongphosy village
2	Mr. Oura	Farmer	Dongphosy village
3	Mr. Oum	Farmer	Na Kouay Tai village
4	Ms. Toubou	Farmer	Thanaleng village
5	Ms. On	Farmer	Na Kouay Tai village
6	Mr. Bounchan Sabundit	Retired	Thanaleng village
7	Ms. Vilon	Farmer	Dongphosy village
8	Mr. Ketsana	Worker	Dongphosy village
9	Mr. Boun	Farmer	Dongphosy village
10	Mr. Somvang Boutavong	Director of Department of ESIA	EIA office of WREA
11	Ms. Khampong Panvilaithong	Staff	EIA office of WREA
12	Ms. Phongphet Bouttakot	Head of village	Dongphosy village
13	Mr. Khampa	Deputy Head of village	Na Kouay Tai village
14	Mr. Thongkhan	Farmer	Dong Phonhie village
15	Ms. Khampun	Farmer	Dong Phonhie village
16	Mr. Soutchai	Staff	Military
17	Ms. Boata	Staff	Friendship hospital
18	Ms. Sengla	Staff	Friendship hospital
19	Mr. Sychan Pongsanti	Farmer	Na Kouay Tai village
20	Ms. Oai Pongsanti	Farmer	Na Kouay Tai village
21	Mr. Pounsavanh Pongsa	Staff	Department of Transport, MPWT
22	Mr. Synon	Farmer	Dong Phonhie village
23	Mr. Lamnguan	Farmer	Dongphosy village
24	Mr. Visean	Farmer	Dong Phonhie village
25	Mr. Pheng	Farmer	Dongphosy village
26	Mr. Phoutsady	Farmer	Dongphosy village
27	Mr. Sea	Farmer	Na Kouay Tai village
28	Ms. Boalay	Farmer	Na Kouay Tai village
29	Mr. Dongthaly	Staff	Railway station
30	Mr. Lea	Farmer	Dongphosy village
31	Mr. Somchai	Farmer	Na Kouay Tai village
32	Ms. Phout	Farmer	Dongphosy village
33	Mr. Khampa	Retired	Na Kouay Tai village
34	Mr. Hongkha	Farmer	Na Kouay Tai village
35	Mr. Som	Farmer	Dongphosy village
36	Mr. Sounthon	Staff	103 hospital

No	Name	Position	Organization/Community
37	Mr. Mun Manothong	Teacher	Vientiane High School
38	Mr. Soutan Phonsongkam	Deputy Head	Ministry of Information and Culture
39	Mr. Khamsamai Soukpengsy	Deputy Head	Office of Conservation Area, Department of Agriculture and Forest, Vientiane Municipality
40	Ms. Mon	Staff	103 Hospital (Military Hospital)
41	Ms. Anousak	Staff	Department of Agriculture and Forest, Vientiane Municipality
42	Ms. Latda	Socio-Cultural Expert	MEK Consultants
43	Ms. Phetnakhon	Socio-Cultural Expert	MEK Consultants
44	Mr. Phommixay	GIS Expert	MEK Consultants
45	Mr. Bounsouk	Team Leader of MEK Study Team	MEK Consultants
46	Dr. Takanori Hayashida	Environmental Expert	JICA Study Team

Appendix G Minutes of Meeting of 2nd Stakeholder Meeting

Date and Time: 8:30 a.m. – 12:30 p.m., Friday, 30 July 2010

Venue: Conference Room of Thanaleng Railway Station Office

Meeting Subjects:

1. Review of Post-Meeting survey of 1st stakeholder meeting
2. Project Outline
3. Progress of VLP-related environmental/social studies.
4. Survey Results of Social Study #2 (200 interviews).
5. Survey Results of Social Study #1 (RAP)
6. Progress of Environmental Approval Process
7. Coffee Break
8. Question and Answer Session
9. Post-Meeting Survey

2. Participants

There were 46 participants attended in 2nd stakeholder meeting; most of them have attended at previous 1st stakeholder meeting, held on 21 May 2010. This is a good to keep coherency of this stakeholder meeting and make participants have continuous discussion about the proposed VLP project.

3. Activities of Meeting

The following were discussed, confirmed and consultation among all parties:
Firstly, the opening remark was given by Dr. Takanori Hayashida, JICA Study Team, and then, the floor was moved to the presentation of "Review of previous 1st Stakeholder Meeting" and "Latest Project Outline of VLP". After this, entire progress of on-going VLP-related environmental and social studies was explained by Mr. Bounsouk Souksavath, MEK Consultants, then Study Results of Social Survey #2 (200 households interviews with four villages around the proposed VLP project area) and Study Results of Social Survey #1 (30 households to be affected by the implementation of VLP project) are explained by another MEK consultants. Current status of the environmental approval for VLP project is explained by Dr. Takanori Hayashida, JICA Study Team. After these presentations, the floor was moved to question and answer session. Followings are summaries of this Q/A session, held among all stakeholders:

Comment1 (Mr. Somvang Boudtavong, Director, Department of EIA, WREA): We would like to suggest to conduct project-related study furthermore, regarding the detail of social and environmental impacts to be induced around the proposed project area. EIA Regulation of Laos requires the submission of EIA, SIA, RAP and ESMP reports to WREA in order to obtain the environmental license. We are very satisfied to see that comprehensive public disclosure regarding the social and environmental study for VLP project has been carried out, so far. Study results of environmental study, presented today, is very detailed one. However, more specific results and information regarding the land use impacts shall be summarized. Also, it may be better to conduct more detailed RAP study once the VLP facility layout is finalized. We hope we will receive the social and environmental reports of this VLP project soon, and we also hope we can work and co-operate with the future environmental monitoring/management work of this VLP project (note that participation in EMP from WREA is specified in EIA Regulation of WREA).

Counter-Comment 1 (Mr. Bounsouk, MEK Consultants Study Team): As Dr. Hayashida mentioned, the MPWT will carry out the relevant EIA study based on the new EIA Law, and will submit sets of reports of a full-scale EIA study to WREA in order to obtain the Environmental License for the proposed VLP project.

Comment 2 and Question 1 (Mr. Soutan Phonsongkam, Ministry of Information and Culture): So far, we didn't find any significant archeological remnants around the project area, including the Dongphosy Conservation area. But we cannot say that no important archeological sites exist, and we may find something historically and/or culturally important during the construction phase as we did in the past. For example, within the "Goff Project of Long Teang", several archeological remnants such as the "Exhibition of Stone" were discovered around the project area during the construction phase. This area also is located inside of Dongphosy Conservation area. So, if you notice/or find something during construction phase of the proposed VLP project, please inform to Ministry of Information and Culture of Vientiane Capital to secure the public archeological treasure. By the way, there are some old trees around Dongphosy area, and may exist in the proposed VLP project area. Do you have any plans to protect these trees?

Reply 1 (Mr. Bounsouk, MEK Consultants Study Team): In general, such environmental concern is well addressed within JICA Guideline for Environmental and Social Considerations. So, we are sure that a proper environmental mitigation will be prepared if there are such remaining big old trees within the proposed VLP project area. For the archeology, if any archeological artifacts are found within the project area during the construction phase, we are also very sure that relevant archeological studies and mitigation/or conservation measures will be implemented, while liaison with authorities closely, as it happened in past JICA infrastructure development projects such as the archeological conservation work of remnants found in the road construction of Number-1 in Vientiane Capital.

Question 2 (Mr. Maan Manothong, local resident): I have rice paddy field in the project area. I would like to know who is going to give compensation? And, how to compensate? I would like to suggest that the project should clarify the compensation. After the relevant construction activities will be done, there will be new roads, and I am not sure that the relevant authority will allow local people to use. Are those new roads for the VLP project-use only?

Reply 2 (Mr. Bounsouk, MEK Consultants Study Team): The Department of Transport, Ministry of Public Work and Transport (the project owner) will consider about compensation through consultations and/or discussions with affected persons, based on relevant regulation of compensation policy. For the new roads, to be constructed within the proposed VLP project, it is not likely that the project owner will ban any local people or communities to use those new roads. We think everyone can use.

Question 3 (Mrs. Bou, local resident): I also have properties within the project area, and I think the project will give me compensation. By the way, I am very happy to support the project. I would like to see this project to be implemented soon. As you know, I am very old, so I would like to see the implementation of everything related with this project.

Reply 3 (Mr. Bounsouk, MEK Consultants Study Team): We think so. Based on compensation policy and the features of your land properties, you will have fair amount of compensation. And we are sure that you will see the implementation of the proposed VLP project.

Question 4 (Mr. Soutchai, local resident): I have properties within the project area, and I would like to know what kind of compensation price (unit cost/m^2) will be applied? Also, I want to know when this project is planned to be constructed, and how long will it take for its construction?

Reply 4-1 (Mr. Bounsouk, MEK Consultants Study Team): At this moment, we are not in the position to determine the compensation cost since we have to conduct more detail survey again in the next EIA preparation stage. And we have to invite all concerning parties and/or individuals to get involved for further discussions.

Reply 4-2 (Dr. Takanori Hayashida, JICA Study Team): According to the interim report of this study, the latest information, the construction is to be initiated sometime between Year 2011 and 2015.

Comment 3 (Mr. Bounchan, local resident): I have properties within the project area (about 4-5 Lai: 1 Lai = 1,600 m^2), but I am not against to this proposed VLP project. However, this project should give enough compensation before the construction starts since we can have another properties at different places.

Comment 4 (Mr. Khamsamai Soukpengsy, Deputy Head of Conservation Areas of Vientiane Capital): Officially, this VLP project should be informed the project planning in the Dongphosy area to the concern convergent office, such as land uses property organization, in order to avoid another project is coming to use this area. The project also should be informed to Department of Agriculture and Forestry of Vientiane Capital, in order to make a changing of conservation area of Dongphosy into land uses for VLP project base on law and regulation. There were about 45 ha of land allocated for the railway authority, but not for VLP project. Therefore the VLP project should discuss with the concerning office of land uses to have the project site in Dongphosy area. The compensation cost for this VLP project should be make a comparable with other project doing within and around Dongphosy area.

Counter Comment 4 (Mr. Bounsouk, MEK Consultants Study Team): Thank you for your comments. We are not sure if the Ministry of Public Work and Transport already officially informed about this VLP project to both Land Uses Property Organization and Department of Agriculture and Forestry of Vientiane Capital. However, we will convey your comments to Department of Transport, Ministry of Public Work and Transport (Note that official IEE of this proposed VLP project was done between January 2010 and July 2010, and all competent agencies such as Vientiane Capital already got noticed within this IEE).

Comment 5 (Mrs. Sengla, local resident): I have properties within the proposed project area more than 2 ha. Currently, I am a government official and will retire soon. I am planning to use my land for the agriculture, but all of my land is located within the project area. I am expecting to have an enough compensation from the project owner because I don't have any other land properties at other places.

Counter Comment 5 (Mr. Bounsouk, MEK Consultants): We will convey your questions/comments to the relevant agencies while mentioned clearly within the report of this environmental studies.

Closing Remark was done by Dr. Takanori Hayashida, JICA Study Team, and then, the meeting of the 2nd stakeholder meeting was adjourned - End of Minutes of Meeting

Appendix H. Photo Records of 2nd Stakeholder Meeting (held on July/30/10, Thanaleng Station, Vientiane)






Appendix I. Questionnaire Sheet for Public Opinion Survey

Surveyor: ____________________
Survey Date ____________________
Sheet No. ____________________

A. BACKGROUND INFORMATION

1. Occupation (1) Worker

1.Legislator, Administrator and Manager	7. Craftsmen
2. Professionals	8. Farmers
3. Tech & Associate Professionals	9. Livestock Keepers
4. Clerks	10. Fishermen
5. Small Business Managers	11. Plant Operators, Assemblers
6. Service & Shop sales Workers	12. Others (please specify)

(2) Student

1. Elementary	3. University & Institute
2. Secondary	4. Others

(3) Non-Worker

1. Job Seekers	3. Retired
2. Housewives	4. Others

2. Age Sex M / F
3. Home Address
4. Commuting Measure

1. Walking	4. Taxi	7. Trucks
2. Bicycle	5. Motorcycle	8. Car
3. Inter-City Bus	6. Pick-Up/Van	9. School/Company Bus
		10. Others

5. Commuting Time hr min.

6. How long have you (or your family) stayed here?

1. Less than 1 year	6. 8 – less than 10 years
2. 1 – less than 2 years	7. 10 – less than 12 years
3. 2 – less than 4 years	8. 12 – less than 15 years
4. 4 – less than 6 years	9. 15 – less than 20 years
5. 6 – less than 8 years	10. More than 20 years

7. Working Place (or school location)

B. PUBLIC CONCERNS FOR VLP PROJECTS AND PAST NEABY INFRASTRUCTURE DEVELOPMENT PROJECT

1. Do you know that the logistics parks will be set-up around Thanaleng Station?
   a. No
   b. Yes

2. Any opinions or possibility that logistics park project may lead to (multiple answers):

	Less Fair Major
a. Environmental degradation (specify)	1------2------3------4------5
b. More improvement of local infrastructure	1------2------3------4------5
c. Availability of more services	1------2------3------4------5
d. More educational opportunities	1------2------3------4------5
e. More employment opportunities	1------2------3------4------5
f. Other impacts (specify)	1------2------3------4------5

3. Any opinions that the construction of the friendship bridge has lead to (multiple answers):

	Less Fair Major
a. Environmental degradation (specify)	1------2------3------4------5
b. More improvement of local infrastructure	1------2------3------4------5
c. Availability of more services	1------2------3------4------5
d. More educational opportunities	1------2------3------4------5
e. More employment opportunities	1------2------3------4------5
f. Other impacts (specify)	1------2------3------4------5

4. Any opinions that the construction of the Thanaleng Station has lead to (multiple answers):

	Less Fair Major
a. Environmental degradation (specify)	1------2------3------4------5
b. More improvement of local infrastructure	1------2------3------4------5
c. Availability of more services	1------2------3------4------5
d. More educational opportunities	1------2------3------4------5
e. More employment opportunities	1------2------3------4------5
f. Other impacts (specify)	1------2------3------4------5

C. ENVIRONMENT AND FORESTRY

1. What are the current main local environmental concerns or issues?

	Less Fair Major
a. Noise/vibration	1------2------3------4------5
b. Vehicular emission	1------2------3------4------5
c. Air quality	1------2------3------4------5
d. Water quality	1------2------3------4------5
e. Vegetation	1------2------3------4------5
f. Fauna	1------2------3------4------5
g. Historical/cultural and/or monumental properties.	1------2------3------4------5
h. Safety	1------2------3------4------5
i. Safe Water Resources	1------2------3------4------5
j. Others (specify)	

2. Have you used any forestry resources and/or products around Dongphosy and/or nearby sites before?
   a. Yes (specify)
   b. No

3. Do you still use any forestry resources and/or products around Dongphosy and/or nearby sites?
    a. Yes (specify)
    b. No

4. Do you think the local forest resources around Dongphosy and nearby sites is devastated (for example, deforestation is on-going) recently?
    a. Yes
    b. No (please move to Question 7)

5. If answered "Yes" in previous question, what kind of change can you recognize in comparison with the past situation?

	Less Fair Major
a. Change in local climate	1------2------3------4------5
b. Deterioration of the local water resources (e.g., flow rate of local rivers/channels and/or creeks have been decreased)	1------2------3------4------5
c. Change in local flora/fauna	1------2------3------4------5
d. Others (specify)	1------2------3------4------5

6. What is the main reason/or factor for this degradation of local fores

	Less Fair Major
a. Development Activities	1------2------3------4------5
b. Illegal Encroachment	1------2------3------4------5
c. Pressure from local husbandly	1------2------3------4------5
d. Natural Phenomenon	1-----2------3-------4------5
e. Pressure from local agriculture	1------2------3------4------5
f. Others	1------2------3------4------5

7. Beside this development activities around Dongphosy, there was large bridge construction project in the past. After the operation of the Friendship Bridge started, what kind of change in local environment do you (or did you) recognize around the local community?

	Less Fair Major
a. Increased local traffic	1------2------3------4------5
b. Worsened roadside environment (e.g., noise and air quality)	1------2------3------4------5
c. Worsened traffic safety	1------2------3------4------5
d. Others (specify)	1------2------3------4------5
e. None	

8. Beside this development activities around Dongphosy, there was the construction of Thanaleng Station recently. After the operation of the Thanaleng Station started, what kind of change in local environment do you (or did you) recognize around the local community?

	Less Fair Major
a. Increased local traffic	1------2------3------4------5
b. Worsened roadside environment (e.g., noise and air q	1------2------3------4------5
c. Worsened traffic safety	1------2------3------4------5
d. Others (specify)	1------2------3------4------5
e. None	

9. Vientiane Logistics park is to be constructed around the Thanaleng Station. What kind of opinion do you have about this project?
    a. Yes, I support this project unconditionally (specify the reason)

b. Conditionally, I support this project if some local problems, listed below, that would be induced due to the construction/or operation of VLP, will be solved (multiple selections).

	Less Fair Major
(i) Deforestation	1------2------3------4------5
(ii) Worsened roadside environment	1------2------3------4------5
(iii) Worsened Traffic Safety	1------2------3------4------5
(iv) Water Quality Degradation	1------2------3------4------5
(v) Loss of Water Recharge Area	1------2------3------4------5
(vi) Worsened Regional Drainage System	1------2------3------4------5
(vii) Loss of local flora/fauna	1------2------3------4------5
(viii) Degraded Quality of Life	1------2------3------4------5
(xi) Others (specify)	1------2------3------4------5

c. No, I will not support this project unconditionally (specify the reason)

10. Do you know local forests around Thanaleng Station is reserved as Dongphosy Forest Reserve?
    a. Yes
    b. No

THANK YOU FOR YOUR CO-OPERATION !!

Appendix J. Photo Record of Public Opinion Survey

Survey Period: 9:00 – 18:00, April 03, 2010

Survey Site: Nakhouy Tai Village

Total Number of Interviews: 50 households

Survey Period: 9:00 – 18:00, April 04, 2010

Survey Site: Xienda Village

Total Number of Interview: 50 households






Survey Period: 9:00 – 18:00, April 10, 2010

Survey Sites: Dongphosy Village

Total Number of Interviews: 50 households

Survey Period: 9:00 – 18:00, April 11, 2010

Survey Site: Dong Phonghae Village

Total Number of Interviews: 50 Households






Appendix K: Results of 200 interviews-based Public Opinion Survey

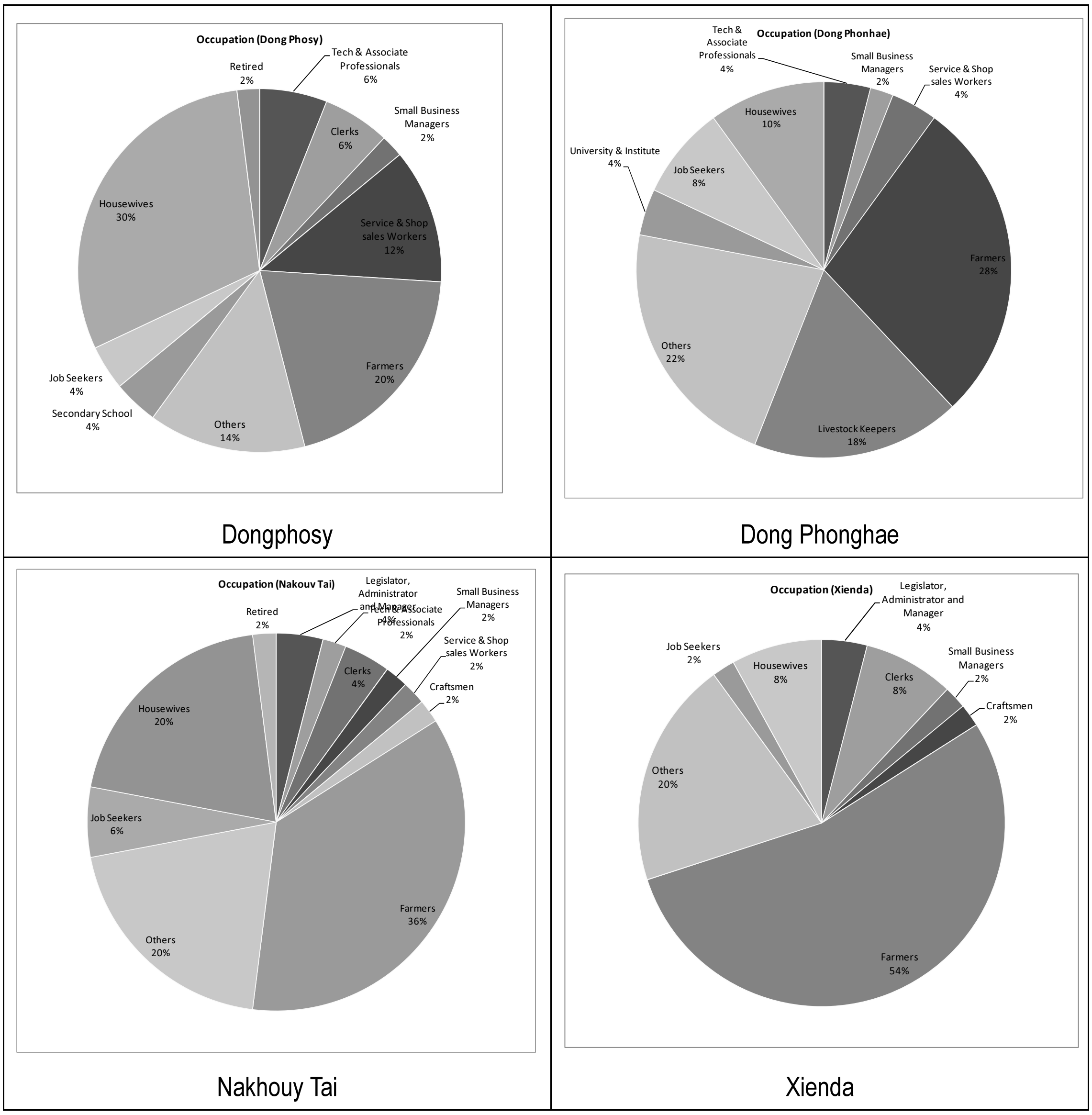


Figure K1 Results of Public Opinion Survey (Occupation)

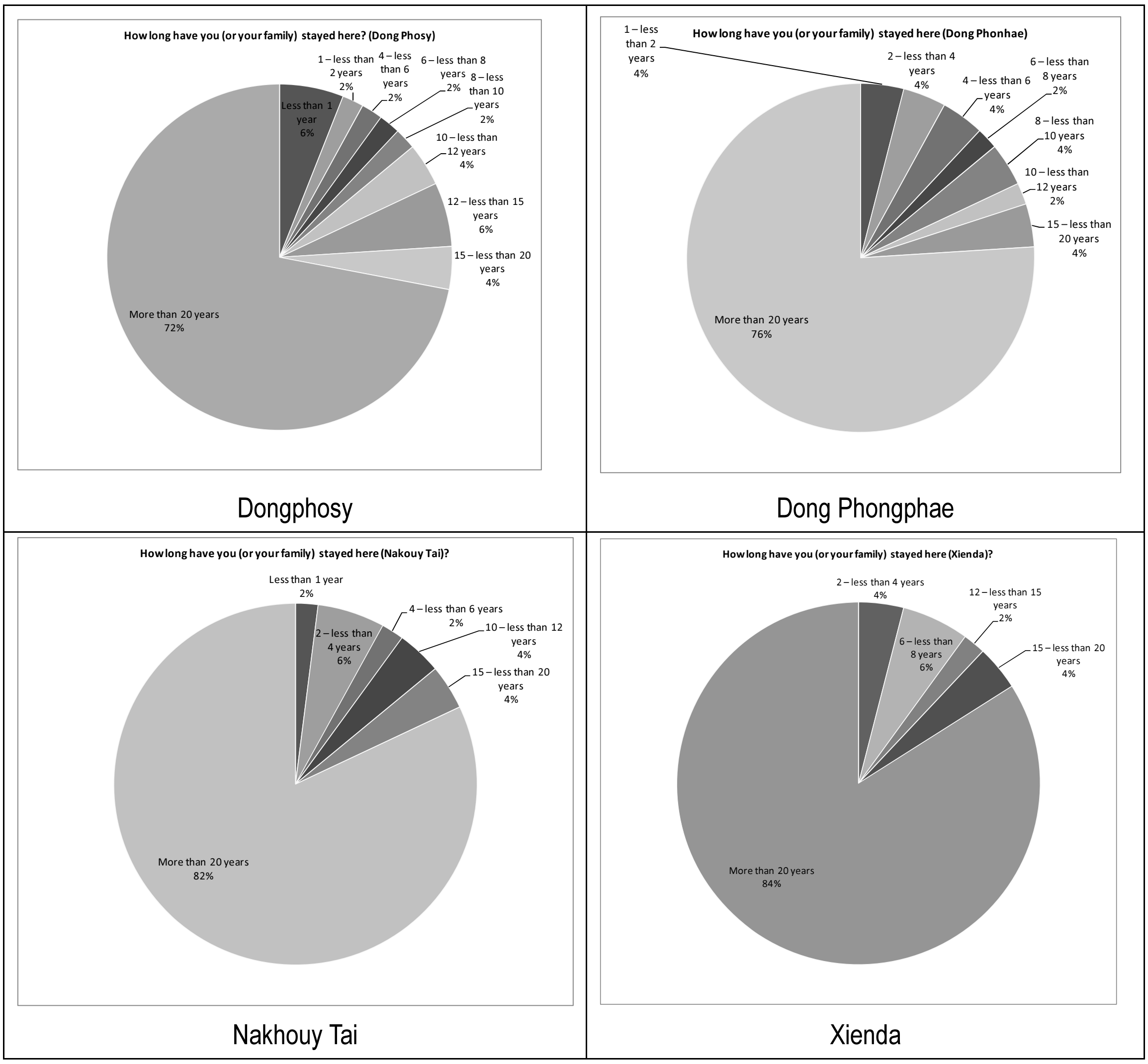


Figure K2 Results of Public Opinion Survey (How long have you stayed there?)

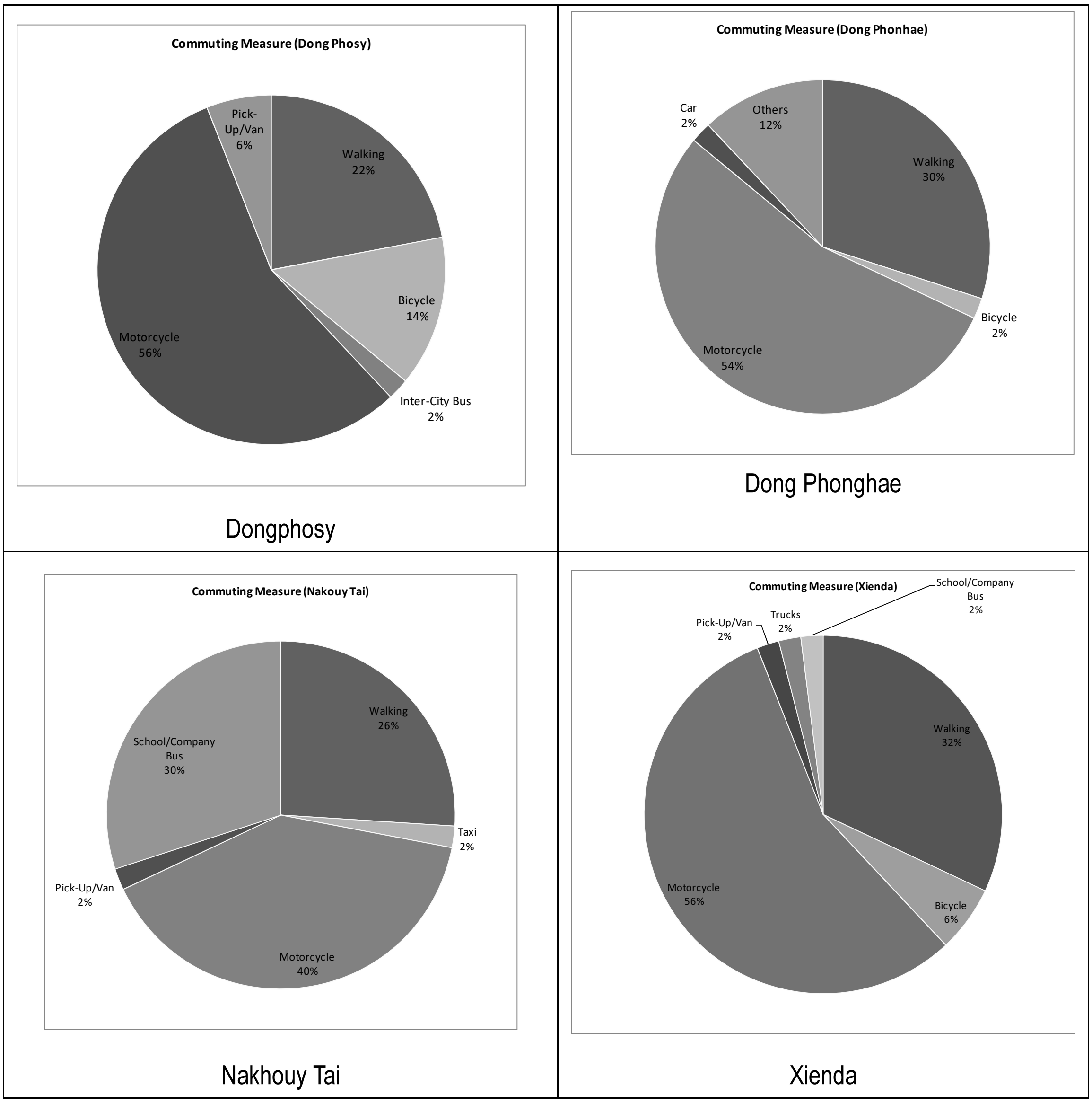


Figure K3 Results of Public Opinion Survey (Commuting Measures)

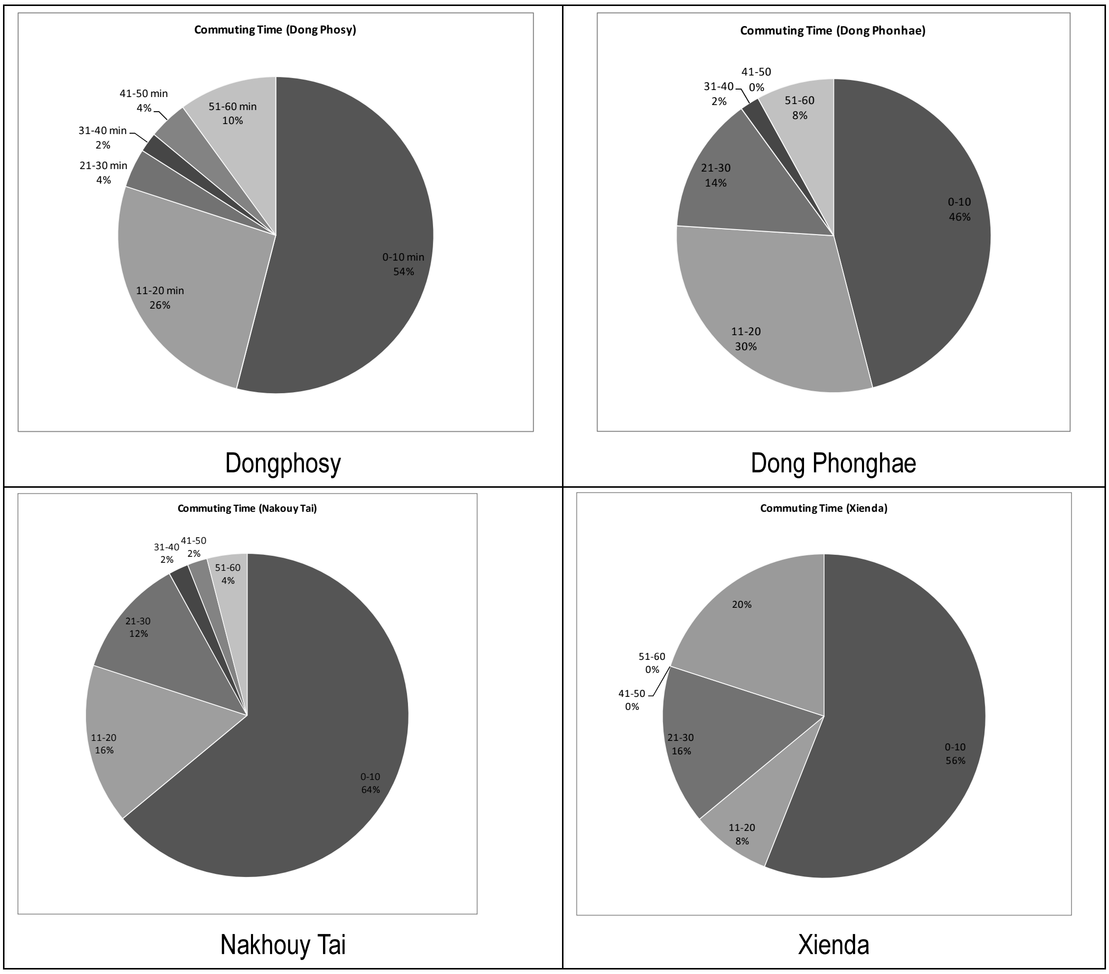
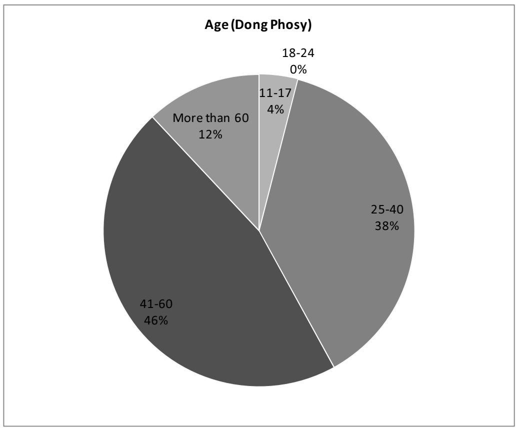
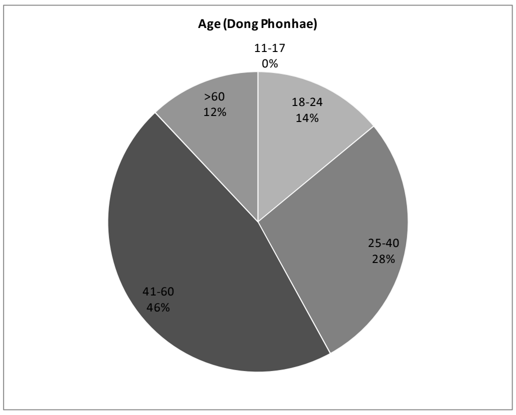


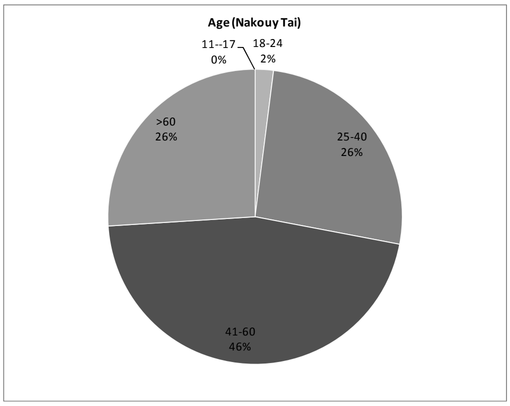
Figure K4 Results of Public Opinion Survey (Commuting Time)



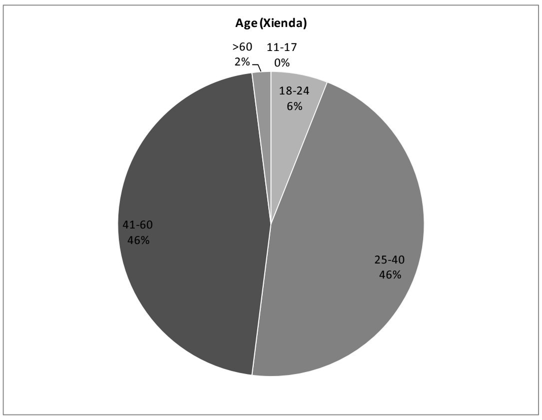
Dongphosy



Dong Phonghae



Nakhouy Tai



Xienda

Figure K5 Results of Public Opinion Survey (Age)

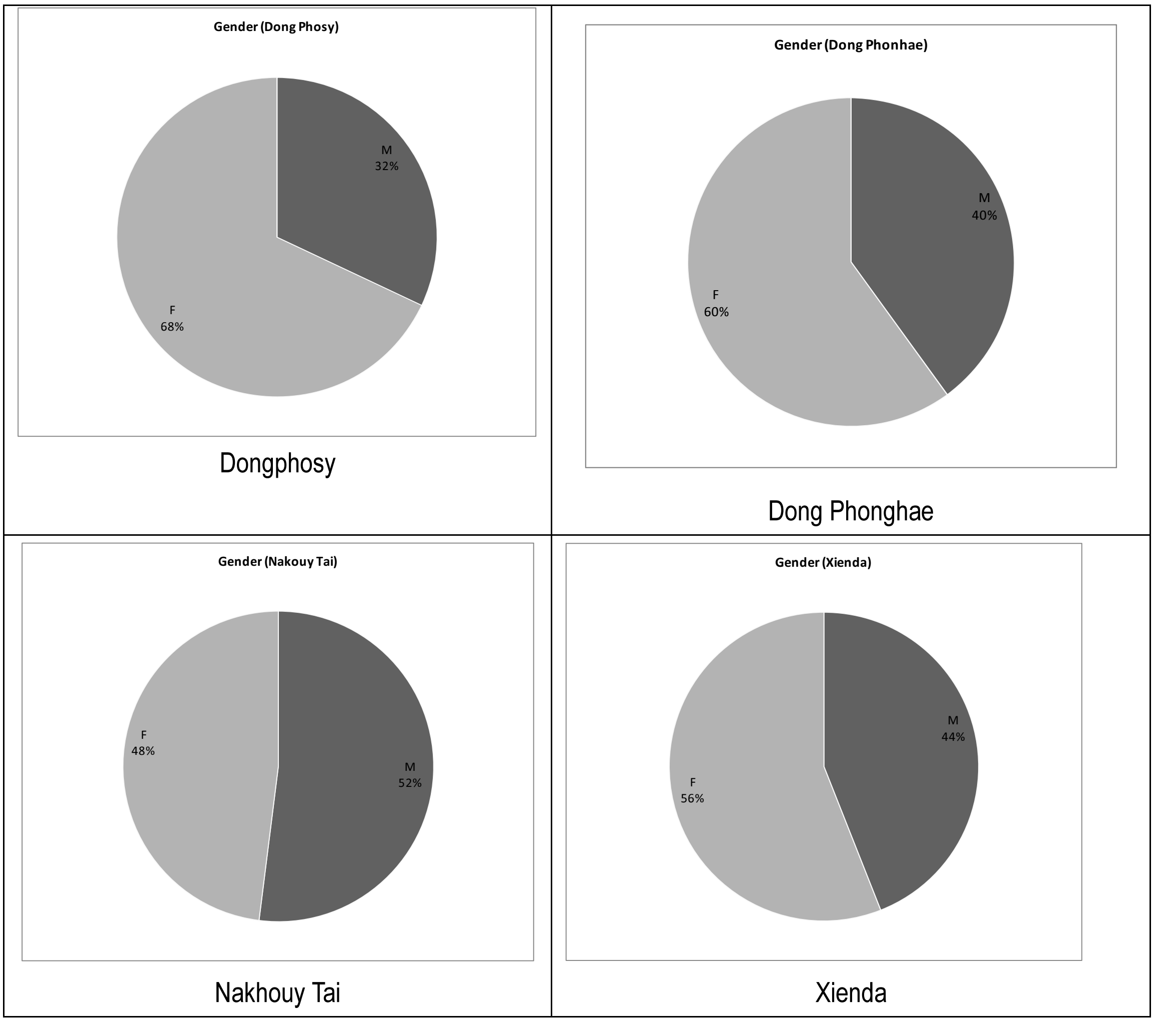
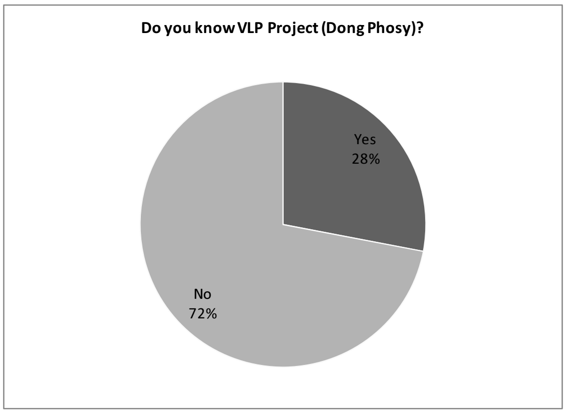
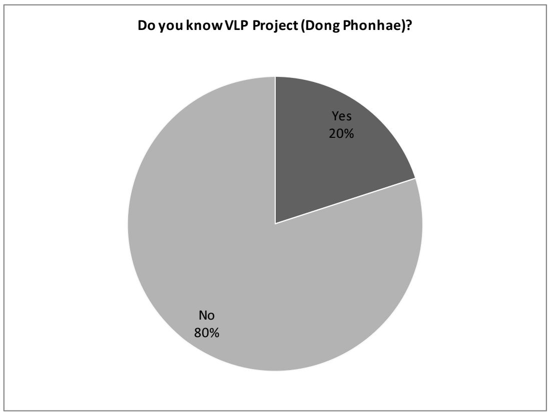


Figure K6 Results of Public Opinion Survey (Gender)



Dongphosy



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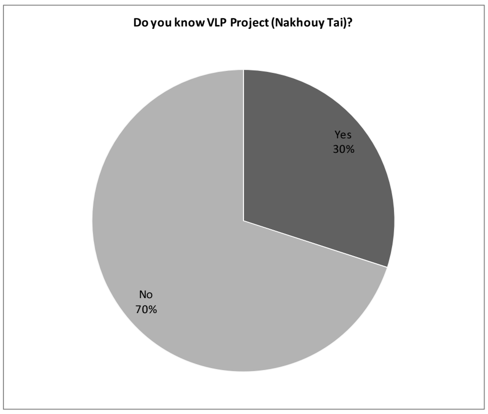

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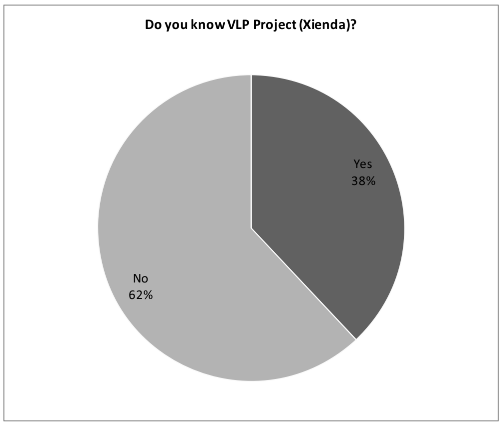

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Figure K7 Results of Public Opinion Survey (Do you know VLP project before this interview?)

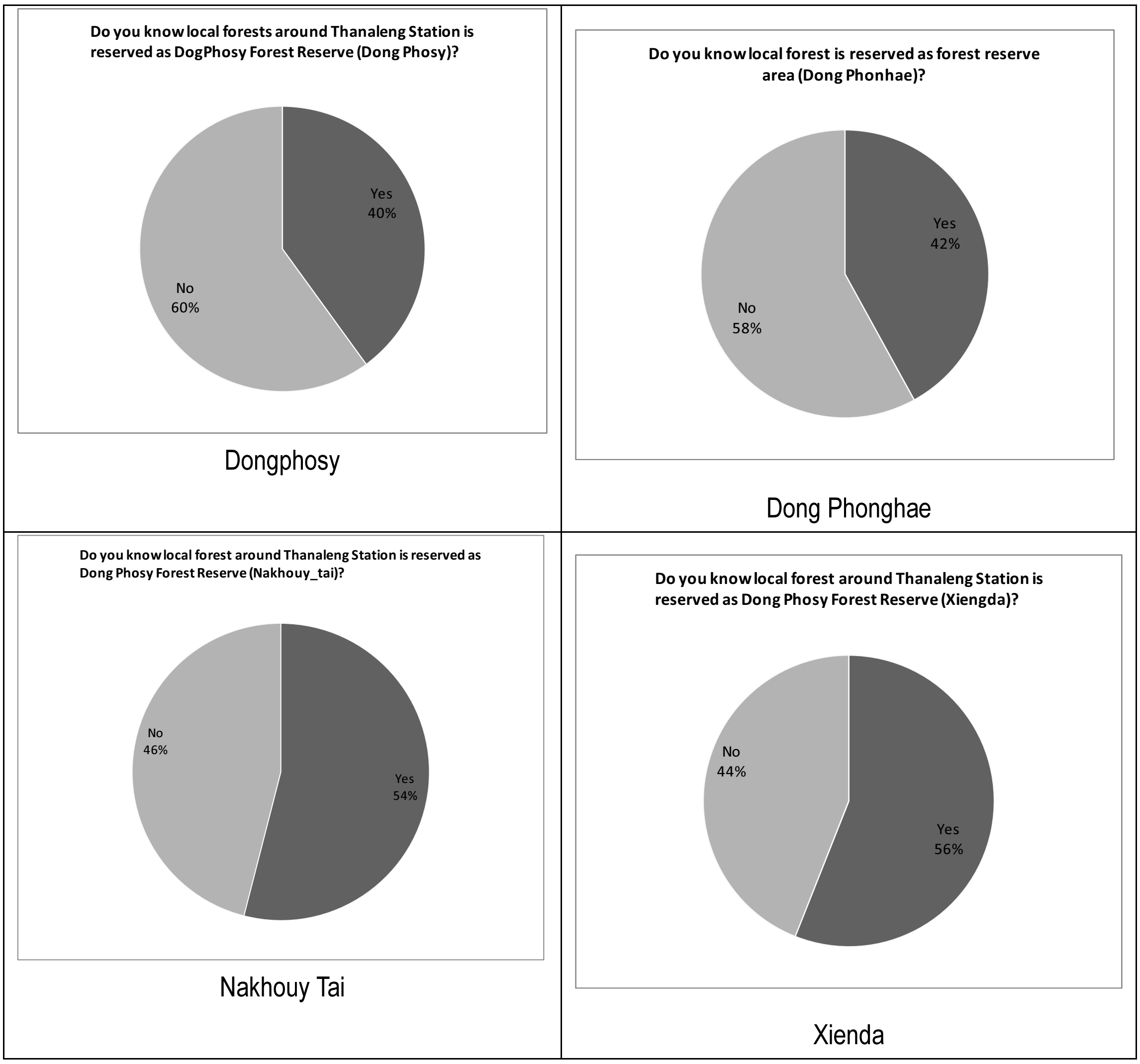


Figure K8 Results of Public Opinion Survey (Do you know local forest around Thanaleng Station is reserved as Dongphosy Forest Reserve?)

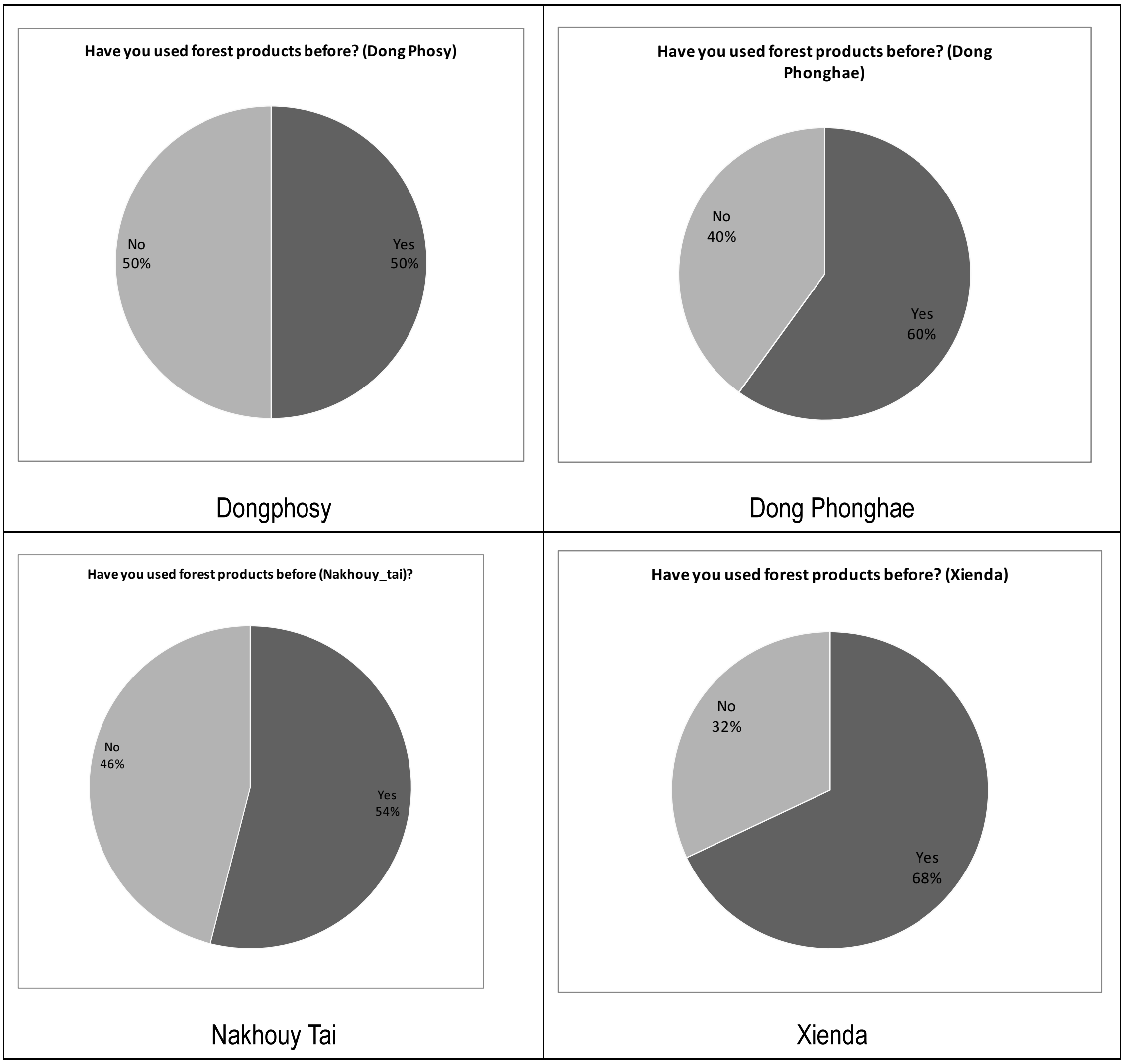
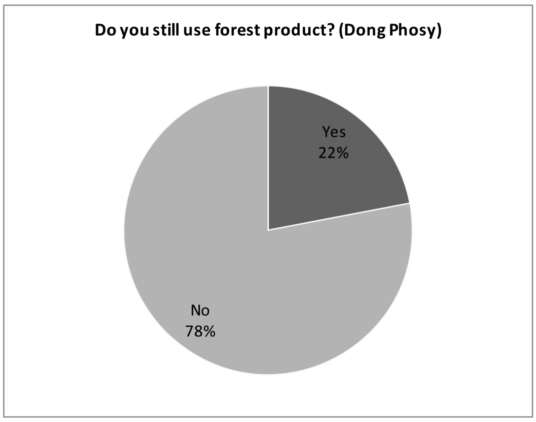
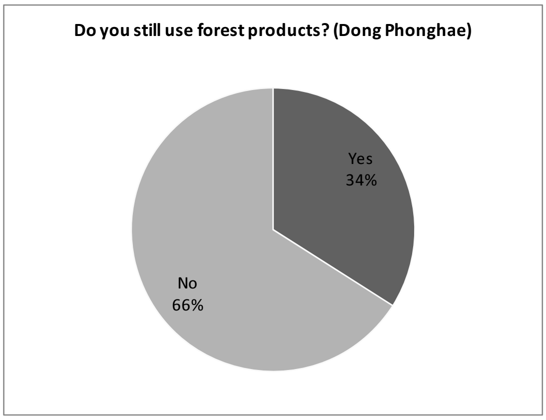


Figure K9 Results of Public Opinion Survey (Have you used forest products before?)



Dongphosy



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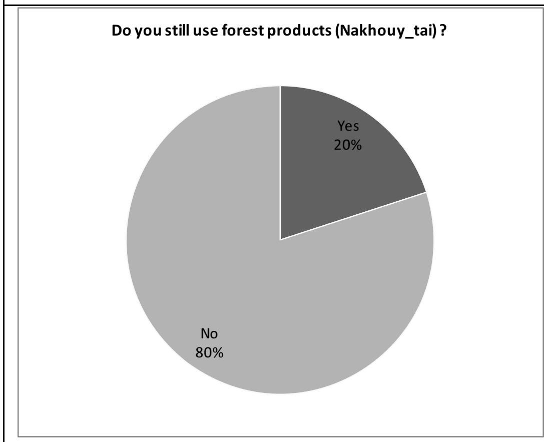

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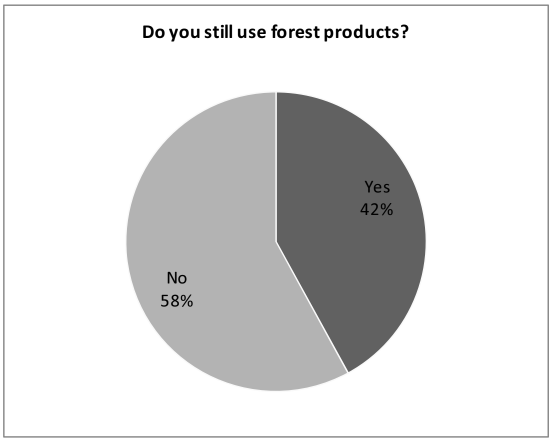

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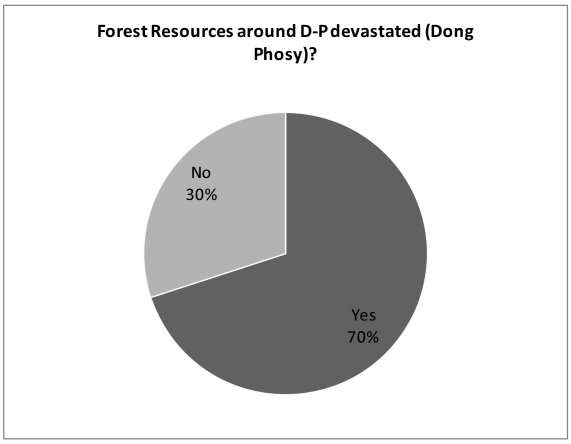
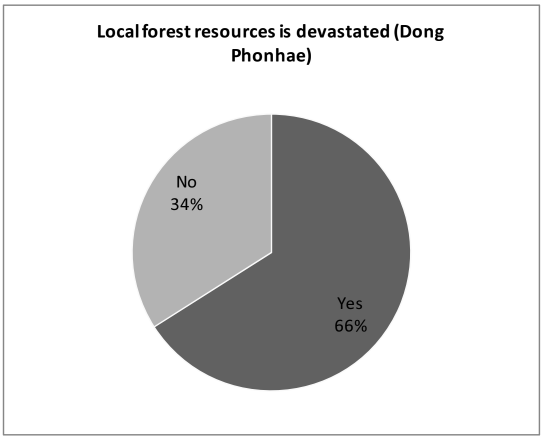
Figure K10 Results of Public Opinion Survey (Do you still use forest products?)



Dongphosy



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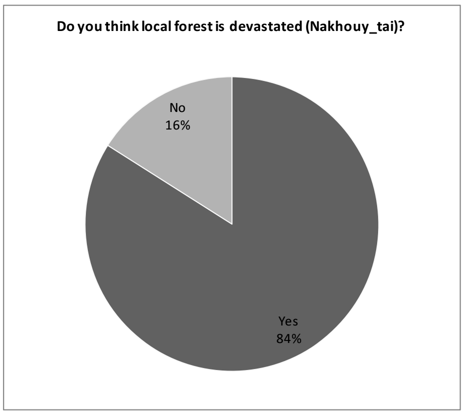

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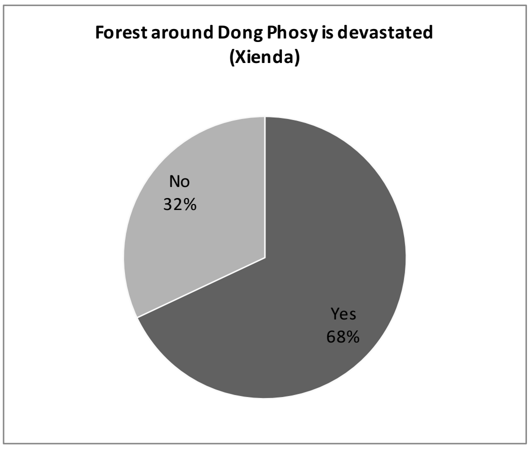

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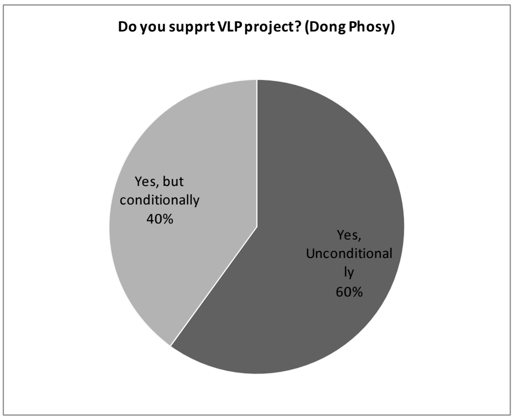
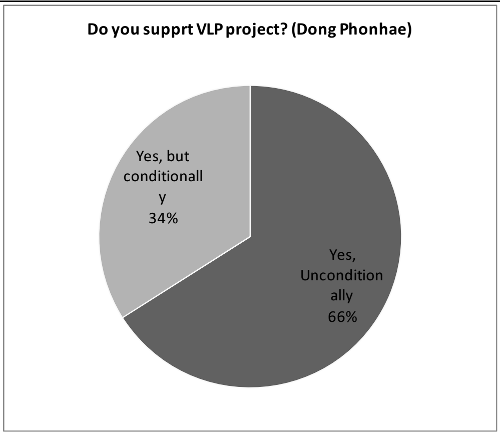
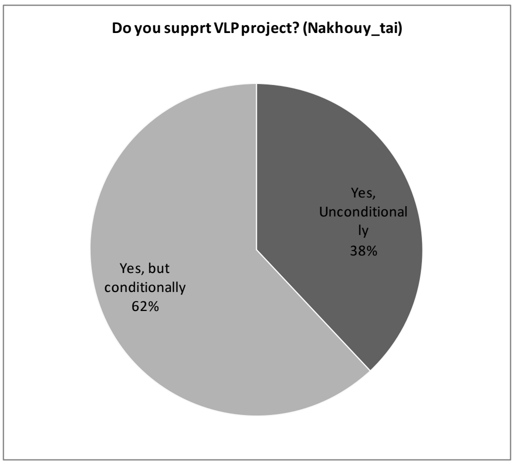
Figure K11 Results of Public Opinion Survey (Do you think local forest around Dongphosy is devastated?)



Dongphosy



Dong Phomghae



Nakhouy Tai

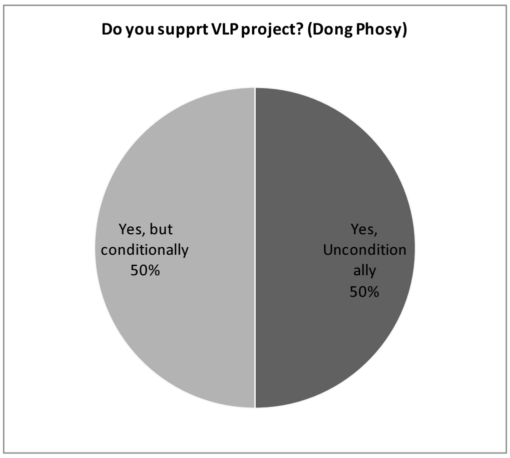


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Figure K12 Results of Public Opinion Survey (Do you support VLP project?)

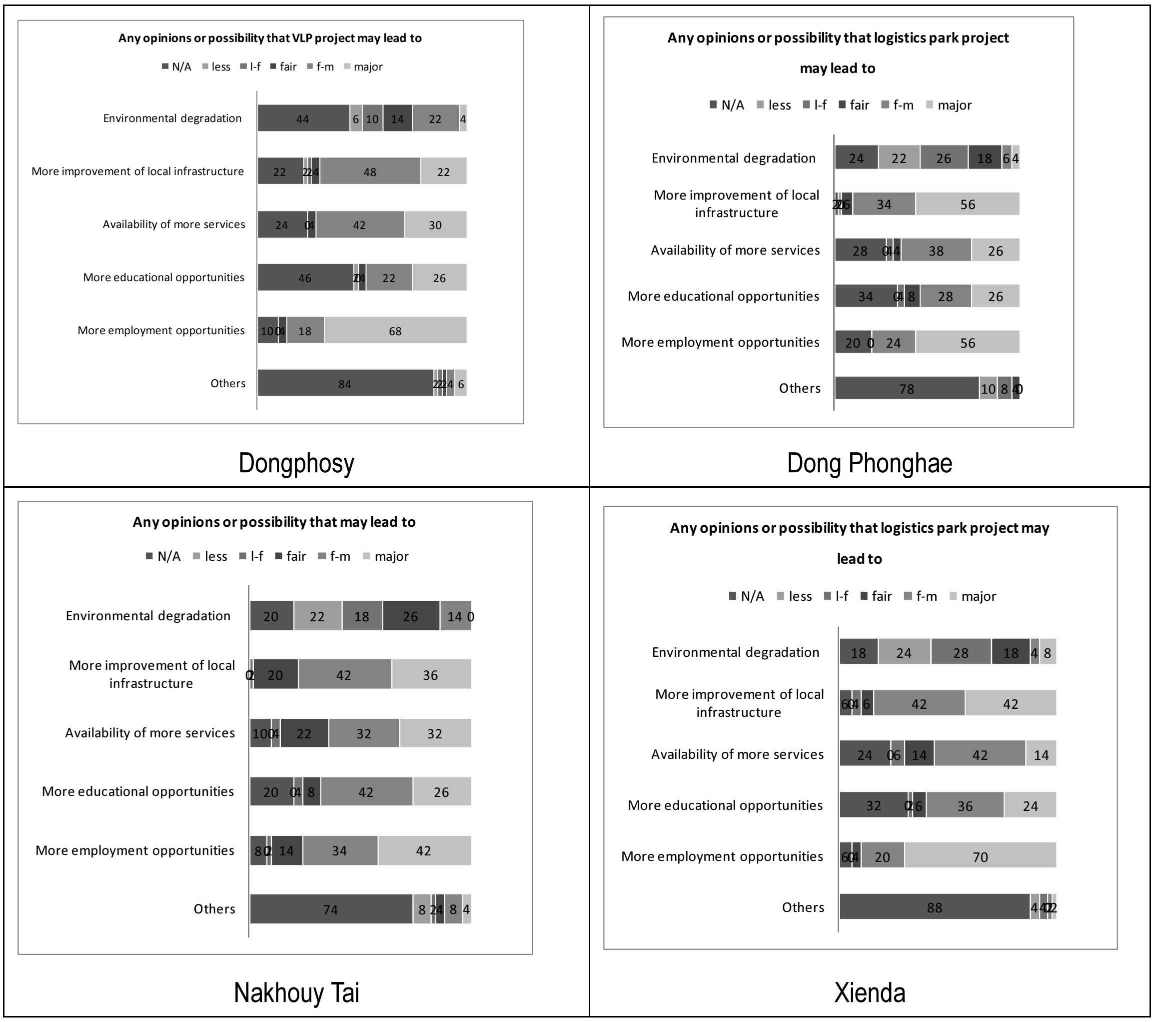


Figure K13 Results of Public Opinion Survey (VLP project may lead into?)

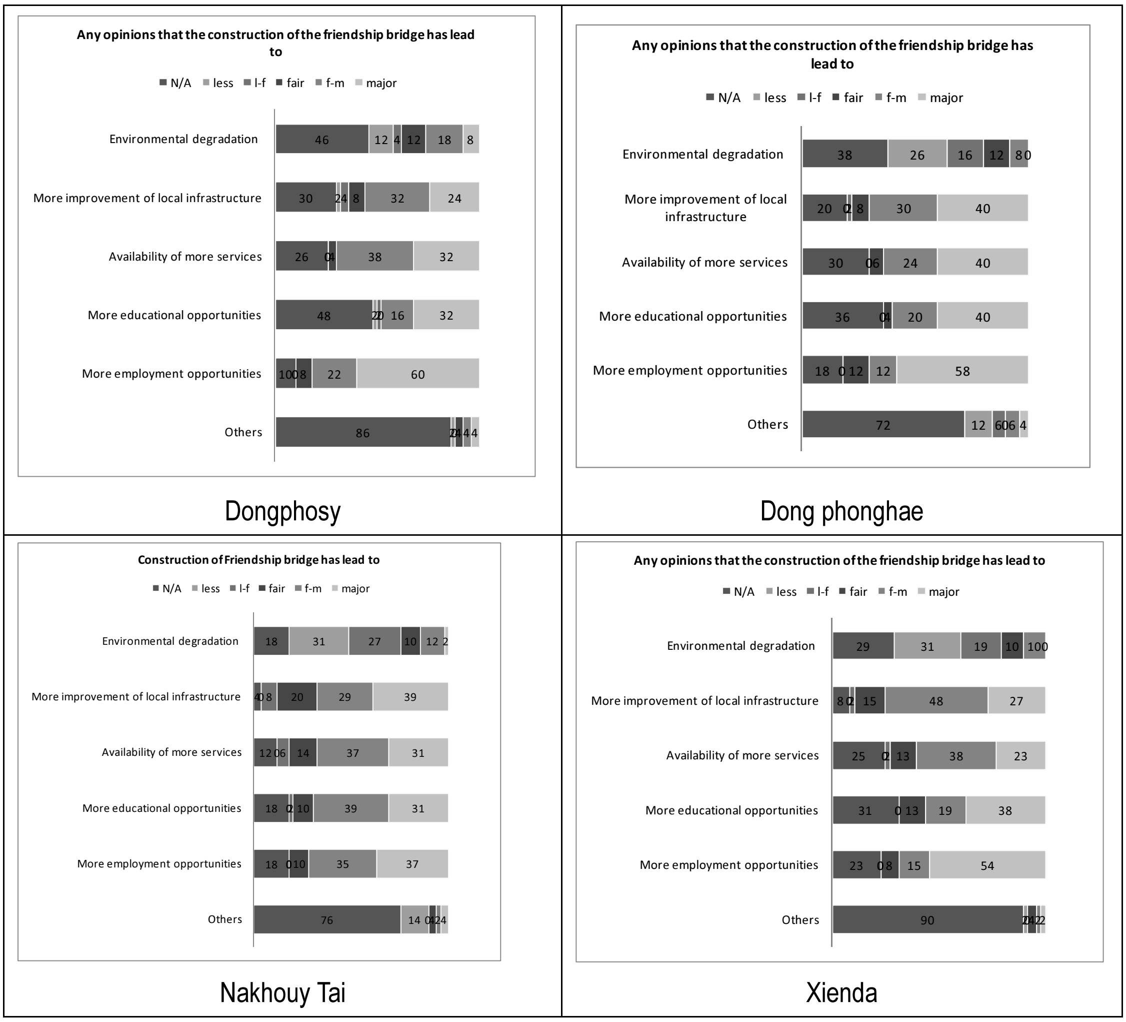


Figure K14 Results of Public Opinion Survey

(Construction/Operation of Friendship Bridge has lead to?)

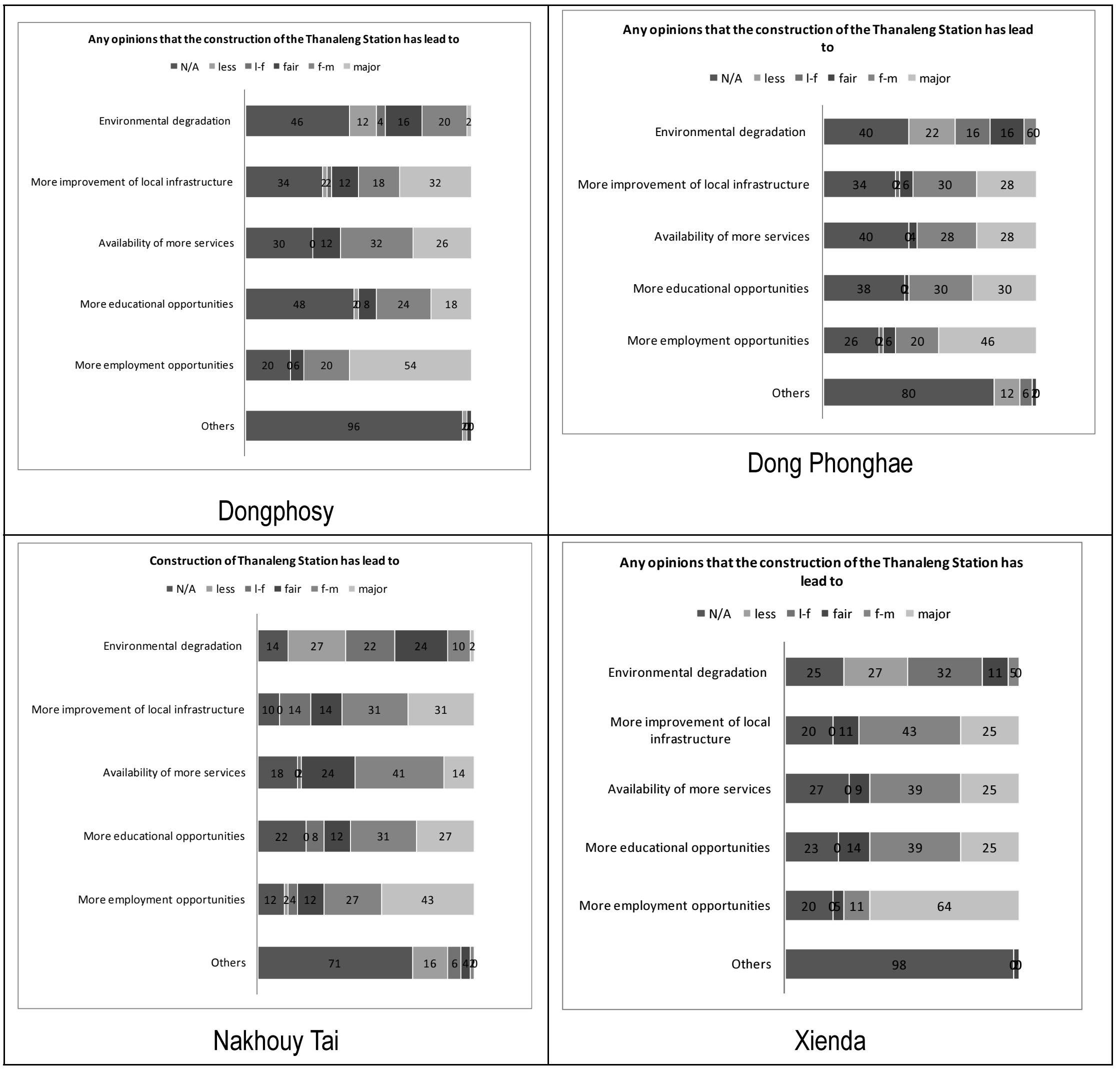


Figure K15 Results of Public Opinion Survey

(Construction/Operation of Thanaleng Station has lead to?)

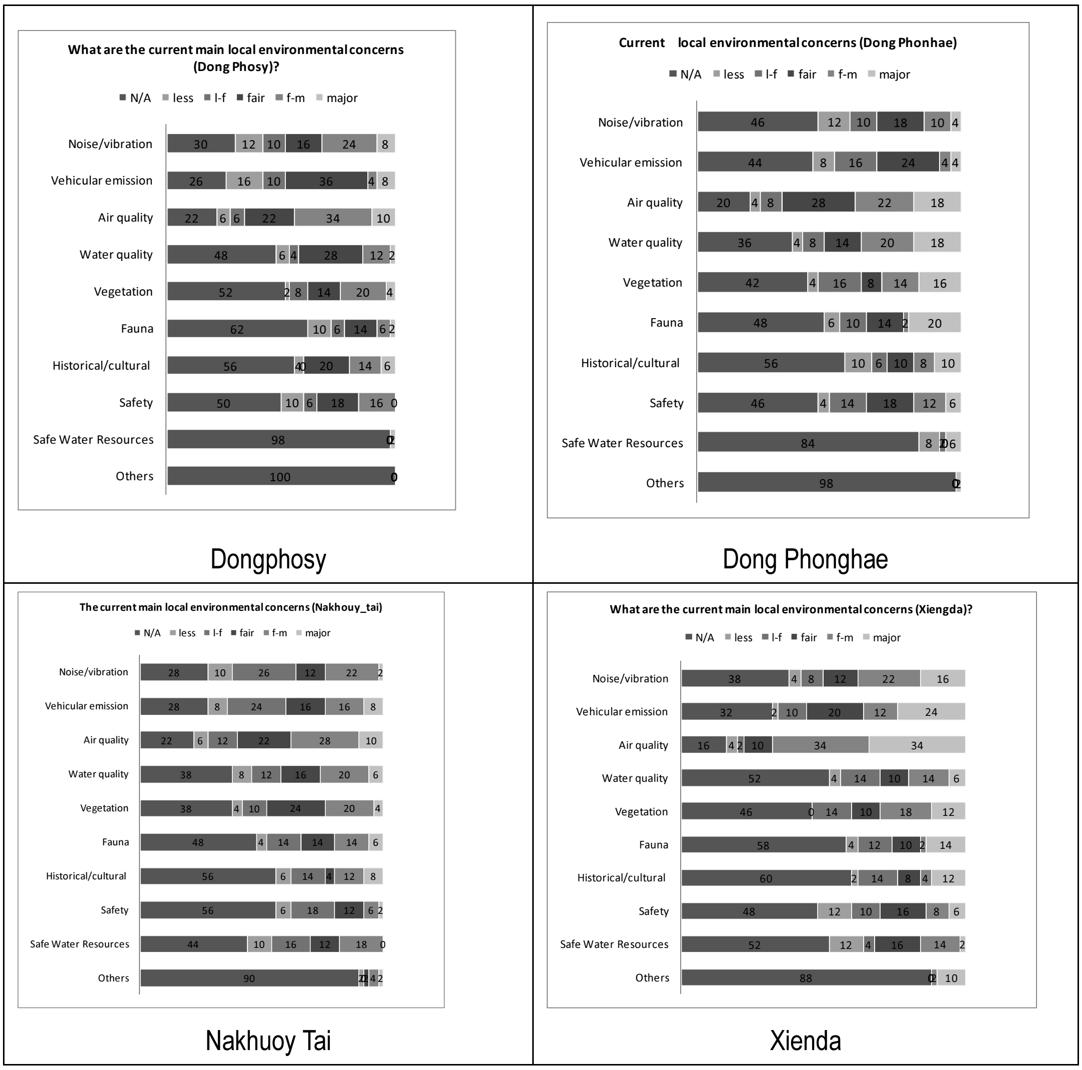
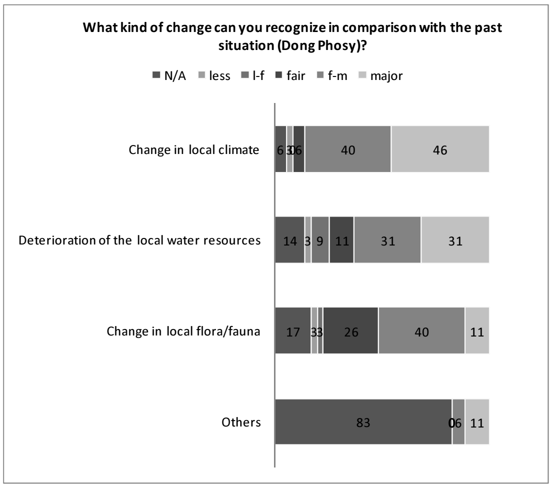
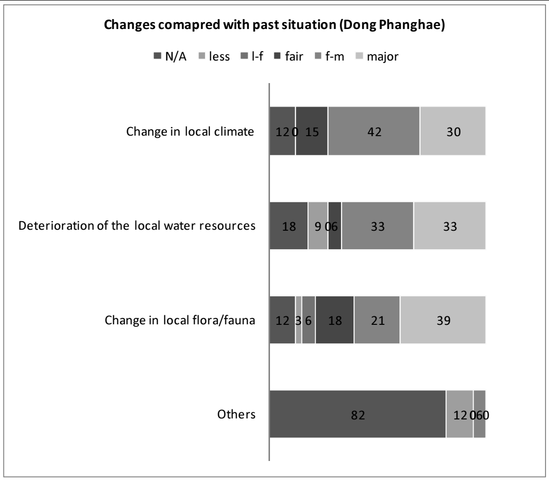


Figure K16 Results of Public Opinion Survey (Current Local Environmental Concerns)



Dongphosy



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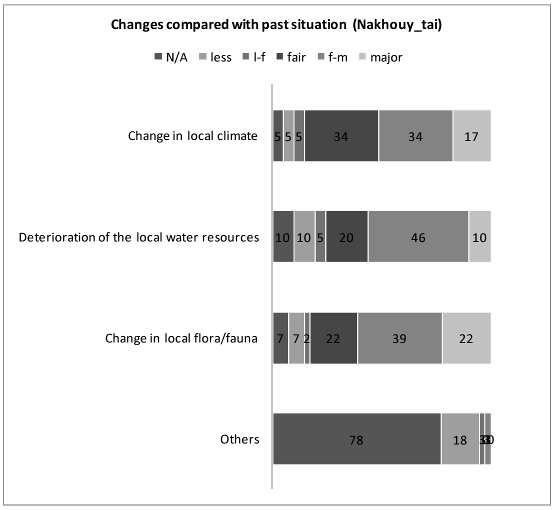

Nakhouy Tai

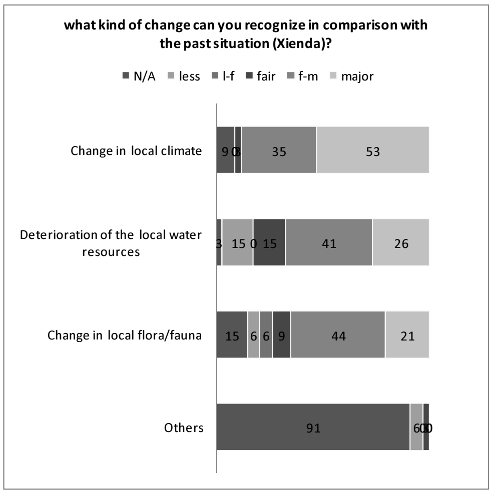

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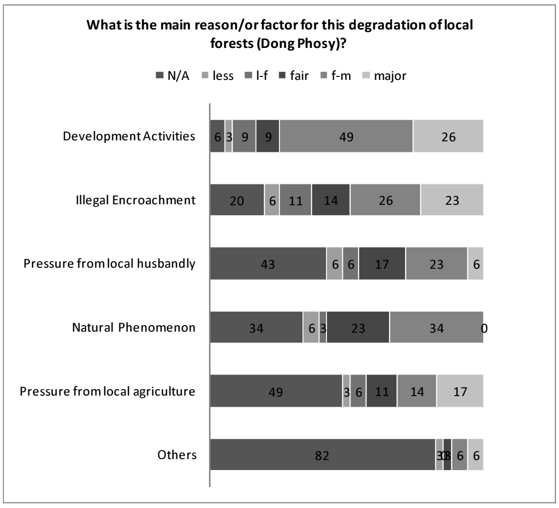
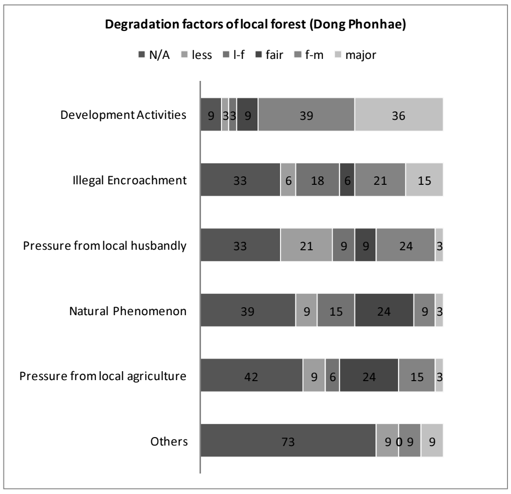
Figure K17 Results of Public Opinion Survey

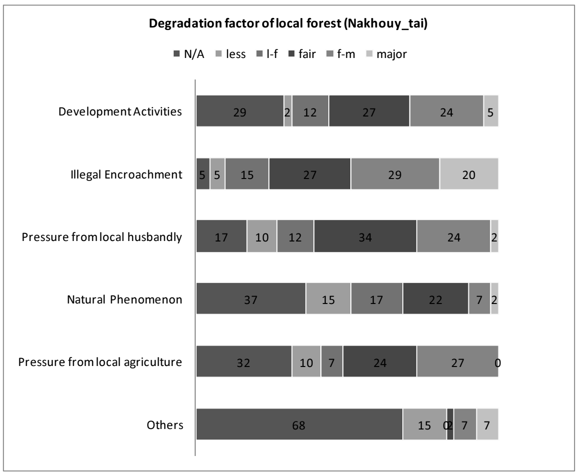
(What kind of change can you recognize, compared with the past condition?)



Dongphosy



Dong Phonghae



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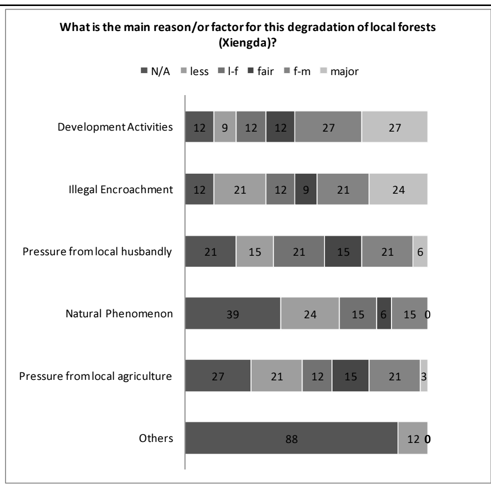

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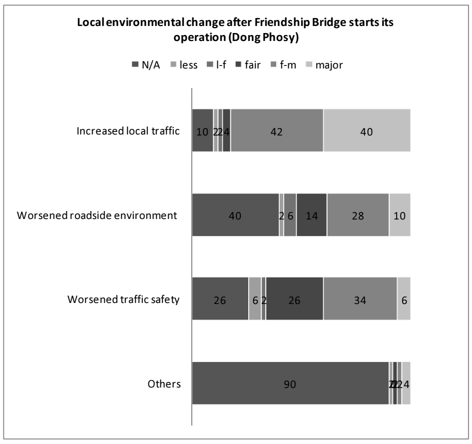
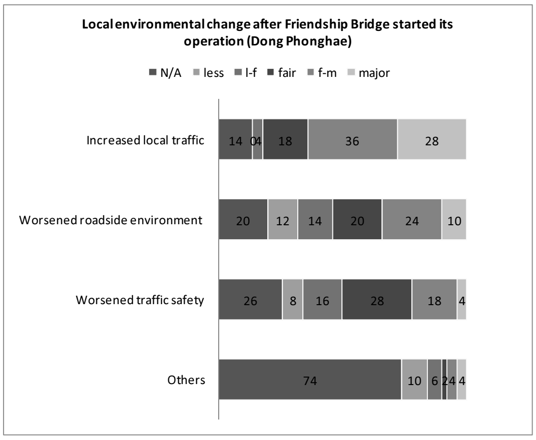
Figure K18 Results of Public Opinion Survey

(What is the main reason/or factor for degradation of local forest?)

19. Local environmental change after Friendship Bridge started its operation.



Dongphosy



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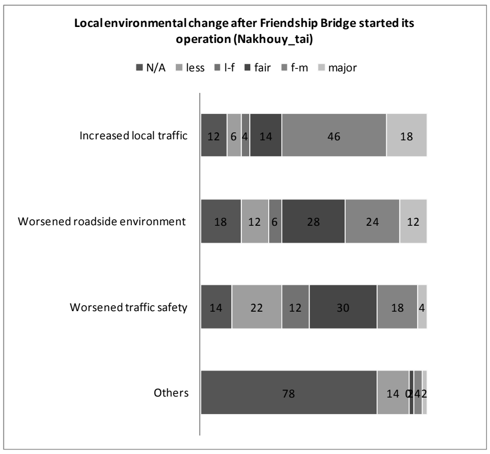

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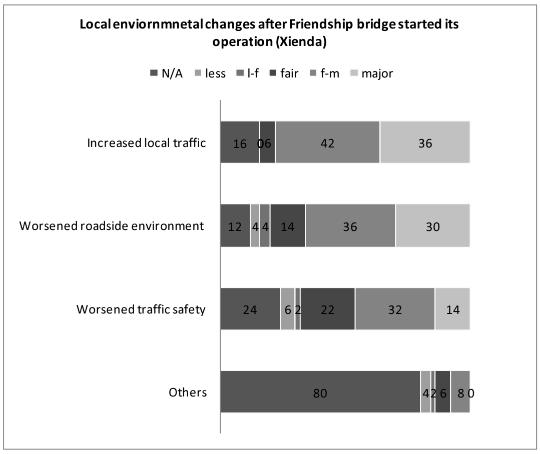

Xienda

Figure K19 Results of Public Opinion Survey

(Local environmental change after Friendship Bridge started its operation)

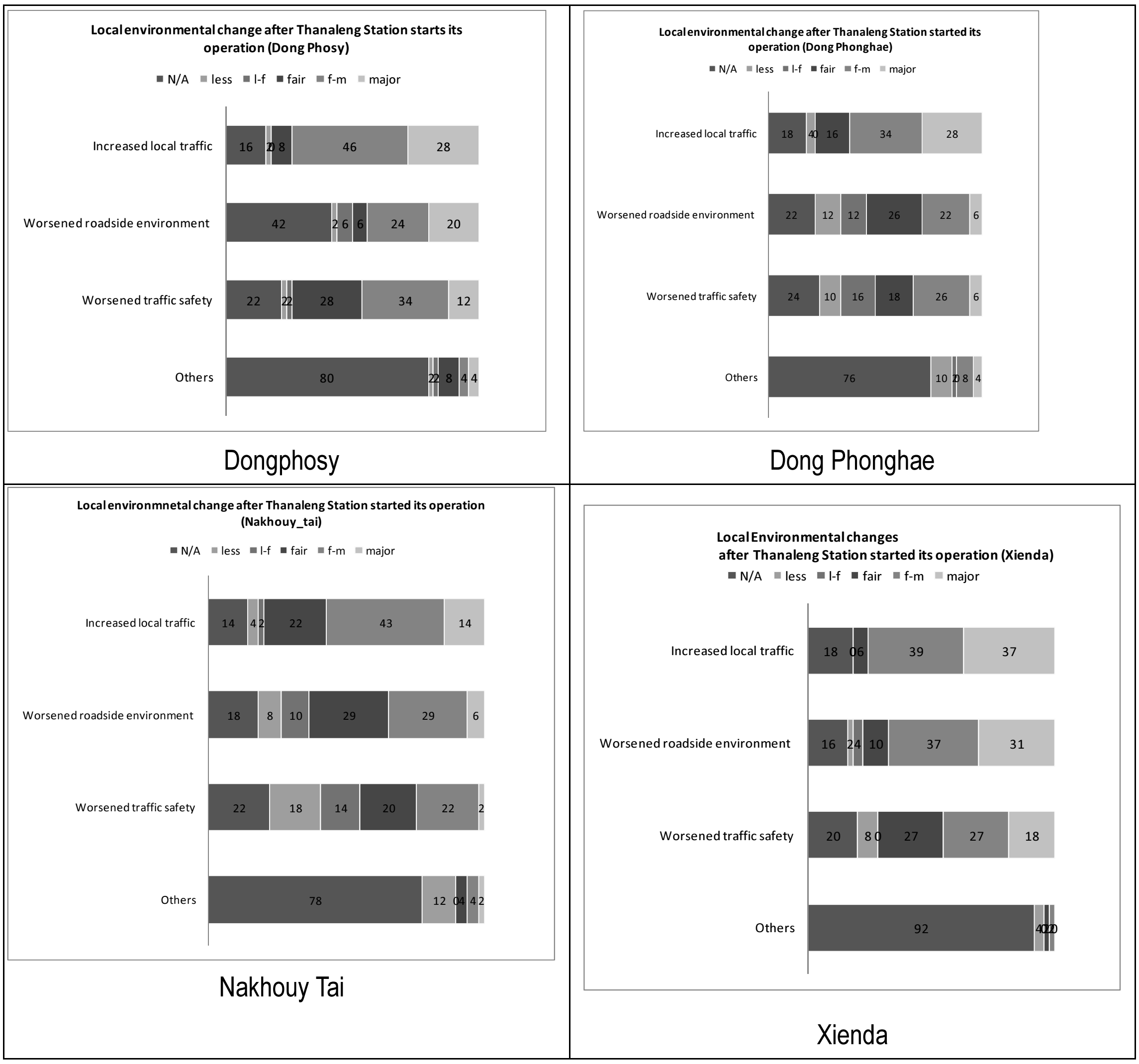

Figure K20 Results of Public Opinion Survey

(Local environmental change after Thanaleng Station started its operation)

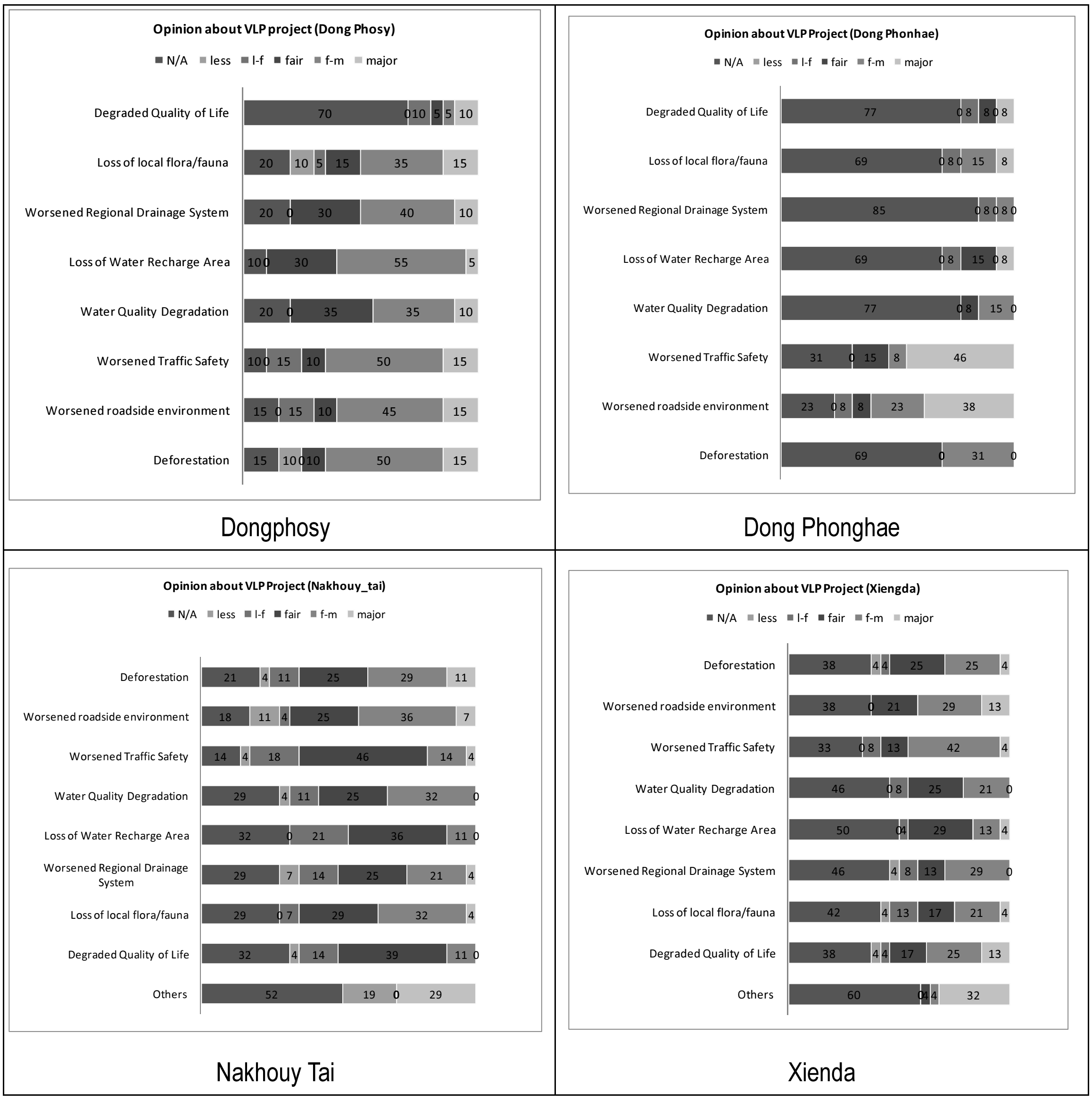

Figure K21 Results of Public Opinion Survey

(VLP is to be constructed around Thanaleng Station. What kind of opinion do you have?)

Appendix L Study Results of EIA-Level Environmental Study

1. Roadside Air Quality Survey

(1) Outline of the Field Survey.

In order to analyze the current roadside air quality conditions of selected VLP site, the roadside air quality field measurements were carried out by the Study Team. Within this study, following five parameters such as TSP, PM10, SOX, NOX and CO are of concern. Beside those five parameters, the hourly traffic volume was also counted at the same time. Three points around the project site representing dominant characteristics of the current public transport system, land use, and topographical conditions were chosen for the roadside air quality measurements. Basically, 24-hours continuous roadside air quality surveys are conducted. Tables L1 and L2 summarize the basic details of this air quality measurement.

Table L1 Instruments Used for Air Quality Measurements

Pollutant	Instrument Used for Measurement
TSP	High volume air sampler/Gravimetric
PM10	PM10 High volume air sampler/Gravimetric
SOX	Fluorescence
NOX	Chemiluminescence
CO	Non-dispersive Infrared

Notes: Total number of sampling points = 3, Measuring period: April 2010 and July 2010.

Table L2 Measurement Point Location (Air Quality)

Point #	Location (approx)
1	Feeder Road to Forest Reserve, Xienda Village
2	Feeder Road to Forest Reserve, Dongphosy Village
3	Village Road, Eastside of Thanalene Station, Donphosy Village.

Note: Roadside noise measurement is carried out, using same 3 survey points.

(2) Results and Discussions

Table L3 summarizes major survey results obtained from this roadside air quality study. From this table, it can be seen that all air quality values measured within this study are lower than environmental standards. So, it can be said that current roadside air quality conditions at all three sites are in good condition.

Table L3 Survey Results (Roadside Air Quality: measured in April and July 2010)

Locations	Concentration				
	24 hr TSP mg/ m^3	24 hr PM10 mg/ m^3	1-hr NO_2 Ppb	1-hr SO_2 Ppb	1-hr CO ppm
Site 1					
April	1.020	0.445	12.4-19.4	2.6-3.1	0.1-1.3
July	0.262	0.163	2.4-12.4	3.0-6.2	0.4-1.3
Site 2					
April	0.141	0.064	15.0-17.8	2.8-3.1	0.0-0.9
July	0.053	0.044	4.0-8.3	3.1-5.9	0.4-0.9
Site 3					
April	0.079	0.049	9.6-16.1	2.4-2.9	0.1-1.6
July	0.090	0.077	5.6-13.4	2.9-6.3	0.1-0.7
Standards					
Japan	-	0.10	40-60(24 hr)	100	10 (24 hr)
Thai	0.33	0.12	170	300	30
U.S.EPA	-	0.15	100	140 (24 hr)	35

Note: Standards available from following sites: www.env.go.jp/en/air/aq/aq.html [May 14, 2010], www.pcd.go.th/info_serv/reg_std_airsnd01.html [May 14, 2010], www.epa.gov/air/criteria.html [May 14, 2010]

2. Roadside Noise Survey

(1) Outline of the Field Survey.

In order to analyze the current roadside noise conditions of selected VLP site, the roadside noise field measurements were carried out by the Study Team. Within this study, following two parameters such as Leq-$_{1hr}$ and Leq-$_{24\ hrs}$ are of concern. Beside those two parameters, the hourly traffic volume was also counted at the same time. Three points around the project site representing dominant characteristics of the current public transport system, land use, and topographical conditions were chosen for the roadside noise measurements. Basically, 24-hours continuous roadside noise surveys are conducted. Tables L4 and L5 summarize the basic details of this noise measurement.

Table L4 Instruments Used for Noise Measurements

Pollutant	Instrument Used for Measurement
Leq-$_{1hr}$, Leq-$_{24\ hrs}$	All weather sound level meter, Model Type6226 S/N 020022

Notes: Total number of sampling points = 3, Measuring period: April 2010 and July 2010.

Table L5 Measurement Point Location (Noise)

Point #	Location (approx)
1	Feeder Road to Forest Reserve, Xienda Village
2	Feeder Road to Forest Reserve, Dongphosy Village
3	Village Road, Eastside of Thanalene Station, Dongphosy Village.

Note: Roadside air quality measurement is carried out, using same 3 survey points.

(2) Results and Discussions

Table L6 summarizes major survey results obtained from this roadside noise study. From this table, it can be seen that all Leq-24hr values obtained within this study are lower than environmental standards. So, it can be said that current roadside noise conditions at all three sites are in good condition. Among three sites, listed in Table 2, traffic volume of Site 3 is the lowest, so that a daily-averaged Leq values of Site 3 tend to be small, compared with those of remaining two sites. It is noted that a daily- averaged Leq value of Site 3, measured in April 2010 was caused by the torrential rain.

Table L6 Survey Results (Roadside Noise: measured in April and July 2010)

Locations	Sound Level (dBA)	
	Leq-1hr	Leq-24hr
Site 1		
April	43.4 – 62.3	58.3
July	49.1 – 64.2	59.4
Site 2		
April	45.4 – 64.9	60.5
July	44.8 – 65.2	60.6
Site 3		
April	43.0 - 69.5	60.2
July	46.9 - 53.5	50.1
Standards Japan Thai	 Residential Zone Daytime (6:00 a.m. – 10 p.m.): 55 dBA Night Time (10 p.m. – 6 a.m.): 45 dBA Daily Averaged: 70 dBA	

Note: Standards available from following sites: www.env.go.jp/kijun/oto1-1.html [September 29, 2010], www.pcd.go.th/info_serv/reg_std_airsnd01.html [May 14, 2010]

3. Water Quality Survey

(1) Outline of Field Survey

In order to grasp the current water quality condition around selected VLP site, the field measurement of the water quality is carried out. Within this measurement, thirteen parameters, listed in Table L7, are of concern. Upon considering the topographic features of study sites, five points are chosen as sampling points for this measurement, mainly located around the study area. Table L7 summarizes the outline of this water quality measurement.

Table L7 Water Quality Measurement.

Total number of sampling points = 5 points 2 points for surface water: Irrigation channel and pond 3 points for groundwater: shallow wells located around VLP site Measuring period: March & July 2010	
Parameter	pH, Temperature, conductivity, DO, BOD, COD, TSS, Arsenic, oil & grease, Hardness, turbidity, fecal & total coli form
Lab	Analyzed at Water Quality Laboratory of National University of Laos

(2) Results and Discussions

Tables L8 and L9 summarize “dry season” - water quality laboratory results of surface water and subsurface water, respectively. Tables L10 and L11 summarize “rainy season” - water quality laboratory results of surface water and subsurface water, respectively. Compared with WREA and WHO water quality standards, it can be said that no trace of the water quality contamination is recognized and the local water quality of both surface and subsurface water around the study area is in good condition. It is noted that the local water quality is not suitable for the drinking but good for washing and agricultural purpose.

Table L8 Analytical Results (Surface Water, Dry Season)

No	Parameter	Unit	St1 (irig.)	St 2 (pond)	Meth.	Amb.Std.	Water body
1	pH		8.11	7.44	pH meter	5 to 9	Recreational water
2	T°C	°C	33.7	29.7	pH meter	none	
3	Cond	uS/cm	262	161	Conductivity meter	none	
4	DO	mg/L	5	4.1	Azide modification	4	
5	BOD	mg/L	7.2	8.6	Direct meth.	2	
6	COD	mg/L	21.7	23.9	Close reflux titration	none	
7	As	Ppb	<10	<10	Test kit	0.05	
8	Turbility	NTU	0.075	0.12	Nephelometry	none	
9	TSS	mg/L	1.34	2.90	dryed at 103°C	none	
10	Hardness	mg/L	100	60	EDTA titration	300	
11	Fat oil & grease	mg/L	Not detected	Not detected	Soxhlet extraction	none	
12	Fecal coliform	MPN/100 mL	20	23	Membrane filter Techn.	1000*	
13	Total Coliform	MPN/100 mL	80	89	Membrane filter Techn.	5000*	

* class 3 medium clean fresh surface water use for agriculture purpose

Table L9 Analytical Results (Groundwater, Dry Season)

No	Parameter	Unit	St1	St 2	St 3	Meth.	Amb.Std.	W. body
1	pH		7.15	5.97	5.94	pH meter	5 to 9	Recreational water
2	T°C	°C	26.7	25.9	25.7	pH meter	none	
3	Cond	uS/cm	71	30	25	Conductivity meter	none	
4	DO	mg/L	5.7	2.6	2.8	Azide modification	4	
5	BOD	mg/L	8.2	9.8	10.8	Direct meth.	2	
6	COD	mg/L	25.6	32.7	39.04	Close reflux titration	none	
7	As	Ppb	<10	10	<10	Test kit	0.05	
8	Turbility	NTU	0.024	0.034	0.029	Nephelometry	none	
9	TSS	mg/L	0.28	0.4	0.3	dryed at 103°C	none	
10	Hardness	mg/L	25	20	15	EDTA titration	300	
11	Fat oil & grease	mg/L	Not detected	Not detected	Not detected	Soxhlet extraction	none	
12	Fecal coliform	MPN/100 mL	18	10	16	Membrane filters Techn.	1000*	
13	Total Coliform	MPN/100 mL	50	44	46	Membrane filters Techn.	5000*	

* Class 3 medium clean fresh groundwater use for agriculture and washing purpose

Table L10 Analytical Results (Surface Water, Rainy Season)

No	Parameter	Unit	St1 (irig.)	St 2 (pond)	Meth.	Amb.Std.	Water body
1	pH		7.93	7.31	pH meter	5 to 9	Recreational water
2	T°C	°C	36.8	33.9	pH meter	none	
3	Cond	uS/cm	395	23.5	Conductivity meter	none	
4	DO	mg/L	5	5.3	Azide modification	4	
5	BOD	mg/L	1.2	1.1	Direct meth.	2	
6	COD	mg/L	24.96	12.48	Close reflux titration	none	
7	As	ppb	<10	<10	Test kit	0.05	
8	Turbility	NTU	0.06	1.9	Nephelometry	none	
9	TSS	mg/L	36	122	dryed at 103°C	none	
10	Hardness	mg/L	140	100	EDTA titration	300	
11	Fat oil & grease	mg/L	0.05	0.03	Soxhlet extraction	none	
12	Fecal coliform	MPN/100 mL	19	57	Membrane filter Techn.	1000*	
13	Total Coliform	MPN/100 mL	67	109	Membrane filter Techn.	5000*	

* class 3 medium clean fresh surface water use for agriculture purpose

Table L11 Analytical Results (Groundwater, Rainy Season)

No	Parameter	Unit	St1	St 2	St 3	Meth.	Amb.Std.	W. body
1	pH		6.63	6.07	6.43	pH meter	5 to 9	Recreational water
2	T°C	°C	32.6	29	29.2	pH meter	none	
3	Cond	uS/cm	131	43	48	Conductivity meter	none	
4	DO	mg/L	5.5	2	4.6	Azide modification	4	
5	BOD	mg/L	1,1	1.4	0.9	Direct meth.	2	
6	COD	mg/L	6.24	12.48	18.72	Close reflux titration	5	
7	As	ppb	<10	10	10	Test kit	0.05	
8	Turbility	NTU	0.58	3.32	0.04	Nephelometry	none	
9	TSS	mg/L	3	42	9	dryed at 103°C	none	
10	Hardness	mg/L	300	100	60	EDTA titration	300	
11	Fat oil & grease	mg/L	Not detected	Not detected	Not detected	Soxhlet extraction	none	
12	Fecal coliform	MPN/100 mL	25	197	29	Membrane filters Techn.	1000*	
13	Total Coliform	MPN/100 mL	61	299	73	Membrane filters Techn.	5000*	

* Class 3 medium clean fresh groundwater use for agriculture and washing purpose

4. Soil Quality Survey

(1) Outline of the Field Survey.

In order to analyze the current soil quality conditions around selected VLP study sites, the soil quality field measurements are carried out by the Study Team. Nine parameters, summarized in Table L12, are of concern. Based on the land use condition of selected VLP project site, three sampling points are chosen for this measurement. Tables L12 and L13 summarize the outline of this soil quality measurement

Table L12 Soil Quality Measurement.

Total number of survey points = 3. Measuring period: April 2010	
Parameter	Instrument
Cadmium (Cd) Lead (Pb) Chromium (Cr) Total Mercury (Hg) Selenium (Se)	AAS flam spectrometer GBC 932 Plus Soil Laboratory, National University of Laos
Boron (B)	Curcumin meth.
Arsenic (As)	Arsenic test strips
Total cyanide	Barbuturic Acid
Fluoride	IC 550 Conductivity Detector

Table L13 Soil Sampling Point Location (Soil Quality)

Point #	Location (approx) and local land use
1	Point close to the center of the southern half of VLP site. Agricultural land.
2	Point close to the center of the northern half of VLP site. Agricultural land.
3	Point outside of VLP. Wet grassland.

(2) Results and Discussions.

Table L14 summarizes analytical results, obtained within this study. As shown in this table, all analytical results obtained at three points are below the current environmental standards. So, it can be said that the likelihood of the soil contamination at all survey points by heavy metals would be small.

Table L14 Analytical Results of Soil Analysis

No	Parameters	Unit	Point 1 (South)	Point 2 (North)	Point 3 (Outside)	**STD, mg/kg (WREA)**
1	Cadmium	mg/kg	0.9	0.8	0.9	**37**
2	T-cyanide	mg/kg	0.1	0.2	0.1	**11**
3	Lead	mg/kg	2.4	2	2	**400**
4	Chromium (VI)	mg/kg	0.2	0.5	0.2	**300**
5	Arsenic	Ppb	<10	<10	<10	**3.9**
6	T-mercury	mg/kg	1	0.3	0.3	**23**
7	Selenium	mg/kg	1	0.8	1	**390**
8	Fluoride	mg/kg	0.21	0.098	0.16	**N**
9	Boron	mg/kg	0.6	0.7	0.3	**N**