

MINISTRY OF PUBLIC WORKS AND TRANSPORT (MPWT)  
LAO PEOPLE'S DEMOCRATIC REPUBLIC  
MINISTRY OF TRANSPORT (MOT)  
SOCIALIST REPUBLIC OF VIETNAM

**DATA COLLECTION SURVEY FOR  
ENHANCING CONNECTIVITY  
BETWEEN HANOI AND VIENTIANE IN  
ASIA REGION**

**FINAL REPORT**

**OCTOBER, 2018**

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)**

**YACHIYO ENGINEERING CO., LTD.**

**NIPPON KOEI CO., LTD**

**CENTRAL CONSULTANT INC.**

**PASCO CORPORATION**

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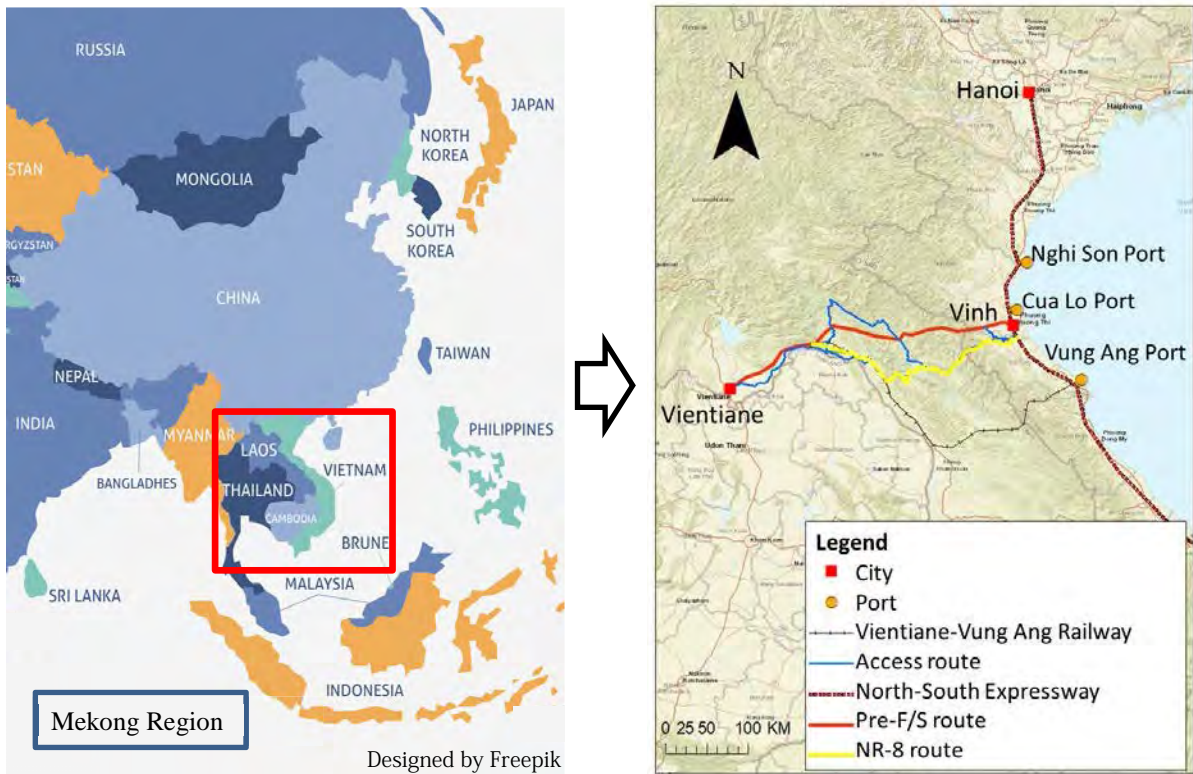
**PASCO CORPORATION**

Exchange Rates: December 2017

US1.00\$=¥111.129

VND1.00=¥0.004935

## Target Areas Location Map



### Target Countries Basic Information

■ Vietnam

Population: 93.6 million (2015)  
 GDP: 223.9 billion USD (2017)  
 GDP per capita 2,343 USD (2017)  
 Economic growth rate: 6.8% (2017)

■ Laos

Population: 6.66 million (2015)  
 GDP: 16.9 billion USD (2017)  
 GDP per capita 2,457 USD (2017)  
 Economic growth rate: 6.9% (2017)

Source : World Bank, United Nations  
<http://www.lib.utexas.edu/maps/asia.html>



## Field Survey Photos

### National Road 13 (Vientiane - Pac Xan)



Vientiane (4 Lanes)



Suburb Area (2 Lanes)



Pac Xan (4 Lanes)



Suburb Area (2 Lanes for Road and Bridge Section)

### National Road 1D



Truck Rolled Over at Sharp Curve



Viengthong

### National Road 8



Mountainous Area (Vieng Kham - Phontan)



Vietnamese Domestic (NR 8A)

**National Road 46, Vietnam**



Near the border



Vinh

**Provincial Road 1B, Laos**



Starting Point (Na Salom)



10km from Starting Point (Section with Huge Cut)

**Provincial Road 5117, Laos**



Simple Pavement Section (8 km from Viengthong)



After 8 km from Viengthong, the road condition has deteriorated in the rainy season for several years after the suspension of the construction

**Other Logistic Facilities**



Check Point at Pac Xan (Constructed in anticipation of the development of the 5<sup>th</sup> Thailand-Laos Friendship Bridge)



NR 8 Laos Border (Nam On)



Vehicle Weight Estimation Facility at Laksao (NR 8)



Nan Phao Check Point (NR 8)



Vung Ang Port



Cua Lo Port



Border Facility (Nam On / Thanh Thuy)



Border Facility (Nam On / Thanh Thuy)

### Joint Field Survey



Pac Xan Check Point (NR 8 Route)



Vieng Kham Check Point (NR 8 Route)





Vienthong Mountainous Section (Pre-F/S Route)



Ha Tinh Near Planned Border Facility (NR 8 Route)

**Meeting**



Kick-off Meeting in Laos



Kick-off Meeting in Vietnam



KOICA NR 8 F/S Workshop



Meeting with Ministry of Industry and Commerce of Laos



Interim Report Meeting at Vietnamese MOT



Joint Survey Wrap Up Meeting

## TABLE OF CONTENTS

Target Areas Location Map	
Field Survey Photos	
Table of Contents	
List of Figures and Tables	
List of Abbreviation	
Executive Summary	

<b>Chapter 1 Outline of the Survey .....</b>	<b>1-1</b>
1.1 Background and Objective of the Survey .....	1-1
1.1.1 Background.....	1-1
1.1.2 The Objective of Study .....	1-2
1.1.3 Target Areas .....	1-2
1.2 Contents of the Study.....	1-2
1.3 Structure of Study Team.....	1-7
<b>Chapter 2 Data Collection and Analysis of Logistics Sector for the Enhancement of Connectivity between Laos and Vietnam.....</b>	<b>2-1</b>
2.1 Current Development Situation and Future Trend of Main Logistics Infrastructure in the Indochina Peninsula ...	2-1
2.1.1 The Mekong Economic Corridor .....	2-1
2.1.2 Infrastructure Development Status of Target Area.....	2-6
2.1.3 Development Plan of Target Area .....	2-19
2.1.4 Future Prospects.....	2-21
2.2 Current Status and Future Development of Main Logistics Infrastructure between Vientiane and Hanoi ...	2-26
2.2.1 The Policies of Laos and Vietnamese Government and Development Status and Future Plan of Logistics Infrastructure.....	2-26
2.2.2 Information Collection of Regional Railway Development Plan.....	2-44
2.2.3 Current Status and Issues of Major Ports (Vung Ang Port, Nghi Son Port, Cua Lo Port) .....	2-53
2.2.4 Current Situation and Issues on Each Corridor Routes.....	2-59
2.3 Current Status and Issues in Enhancing Connectivity from Soft Component Point of View .....	2-66
2.3.1 Cross-Border Transport Agreement .....	2-66
2.3.2 Promotion of Trade, Investment, and Logistics in Laos and Thailand.....	2-70
<b>Chapter 3 Data Collection and Organization for Environmental and Social Considerations.....</b>	<b>3-1</b>
3.1 Scope of Data Collection and Organization for Environmental and Social Considerations .....	3-1
3.1.1 Contents of Data Collection of Organization.....	3-1
3.1.2 Study Area for Environmental and Social Considerations .....	3-2
3.2 Review of Laws and Regulations Relevant to Environmental and Social Considerations .....	3-3
3.2.1 Laws and regulations of Lao PDR relevant to environmental and social consideration .....	3-3
3.2.2 Laws and Regulations of Vietnam Relevant to Environmental and Social Considerations .....	3-6
3.3 Items to be considered in Environmental Impact Assessment .....	3-10
3.3.1 Climate.....	3-10
3.3.2 Population .....	3-11
3.3.3 Air Pollution, Noise and Vibration.....	3-14
3.3.4 Ecosystems.....	3-15
3.3.5 Protected Areas .....	3-19
3.3.6 Land Use.....	3-23

3.3.7	Landscape and Tourism Resources .....	3-27
3.3.8	Disasters.....	3-29
3.3.9	UXO Distribution.....	3-33
3.3.10	Ethnic Minorities .....	3-35
3.4	Land Acquisition and Resettlement .....	3-38
3.4.1	Legal System of Land Acquisition and Resettlement .....	3-38
3.4.2	Preconditions for Estimation of Land Acquisition and Resettlement Cost .....	3-40
3.4.3	Estimation Result of Compensation Cost .....	3-42
3.5	Impact Assessment and Mitigation Measures .....	3-45
3.5.1	Scoping and Terms and Reference for Environmental and Social Consideration.....	3-45
3.5.2	Expressway development along Alternative 2 (NR 8 route).....	3-45
3.5.3	Other Non-Expressway Development Sections Proposed in Phased Approach.....	3-57
3.6	Issues to Consider in Examining Alternative Routes .....	3-63
3.6.1	Protected Areas .....	3-63
3.6.2	Habitats for Endangered Species .....	3-64
3.6.3	Nam Thean Dam Construction.....	3-64
3.6.4	Impact on Cultural Heritage.....	3-64
3.6.5	Impact on Land Use and Settlement of People .....	3-64
<b>Chapter 4 Map Preparation Using Satellite Image Analysis and Correction .....</b>		<b>4-1</b>
4.1	Map Preparation Range and Procedure.....	4-1
4.1.1	Map Preparation Range.....	4-1
4.1.2	Work Procedure.....	4-1
4.2	Field Survey Correction Content .....	4-3
4.2.1	GCP Survey .....	4-3
4.2.2	Tree Height Survey .....	4-6
4.3	Types and Precision of Results .....	4-8
4.3.1	Scale 1:50,000 Maps.....	4-8
4.3.2	Scale 1:25,000 Maps.....	4-8
4.3.3	Scale 1:5,000 Maps.....	4-9
4.3.4	Checking with Track Data.....	4-10
4.3.5	Checking Elevation of GCP Points and AW3D DSM Points.....	4-10
<b>Chapter 5 Overview of Geology of the Subject Area.....</b>		<b>5-1</b>
5.1	Topography .....	5-1
5.2	Climate.....	5-1
5.3	Geological Features and Structure .....	5-3
5.3.1	Geological Features .....	5-3
5.3.2	Geological Structure .....	5-4
5.4	Geology and Structures.....	5-7
5.4.1	Geology and Tunnels .....	5-7
5.4.2	Entrance of Tunnel.....	5-9
5.4.3	Geology and Earthwork (Cutting and Filling) .....	5-10
<b>Chapter 6 Evaluation of the Route in the Proposed Expressway Development Plan.....</b>		<b>6-1</b>
6.1	Review of Pre-Feasibility Study .....	6-1
6.1.1	Routes Planned in the Pre-Feasibility Study .....	6-1

6.1.2	Review of the Pre-F/S Expressway Plan.....	6-3
6.2	Basic Policy to Examine Alternative Routes.....	6-8
6.2.1	Services to Densely Populated Areas.....	6-8
6.2.2	Contribution to Roadside Regional Development .....	6-8
6.2.3	Coordination with Other Transportation Projects .....	6-9
6.2.4	Connection with General Roads.....	6-9
6.2.5	Avoidance of Effects on Natural Reserves.....	6-9
6.2.6	Improvement of Access to the Port.....	6-10
6.3	Proposed Development Plan .....	6-11
6.3.1	Development Standards for Expressway Plan .....	6-11
6.3.2	Development Alternatives for the Expressway Plan .....	6-11
<b>Chapter 7 Traffic Demand Forecast .....</b>		<b>7-1</b>
7.1	Characteristic of the Target Area.....	7-1
7.1.1	Traffic Volume and Origin & Destination.....	7-1
7.1.2	International Traffic Flow between Laos and Vietnam .....	7-7
7.2	Methodology of Traffic Demand Forecast .....	7-11
7.2.1	Basic Policy .....	7-11
7.2.2	Traffic Demand Forecast Procedure.....	7-11
7.2.3	Target Area of Traffic Demand Forecast.....	7-13
7.2.4	Socio Economic Framework (Population, GDP, Development along Expressway) .....	7-15
7.2.5	Reproduction of the Present Traffic Condition .....	7-20
7.3	Result of Traffic Demand Forecast .....	7-22
7.3.1	Forecast Case .....	7-22
7.3.2	Future Traffic Generation and Attraction .....	7-23
7.3.3	Analysis of the Pricing Sensitivity.....	7-30
7.3.4	Assumption of Modal Share with Railway .....	7-31
7.3.5	Result of Traffic Demand Forecast by Forecast Case .....	7-32
7.3.6	Comparison with the Pre-F/S Result.....	7-34
7.3.7	Impact by Other Expressways.....	7-35
7.3.8	Impact by Regional Development.....	7-36
<b>Chapter 8 Design and Cost Estimation of Road and Structure .....</b>		<b>8-1</b>
8.1	Review of Previous Studies .....	8-1
8.1.1	Road Design.....	8-1
8.1.2	Structural Design .....	8-8
8.1.3	Cost Estimation.....	8-9
8.2	Preliminary Design of Road and Structures.....	8-13
8.2.1	Target Route of Designing .....	8-13
8.2.2	Design Condition of Road Design .....	8-15
8.2.3	Typical Cross Sections .....	8-17
8.2.4	Review of Main Structures .....	8-19
8.3	Rough Cost Estimation of Roads and Structures .....	8-24
8.3.1	Cost Estimation Conditions .....	8-24
8.3.2	Classification of Terrains .....	8-25
8.3.3	Setting of Unit Project Prices.....	8-26
8.3.4	Rough Estimation of Project Cost.....	8-27

<b>Chapter 9</b>	<b>Evaluation of Proposed Expressway Development Plan.....</b>	<b>9-1</b>
9.1	Evaluation Method.....	9-1
9.2	Evaluation by Each Evaluation Item.....	9-1
9.2.1	Project Cost.....	9-1
9.2.2	Traffic Demand.....	9-2
9.2.3	Travel Time between Major Cities.....	9-2
9.2.4	Vertical Gradient.....	9-3
9.2.5	Contribution to Regional Development.....	9-4
9.2.6	Impact on Environment.....	9-4
9.2.7	Resettled Structures.....	9-5
9.2.8	Effectiveness of Phased Approach.....	9-6
9.3	Evaluation Result.....	9-6
9.4	Study of Routes on Vietnam Side.....	9-7
9.4.1	Route Comparison on Vietnam Side.....	9-7
9.4.2	Route Evaluation through Whole Length (Laos and Vietnam).....	9-8
9.4.3	Measures for Structural Issues along NR 8 Route.....	9-8
9.5	Detailed Plan of Selected Route.....	9-10
9.5.1	Points to Consider along the Whole Alignment.....	9-10
9.5.2	Study Results by Section.....	9-11
9.6	Review of Stage-Wised Development Plan.....	9-16
9.6.1	Study for Phased Development Plan by Section.....	9-16
9.6.2	Study for Phased Development Plan.....	9-17
<b>Chapter 10</b>	<b>Economic and Financial Analysis.....</b>	<b>10-1</b>
10.1	Economic Analysis.....	10-1
10.1.1	Analysis Method.....	10-1
10.1.2	Economic Analysis of Pre-F/S route and NR 8 route.....	10-2
10.1.3	Feasibility of Vientiane - Pac Xan Section.....	10-2
10.2	Financial Analysis.....	10-4
10.2.1	Introduction.....	10-4
10.2.2	Preliminary Evaluation of Financial Viability of the Entire Section.....	10-4
10.2.3	Financial Evaluation of Vientiane - Pac Xan Section.....	10-5
10.3	Study of the Project Scheme and Financing Policy.....	10-8
10.3.1	Governments' Fiscal Status and Financing Policy.....	10-8
10.3.2	Study of the Project Scheme.....	10-10
<b>Chapter 11</b>	<b>Road Development by Providing Road Construction Equipment.....</b>	<b>11-1</b>
11.1	Current Status of Road Development Project in Lao PDR.....	11-1
11.1.1	Method of Road Development.....	11-1
11.1.2	Current Status of Road Development.....	11-1
11.1.3	Status of Construction Companies.....	11-1
11.2	Study for Target Road Development Plan.....	11-2
11.2.1	Financial Situation of Road Sector in Laos.....	11-2
11.2.2	Study for Road Development Plan.....	11-3
11.3	Necessity of Road Construction Equipment.....	11-4
11.3.1	Process of Providing Construction Equipment.....	11-4
11.3.2	Overview of the Government of Japan's Grant Aid scheme.....	11-5

11.4	Agenda for Future Implementation .....	11-6
<b>Chapter 12</b>	<b>Soft Component for the Enhancement of Connectivity .....</b>	<b>12-1</b>
12.1	Necessity of Measures to Enhance Connectivity through Institutional Improvement .....	12-1
12.2	Measures to Achieve the Freight Transport Volume Appropriate to Expressway .....	12-1
12.2.1	Planning for Regional Development and Industrial Promotion along the Expressway and Enhancement of Relevant Institutions .....	12-2
12.2.2	Selection the Candidate Industries/Enterprises to Attract according to the Regional Development and Industry Promotion Plans.....	12-4
12.2.3	Planning and Implementation for Development of Special Economic Zones/ Industrial Parks to Attract Industries/Enterprises.....	12-5
12.2.4	Planning and Implementation of Export Promotion for Products of Regions along the Expressway .....	12-6
12.2.5	Attraction of Industries/Enterprises, and Planning and Implementation for Investment Promotion.....	12-8
12.2.6	Implementation of Regional Development and Industry, Investment and Export Promotions Appropriate to Characteristics of Regions along the Expressway .....	12-9
12.3	Measures for Institutional Improvement to Reduce Time and Costs of Freight Transport .....	12-13
12.3.1	Promotion and Improvement of Electronic Processing of Customs Clearance, Immigration and Quarantine Procedures .....	12-13
12.3.2	Realization of a Single Window for Customs Clearance, Immigration, and Quarantine Procedures, and Extension of Single Stop Inspection .....	12-14
12.3.3	Agreement Concerning Cross-Border Traffic and Improvement of the Customs Clearance System ...	12-15
12.3.4	Reinforcement of Border Facilities and Increase in the Customs Officers .....	12-15
12.3.5	Training of Customs Officers.....	12-16
12.3.6	Fostering of Logistics Operators of Laos, Attraction of Foreign Logistics Operators, and Establishment of a Network of Logistics Operators of Laos and Foreign Countries.....	12-17
<b>Chapter 13</b>	<b>Conclusion and Future Challenges .....</b>	<b>13-1</b>
13.1	Conclusion .....	13-1
13.2	Future Challenges .....	13-1

Appendix

## List of Figures

Figure 1.2.1	The Entire Workflow .....	1-3
Figure 1.2.2	Topographic Mapping range.....	1-5
Figure 1.3.1	Study Team Composition.....	1-8
Figure 2.1.1	Intercountry Distribution of the GMS Economic Corridors (%).....	2-2
Figure 2.1.2	Current GMS Economic Corridors.....	2-2
Figure 2.1.3	New GMS Economic Corridor (Yellow line route: added/proposed routes).....	2-4
Figure 2.1.4	Asian Highway Network in GMS region (As of November, 2016) .....	2-8
Figure 2.1.5	ASEAN Highway Network.....	2-9
Figure 2.1.6	Transit Transport Routes (TTR) in ASEAN Highway .....	2-10
Figure 2.1.7	Railway Network in the GMS Region (as of April, 2016).....	2-12
Figure 2.1.8	Trans-Asian Railway Network in GMS Region (as of November, 2016) .....	2-13
Figure 2.1.9	Current Situation of Port in GMS Region (as of April, 2016).....	2-14
Figure 2.1.10	Amount of Cargo Handled in ASEAN Major Port (2008).....	2-15
Figure 2.1.11	Current Situation of Airport in GMS Region (as of April, 2016).....	2-16
Figure 2.1.12	Main Road and Railway Network and Location of Dry Port in Laos, Vietnam, and Thailand.....	2-17
Figure 2.1.13	Location of SEZ in GMS Region.....	2-18
Figure 2.1.14	Ongoing Projects in GMS Region (As of March, 2018) .....	2-23
Figure 2.1.15	Planned Projects in GMS Region (As of March, 2018) .....	2-24
Figure 2.2.1	Road Network in Laos (Current and Future) .....	2-31
Figure 2.2.2	Target Routes of National Road 13 Improvement and Maintenance Project .....	2-32
Figure 2.2.3	Future Expressway Network in Vietnam .....	2-33
Figure 2.2.4	Railway Network in Laos (Present and Future) .....	2-34
Figure 2.2.5	Railway Network (Present and Future).....	2-36
Figure 2.2.6	Situation of River Port in Laos.....	2-37
Figure 2.2.7	Location of River Port in Laos.....	2-37
Figure 2.2.8	Development Plan of Xiengkong port, Pakbeng port, and Luang Prabang Port.....	2-38
Figure 2.2.9	Location of New River Port in Laos .....	2-38
Figure 2.2.10	Location of Seaport in Vietnam (as of April, 2016).....	2-40
Figure 2.2.11	Location of Airport in Laos (Present and Future) .....	2-41
Figure 2.2.12	Location of Airports in Vietnam (Present and Future) .....	2-43
Figure 2.2.13	Proposed Route .....	2-44
Figure 2.2.14	Route Map (Left: SKRL, Right: Target Route of F/S).....	2-46
Figure 2.2.15	Construction Section (Upper: Scenario 1, Under: Scenario 2).....	2-47
Figure 2.2.16	Traffic Assignment of Passenger and Freight Demand between Vientiane and Vung Ang Port.....	2-49
Figure 2.2.17	Priority Railway Link in GMS Region.....	2-52
Figure 2.2.18	Location of Vung Ang Port, Nghi Son Port, Cua Lo Port .....	2-53
Figure 2.2.19	Vung Ang Port .....	2-54
Figure 2.2.20	Cua Lo Port.....	2-55
Figure 2.2.21	Future Plan of Vung Ang Port.....	2-57
Figure 2.2.22	Development Plan of Cua Lo Port .....	2-58
Figure 2.2.23	Location of Thanh Thuy/Nam On Border Gate.....	2-59
Figure 2.2.24	Thanh Thuy/Nam On Border Gate and its Environ.....	2-59
Figure 2.2.25	Road No. 8 Route (Red Line) .....	2-60
Figure 2.2.26	Gradient of Road No. 8 Route.....	2-60
Figure 2.2.27	Road Condition of National Road No. 8 Route.....	2-61
Figure 2.2.28	Routes of Bangkok to Hanoi .....	2-62
Figure 2.2.29	Road Condition of National Road No. 12 Route.....	2-63
Figure 2.2.30	East-West Economic Corridor Route.....	2-64
Figure 2.2.31	Road Condition of Running Route.....	2-64
Figure 2.2.32	Traffic Volume of East-West Direction Road (Road No.8, No. 9 No. 12).....	2-65
Figure 2.3.1	Evolution of Amounts of Investment Approved in Laos.....	2-71
Figure 2.3.2	Approved Amount of Investment in Laos per year by Sector .....	2-71

Figure 2.3.3	SEZ Location Map.....	2-74
Figure 2.3.4	ASEAN's Major Trade Partners/Regions.....	2-83
Figure 2.3.5	Values of ASEAN's Exports of Capital Goods, Raw Materials, Consumer Goods, Parts, and Intermediate Goods.....	2-84
Figure 2.3.6	Trade of Consumable Goods and Intermediary Commodities among Asian Countries.....	2-84
Figure 2.3.7	Import/Export of Raw Materials, Intermediate Goods, Consumer Goods, and Capital Goods of Laos.....	2-85
Figure 2.3.8	GDP in Thailand, Laos, Vietnam, Cambodia, and Myanmar.....	2-86
Figure 2.3.9	Monthly Average Wage in Asian Cities.....	2-86
Figure 3.1.1	Study Area for Data Collection for Environmental and Social Considerations.....	3-2
Figure 3.2.1	Organizational Chart of MONRE of Vietnam.....	3-8
Figure 3.3.1	Mean Monthly Temperature and Mean Monthly Precipitation in Lao PDR (left) and Vietnam (right).....	3-10
Figure 3.3.2	Mean, minimum, and maximum monthly temperature and mean monthly rainfall in Vientiane Capital.....	3-11
Figure 3.3.3	Population change in urban and rural areas in Lao PDR (1990-2017).....	3-11
Figure 3.3.4	Population of each Administrative Division in the Study Area.....	3-12
Figure 3.3.5	Distribution of Villages and Population in the Study Area in Lao PDR.....	3-13
Figure 3.3.6	Estimated population density in Lao PDR.....	3-13
Figure 3.3.7	Habitat Ranges of the Endangered Species Found in the Study Area.....	3-17
Figure 3.3.8	Locations where Saolas were Observed and Pre-F/S Route.....	3-19
Figure 3.3.9	Distribution of Protected Areas in Lao PDR and Vietnam.....	3-20
Figure 3.3.10	Map of Nam Kading National Protected Area.....	3-21
Figure 3.3.11	Map of Western Nghe An Biosphere Reserve.....	3-21
Figure 3.3.12	Procedure to Change Designation of Protected Area.....	3-22
Figure 3.3.13	Nam Thean Dam under Construction and Alternative Routes.....	3-23
Figure 3.3.14	Land Use Patterns in Vientiane City.....	3-25
Figure 3.3.15	Land Use Pattern in Bolikhamsai Province.....	3-26
Figure 3.3.16	Land Use Patterns of Ha Tinh.....	3-27
Figure 3.3.17	Tourist Map in Phou Khao Khouay National Protected Area.....	3-28
Figure 3.3.18	Distribution of Tourist Destination in Bolikhamsai Province.....	3-28
Figure 3.3.19	Regions where Flash Flood Warning was issued (2010-2014).....	3-30
Figure 3.3.20	Precipitation between 8th and 25th of August, 2016.....	3-31
Figure 3.3.21	Epicenters of earthquakes in the northern and central Lao PDR and the northern Vietnam.....	3-32
Figure 3.3.22	Degree of Exposure to Natural Disasters in Lao PDR and Vietnam.....	3-32
Figure 3.3.23	Modified Mercalli Scale.....	3-33
Figure 3.3.24	Distribution of UXO in Study Area in Lao PDR.....	3-34
Figure 3.3.25	Ethnic Groups of the Greater Mekong Subregion.....	3-35
Figure 3.3.26	Distribution of Ethnic Group in the Study Area.....	3-36
Figure 3.4.1	Procedural Flow regarding Land Acquisition and Resettlement.....	3-39
Figure 3.4.2	Road Segmented into Sections.....	3-41
Figure 3.4.3	Area Size Acquired and Compensation for Land Acquisition by Section.....	3-42
Figure 3.4.4	Land Acquisition Cost by Route.....	3-43
Figure 3.4.5	Resettlement Cost by Section (thousand USD).....	3-43
Figure 3.4.6	Resettlement Cost by Route (thousand USD).....	3-44
Figure 4.1.1	Topographic Map Preparation Range.....	4-1
Figure 4.1.2	Topographic Map Preparation Procedure.....	4-2
Figure 4.2.1	GCP Index Map.....	4-3
Figure 4.2.2	Trimble Geo7X.....	4-3
Figure 4.2.3	Reference Point Details.....	4-4
Figure 4.2.4	Approximate Shape of the Geoid.....	4-4
Figure 4.2.5	Conceptual Diagram of Mercator Projection and UTM Projection.....	4-5
Figure 4.2.6	Relation of Ellipsoid, Geoid, Altitude.....	4-5
Figure 4.2.7	Tree Height Survey.....	4-7



Figure 4.3.1	Scale 1:50,000 Topographic Map (Ortho Map) .....	4-8
Figure 4.3.2	Scale 1:25,000 Topographic Map .....	4-9
Figure 4.3.3	1:5,000 Topographic Map .....	4-9
Figure 4.3.4	Checking Map Created with Track Data .....	4-10
Figure 5.1.1	Geography of Lao PDR and Vietnam .....	5-1
Figure 5.2.1	Precipitation Distribution in the Indochina Peninsula (1997~2000) .....	5-2
Figure 5.2.2	Climate of Vientiane, Lao PDR .....	5-2
Figure 5.3.1	Geological Map of Lao PDR.....	5-3
Figure 5.3.2	Plates and Occurrence of Earthquakes (Red dots indicate earthquake epicenters).....	5-4
Figure 5.3.3	Elevation and Distribution of Volcanoes .....	5-5
Figure 5.3.4	Conspicuous Vertical Fissures in Metamorphosed Slate and Quartzite .....	5-6
Figure 5.3.5	Block of Very Hard Quartzite and Metamorphosed Slate (Area in red dots).....	5-6
Figure 5.4.1	Weathered Quartz-biotite Granite and Biotite Schist Turning Reddish Brown (White grains in the left photo are quartz) .....	5-8
Figure 5.4.2	Rock Mass Located 24km East of Vieng Kham.....	5-8
Figure 5.4.3	Rock Burst during Construction of Kan-etsu Tunnel.....	5-9
Figure 5.4.4	Rocks at ca. 24 km East of Vieng Kham.....	5-9
Figure 5.4.5	Types of Sediment Movement .....	5-10
Figure 5.4.6	Conspicuous Slope Failure along Existing Road in the Mountainous Area (at 245km point of Pre F/S route).....	5-10
Figure 5.4.7	A dip Slope Structure of Slate and Shale and Slope Failure (at 260km point of Pre F/S route) .....	5-11
Figure 6.1.1	Routes Planned in the Pre-Feasibility Study .....	6-2
Figure 6.1.2	Diagram of Pre-F/S Expressway Plan .....	6-2
Figure 6.1.3	Profile Gradient and Distribution for the Pre-F/S Expressway .....	6-4
Figure 6.1.4	Structure Lengths and Ratios for the Pre-F/S Expressway .....	6-4
Figure 6.1.5	Low Speed Sections for Trailer Trucks on the Pre-F/S Expressway (bottlenecks) .....	6-6
Figure 6.1.6	Trailer Trucks Traveling on NR 8.....	6-6
Figure 6.2.1	Population Distribution of Target Area.....	6-8
Figure 6.2.2	Distribution of Developable Area .....	6-9
Figure 6.2.3	Conditions of Natural Reserves.....	6-10
Figure 6.2.4	Saola Observation Sites .....	6-10
Figure 6.3.1	Route Map for Alternative 1 .....	6-11
Figure 6.3.2	Route Map for Alternative 2 .....	6-12
Figure 6.3.3	Route Map for Alternative 3A .....	6-13
Figure 6.3.4	Route Map for Alternative 3B.....	6-13
Figure 7.1.1	Survey Location of Traffic Survey (Traffic volume in 24 hours volume/day).....	7-2
Figure 7.1.2	Result of Traffic Volume Survey .....	7-3
Figure 7.1.3	Time Variation of Traffic Volume .....	7-3
Figure 7.1.4	Main OD Survey in the Roadside Interview Survey (Interview Location: NR13 Vientiane).....	7-4
Figure 7.1.5	Main OD Survey in the Roadside Interview Survey(Interview Location: NR 13 Vieng Kham).....	7-5
Figure 7.1.6	Main OD Survey in the Roadside Interview Survey (Interview Location: NR 8 : Laksao) .....	7-6
Figure 7.1.7	Type of Freight at the Roadside Interview Survey .....	7-7
Figure 7.1.8	Location Map of Laos-Vietnam Border .....	7-7
Figure 7.1.9	Main OD surveyed at NR8.....	7-8
Figure 7.1.10	Main OD surveyed at NR12.....	7-9
Figure 7.1.11	Main OD surveyed at NR9.....	7-9
Figure 7.2.1	Traffic Demand Forecast Flow of Passenger Traffic .....	7-12
Figure 7.2.2	Traffic Demand Forecast Flow of Freight Traffic.....	7-13
Figure 7.2.3	Traffic Zone of Passenger Traffic and Freight Traffic .....	7-14
Figure 7.2.4	Trend of Crude Survival Rate and Infant Mortality Rate .....	7-15
Figure 7.2.5	Population Projection in Laos .....	7-15
Figure 7.2.6	Population Projection in Vietnam .....	7-16

Figure 7.2.7	Planned SEZ Location Map .....	7-18
Figure 7.2.8	Distribution of Developable Land.....	7-19
Figure 7.2.9	Road Network in Present Case (2018) .....	7-21
Figure 7.2.10	Reproduction Result of Present Case (2018).....	7-22
Figure 7.3.1	Forecast Result of Number of Registered Vehicle in Laos .....	7-23
Figure 7.3.2	Trade Value in Mekong Region (2014) .....	7-25
Figure 7.3.3	Trend of Trade Value between Laos and Vietnam.....	7-26
Figure 7.3.4	Trend of Trade Value between Thailand and Vietnam .....	7-26
Figure 7.3.5	Trend of Trade Value between Laos and Thailand .....	7-27
Figure 7.3.6	Conversion Ratio to Expressway by Cost Time Difference (Passenger Traffic).....	7-30
Figure 7.3.7	Conversion Ratio to Expressway by Cost Time Difference (Passenger Traffic).....	7-31
Figure 7.3.8	Route Alignment of Vientiane – Vung Ang Railway and Estimated Direct Influence Area.....	7-32
Figure 7.3.9	Future Traffic Demand Forecast in 2035 .....	7-33
Figure 7.3.10	Reproduction of the Present Traffic Condition (2018).....	7-34
Figure 7.3.11	Impact by Other Expressways (Year 2035 • Alt. 2).....	7-35
Figure 7.3.12	Impact by Regional Development (Year 2035 • Alt. 2).....	7-36
Figure 8.1.1	Schematic Drawing of Pre-F/S Route .....	8-2
Figure 8.1.2	Typical Cross Section in Pre-F/S Report (6 lanes, fill) .....	8-2
Figure 8.1.3	NR8 Development Project .....	8-4
Figure 8.1.4	Project Plan for the 5th Mekong River Crossing Bridge Project.....	8-6
Figure 8.1.5	Plan of Viengthong – Thanh Thuy Road (PR5117) .....	8-7
Figure 8.1.6	Route Map around Thanh Thuy Border and NR8 .....	8-7
Figure 8.1.7	Road Plan around the 5th Mekong River Crossing Bridge Project .....	8-8
Figure 8.2.1	Target Route of Designing .....	8-14
Figure 8.2.2	Typical Cross Section (6-lane section, Flat).....	8-17
Figure 8.2.3	Typical Cross Section (4-lane section, Rolling/Mountainous, Fill) .....	8-17
Figure 8.2.4	Typical Cross Section (4-lane section, Rolling/Mountainous, Fill-oneside) .....	8-18
Figure 8.2.5	Typical Cross Section (4-lane section, Rolling/Mountainous, Cut) .....	8-18
Figure 8.2.6	Typical Cross Section (4-lane section, Bridge).....	8-18
Figure 8.2.7	Typical Cross Section (6-lane section, Bridge).....	8-19
Figure 8.2.8	Typical Cross Section (4-lane section, Tunnel).....	8-19
Figure 8.2.9	Slope Failures Generated around Border on National Road No.8.....	8-20
Figure 8.2.10	Outline of Special Construction Method of High Piers in the Valley (Thrust Method).....	8-22
Figure 8.2.11	Tunnel Auxiliary Construction Method (the long steel pipe tip forepiling method) .....	8-23
Figure 8.2.12	Image of Grand Anchor Work .....	8-24
Figure 8.3.1	Composition of Project Cost .....	8-25
Figure 8.3.2	Summary of Project Cost Estimation .....	8-27
Figure 8.3.3	Comparison of Cost Estimation Results in Pre-F/S and in this Study .....	8-33
Figure 9.2.1	Summary of Project Cost (Cost breakdown by country).....	9-1
Figure 9.2.2	Average Daily Traffic Volume by Alternative (PCU/day) (2035) .....	9-2
Figure 9.2.3	Travel Time between Major Cities.....	9-3
Figure 9.2.4	Length of Road Section with over 6% of Vertical Gradient.....	9-3
Figure 9.2.5	Contribution to Regional Development (Area of Possible Development Site) .....	9-4
Figure 9.2.6	Habitat of Critically Endangered Species (Saola) .....	9-5
Figure 9.2.7	Number of Resettled Structures by Alternative/Section.....	9-5
Figure 9.2.8	Strategy of Phased Approach .....	9-6
Figure 9.4.1	Comparison of the Number of Resettled Structures .....	9-8
Figure 9.4.2	Comparison of Routes on Vietnam Side .....	9-9
Figure 9.4.3	Potential Location for New Border Facility .....	9-9
Figure 9.5.1	Target Sections along NR 8 Route.....	9-11
Figure 9.5.2	Improvement of NR 8 Route Alignment .....	9-11
Figure 9.5.3	A-A Cross section (Parallel to NR8 Route) .....	9-12
Figure 9.5.4	Improvement of NR 8 Route (Knoun Ngeun – Ban Khounkeo) .....	9-12
Figure 9.5.5	Geology near Planned Tunnel site (Knoun Ngeun-Ban Khounkeo section) .....	9-12

Figure 9.5.6	Improvement of Route Alignment along NR 8 (Theun Hinboun Hydropower Station).....	9-13
Figure 9.5.7	Improvement of NR 8 Route (Na Hin - Nong Coc) .....	9-13
Figure 9.5.8	Geology near planned tunnel site (Na Hin-Nong Coc section) .....	9-14
Figure 9.5.9	Improvement of NR 8 Route (Laksao BP).....	9-14
Figure 9.5.10	Improvement of NR 8 Route (alignment change around border areas).....	9-15
Figure 9.5.11	Geology near Proposed Route (border area) .....	9-15
Figure 9.6.1	Implementation Period by Section from the Viewpoint of Traffic Demand .....	9-16
Figure 9.6.2	Proposed Phased Development Plan .....	9-18
Figure 10.1.1	Method of Economic Analysis.....	10-1
Figure 10.2.1	Demand and Revenue Forecast between Vientiane and Pac Xan.....	10-6
Figure 10.2.2	Revenue and Expenses Forecast between Vientiane and Pac Xan (FIRR 11.00% case) .....	10-7
Figure 10.2.3	Amount of Compensation by Equity in O&M Phase.....	10-8
Figure 10.3.1	Fiscal Projection of Lao PDR by IMF .....	10-9
Figure 10.3.2	Public Sector Debt Projection for Lao PDR.....	10-11
Figure 11.2.1	Transition in Revenue of RMF.....	11-2
Figure 11.2.2	Target Road Section.....	11-3
Figure 11.2.3	Traffic Volume of NR 8.....	11-4
Figure 12.2.1	Proposed Procedure for Development of Roadside Areas.....	12-2

## List of Tables

Table 1.1.1	Economic Outline of the Mekong Region (2015) .....	1-1
Table 1.2.1	Summary of Topographic Map Preparation .....	1-5
Table 1.2.2	Roadside Interview Survey List .....	1-6
Table 1.2.3	Design and Cost Estimation Policy in this Survey .....	1-6
Table 2.1.1	Each Route and Corridor Length of GMS Economic Corridors.....	2-1
Table 2.1.2	Current Development Status: E-W, N-S, South Economic Corridor Action Plan.....	2-5
Table 2.1.3	Total Length of Asian Highway in GMS Countries (As of Sep. 2017).....	2-6
Table 2.1.4	Asian Highway Design Standard .....	2-7
Table 2.1.5	ASEAN Highway Priority Projects .....	2-11
Table 2.1.6	The Outline and Goal of the Related Upper-level Plan.....	2-19
Table 2.1.7	Outline of Two Transport Strategic Plans .....	2-20
Table 2.1.8	Strategic Goals of Kuala Lumpur Transport Strategic Plan .....	2-21
Table 2.1.9	Ongoing Projects in GMS Region (As of March, 2018) .....	2-22
Table 2.1.10	Planned Projects in GMS Region (As of March, 2018) .....	2-23
Table 2.1.11	Outline of Regional Investment Framework 2022 .....	2-24
Table 2.1.12	Priority Projects in Each Transport Sector in Revised Transport Sector Strategy.....	2-25
Table 2.2.1	Road Classification, Length, Pavement Ratio .....	2-29
Table 2.2.2	The Length by Pavement Type .....	2-29
Table 2.2.3	Road Classification, Length, Pavement Ratio .....	2-32
Table 2.2.4	The Length by Pavement Type .....	2-32
Table 2.2.5	Basic Information of North-South Railway .....	2-35
Table 2.2.6	Main Airport in Vietnam.....	2-42
Table 2.2.7	Outline of Vientiane-Boten Railway .....	2-44
Table 2.2.8	Result of Demand Forecast of Freight .....	2-45
Table 2.2.9	Passing Traffic Volume of Vientiane - Boten and Necessary Number of Vehicles .....	2-45
Table 2.2.10	Result of Financial Analysis in F/S report .....	2-45
Table 2.2.11	Result of Economic Analysis in F/S report .....	2-46
Table 2.2.12	Examined Three Technical Standards .....	2-47
Table 2.2.13	Total Construction Cost by each Scenarios.....	2-48
Table 2.2.14	Result of Passenger and Freight Demand Forecast by Scenario.....	2-48
Table 2.2.15	Result of Economic Analysis .....	2-50
Table 2.2.16	Result of Financial Analysis .....	2-50
Table 2.2.17	Comparison of Transportation Cost between Vientiane-Boten .....	2-50
Table 2.2.18	Result of Benefit of Reduction of Travel Time .....	2-51
Table 2.2.19	Outline of Berth at Vung Ang Port .....	2-53
Table 2.2.20	Outline of Nghi Son Port.....	2-54
Table 2.2.21	Outline of Berth at Cua Lo Port .....	2-55
Table 2.2.22	Future Demand of Goods (Unit: million tons) .....	2-56
Table 2.2.23	Comparison of Travel Time from Bangkok to Hanoi .....	2-62
Table 2.2.24	Comparison of Road No. 8, No. 9, and No. 12 .....	2-66
Table 2.3.1	The Overall Structure of CBTA .....	2-67
Table 2.3.2	List of MOU on Cross-Border Transportation Signed by Lao PDR.....	2-68
Table 2.3.3	Issues and Tasks for Customs Clearance, Immigration Control, and Animal and Plant Quarantine (CIQ) in Laos .....	2-69
Table 2.3.4	Problems, Recognition and Tasks ahead to be Tackled .....	2-69
Table 2.3.5	Periods of Corporate Tax Exemption under the Lao Investment Incentives Law .....	2-73
Table 2.3.6	List of SEZs .....	2-74
Table 2.3.7	Fields with Investment Incentives in Vietnam .....	2-75
Table 2.3.8	Investment Incentive Areas of Vietnam .....	2-77
Table 2.3.9	List of Preference and Reduction/Exemption of Corporate Tax in Vietnam.....	2-77
Table 2.3.10	Activity-based Incentives of Thailand .....	2-80
Table 2.3.11	Additional Incentives for Investment Intended to Enhance Competitiveness of Thailand .....	2-81
Table 2.3.12	Additional Incentives for Decentralization of Thailand .....	2-81

Table 2.3.13	Additional Incentives for Development of Industrial Land in Thailand.....	2-82
Table 3.1.1	Alternative Routes under Review .....	3-2
Table 3.2.1	Major Laws Relevant to Environmental and Social Considerations in Lao PDR .....	3-3
Table 3.2.2	Project Categorization in Road Sector .....	3-4
Table 3.2.3	Road Project Categories and Safeguard Requirements in Lao PDR .....	3-5
Table 3.2.4	Genetic Project Types and Road Classification .....	3-5
Table 3.2.5	Gap Analysis between JICA Guidelines and Lao National Laws .....	3-6
Table 3.2.6	Major Laws and Regulations Related to Protected Areas in Lao PDR .....	3-6
Table 3.2.7	Law and Regulations Related to Environmental and Social Considerations in Vietnam.....	3-6
Table 3.2.8	Type and Scope of Projects that Require EIA.....	3-9
Table 3.2.9	Gap between Vietnamese System and International Standards Regarding Environmental and Social Considerations.....	3-9
Table 3.2.10	Laws and Decrees Related to Protected Areas in Vietnam .....	3-9
Table 3.3.1	Population of the Provinces in the study area in Lao PDR (2015).....	3-12
Table 3.3.2	Population of the Provinces in the study area in Vietnam (2016).....	3-12
Table 3.3.3	Air Quality Standards in Lao PDR.....	3-14
Table 3.3.4	Noise and vibration standards in Lao PDR .....	3-14
Table 3.3.5	Species in Lao PDR .....	3-15
Table 3.3.6	Endangered Species on IUCN Red List found in the Study Area .....	3-15
Table 3.3.7	CITES Criteria and Exception.....	3-18
Table 3.3.8	Regulation in Lao PDR and Vietnam Related to Protection of Endangered Species .....	3-18
Table 3.3.9	Protected Areas in Lao PDR in the Study Area.....	3-20
Table 3.3.10	Protected Areas in Vietnam in the Study Area.....	3-20
Table 3.3.11	Protected Areas and Alternative Routes.....	3-21
Table 3.3.12	Land use categories in Lao PDR.....	3-23
Table 3.3.13	Forest Categories in Lao PDR.....	3-24
Table 3.3.14	Changes in the Land Use Patterns in Vientiane City.....	3-25
Table 3.3.15	Land Use Pattern in Nghe An Province .....	3-26
Table 3.3.16	Land Use Pattern in Ha Tinh Province.....	3-27
Table 3.3.17	List of Tourism Resources in Bolikhamsai Province .....	3-28
Table 3.3.18	Past Disasters and Damages in Lao PDR.....	3-29
Table 3.3.19	Number of UXO found and destroyed from 2010 to 2015.....	3-33
Table 3.3.20	UXO Accidents and Casualties.....	3-33
Table 3.3.21	Demography of ethnic groups in Bolikhamsai Province.....	3-36
Table 3.3.22	Ethnic Minorities in Mountainous areas of Nghe An Province, Vietnam .....	3-37
Table 3.4.1	Laws and Regulations for Land Acquisition and Resettlement in Laos PDR .....	3-38
Table 3.4.2	Laws and Regulations for Land Acquisition and Resettlement in Vietnam.....	3-38
Table 3.4.3	Method for Calculation of Compensation regarding Land Acquisition and Resettlement.....	3-40
Table 3.4.4	Target Routes for Calculating Compensation for Land Acquisition and Resettlement.....	3-41
Table 3.4.5	Method for Calculating Compensation for Land Acquisition and Resettlement.....	3-41
Table 3.4.6	Setting Unit Prices for Compensation .....	3-42
Table 3.6.1	Summary of Situation regarding Road Construction and Protected Area .....	3-63
Table 4.2.1	GCP Results.....	4-6
Table 4.3.1	Comparison of AW3D and GCP Points.....	4-11
Table 5.4.1	Types of Grounds to Pay Attention to.....	5-7
Table 6.1.1	Routes Planned in the Pre-Feasibility Study .....	6-1
Table 6.1.2	Road Alignment Factors for Pre-F/S Expressway Plan.....	6-3
Table 6.1.3	Breakdown of Structure Lengths/Ratios for the Pre-F/S Expressway Plan.....	6-5
Table 6.1.4	Reduced Travel Speed for Logistics Vehicles.....	6-5
Table 6.1.5	Sections and Lengths below 30 km/h of Large-Sized Vehicles .....	6-7
Table 6.3.1	Road Alignment Factors for the Study of Expressway Plan .....	6-11
Table 6.3.2	Alignment Factors for National Road 8 Upgrade Plan.....	6-12

Table 7.1.1	Outline of the Traffic Survey .....	7-1
Table 7.1.2	Ratio of Daily Time Traffic to Daytime Traffic.....	7-2
Table 7.1.3	Traffic Volume passing Laos – Vietnam Border Gate .....	7-8
Table 7.1.4	Trade Volume and Value by Items passing through Nam Phao Border (2014) .....	7-10
Table 7.1.5	Trade Value passing Nam Phao Border (2014).....	7-10
Table 7.2.1	Comparison of Traffic Demand Forecast Method.....	7-11
Table 7.2.2	Traffic Zones using for Traffic Demand Forecast.....	7-13
Table 7.2.3	Average GDP Growth Rate in Existing Reports (Laos).....	7-16
Table 7.2.4	Average Annual GDP Growth Rate of Laos .....	7-17
Table 7.2.5	Average Annual GDP Growth Rate in Existing Reports (Vietnam) .....	7-17
Table 7.2.6	Average Annual GDP Growth Rate of Vietnam .....	7-17
Table 7.2.7	Planned SEZ .....	7-18
Table 7.2.8	Developable Land by Province .....	7-19
Table 7.2.9	Land Use and Area in Vientiane Industrial Zone .....	7-19
Table 7.2.10	PCU Factor .....	7-20
Table 7.2.11	Design Speed and Traffic Capacity for Road Classification .....	7-21
Table 7.3.1	Forecast Case .....	7-23
Table 7.3.2	Growth Rate of Passenger Traffic (%) .....	7-24
Table 7.3.3	Growth Rate of Domestic Freight Traffic (%) .....	7-24
Table 7.3.4	Growth Rate of International Freight Traffic (2018 - 2025) .....	7-28
Table 7.3.5	Growth Rate of International Freight Traffic (2025 - 2035) .....	7-28
Table 7.3.6	GDP Elasticity between Laos and Vietnam by Items.....	7-28
Table 7.3.7	GDP Elasticity between Thailand and Vietnam by Items .....	7-29
Table 7.3.8	GDP Elasticity by Items between Laos and Thailand .....	7-29
Table 7.3.9	Estimated Parameter by Type of Modes .....	7-30
Table 7.3.10	Modal Share of Passenger Traffic.....	7-31
Table 7.3.11	Modal Share of Freight Traffic .....	7-31
Table 7.3.12	Comparison between Pre-F/S and Forecast by JICA Study Team .....	7-34
Table 8.1.1	Previous Studies/Data on the target Road Reviewed .....	8-1
Table 8.1.2	Road Geometric Design Criteria in Pre-F/S.....	8-3
Table 8.1.3	Interchange Plan in Pre-F/S .....	8-4
Table 8.1.4	NR8 Improvement Project F/S by KOICA .....	8-5
Table 8.1.5	Development Plan of Provincial Road 5117 .....	8-6
Table 8.1.6	Outline of the Structural Design (Pre-F/S Route Expressway Development) .....	8-9
Table 8.1.7	Outline of Structural Design (F/S for National Road No.8 Development) .....	8-9
Table 8.1.8	Outline of the Project Cost Estimation (Pre-F/S Route Expressway Development) .....	8-11
Table 8.1.9	Outline of the Project Cost Estimation (NR-8 Route Expressway Development).....	8-12
Table 8.1.10	Outline of Rough Cost Estimation (Pre-F/S Route Highway Development) .....	8-13
Table 8.2.1	Current Status of the Target Route for Designing.....	8-14
Table 8.2.2	Length of Each Section of Target Route of Designing.....	8-15
Table 8.2.3	Cross Section and Geometric Design Criteria.....	8-16
Table 8.2.4	Interchange Location.....	8-16
Table 8.2.5	Major Typical Cross Section.....	8-17
Table 8.2.6	Classification of Types of Bridges .....	8-21
Table 8.2.7	Classification of Bridge Type (2).....	8-22
Table 8.3.1	Rough Project Cost Estimation Cases .....	8-25
Table 8.3.2	Classification of Terrains .....	8-26
Table 8.3.3	Unit of the Unit Cost by Construction Work.....	8-26
Table 8.3.4	Revision rates.....	8-26
Table 8.3.5	Project Unit Price.....	8-27
Table 8.3.6	Rough Breakdown of Project Cost.....	8-28
Table 8.3.7	Breakdown of Direct Construction Cost for Alternative 1 (Pre-F/S corridor).....	8-29
Table 8.3.8	Breakdown of Direct Construction Cost for Alternative 2 (NR8 Corridor) .....	8-30
Table 8.3.9	Breakdown of Direct Construction Cost for Alternative 3A .....	8-31
Table 8.3.10	Breakdown of Direct Construction Cost for Alternative 3B .....	8-32

Table 9.1.1	Evaluation Items and Evaluation Indices of Alternative Plans.....	9-1
Table 9.2.1	Project Costs by Alternative.....	9-2
Table 9.2.2	Regulations on Passing Protected Areas / Natural Reserves .....	9-4
Table 9.3.1	Evaluation Results of Alternative Routes.....	9-6
Table 9.4.1	Comparison of Alternative Routes on Vietnam Side .....	9-7
Table 9.4.2	Comparison of Project Cost .....	9-8
Table 9.5.1	Points to Consider on National Road 8 Route.....	9-10
Table 10.1.1	Conditions for Economic Analysis .....	10-2
Table 10.1.2	Economic Analysis Results of Hanoi-Vientiane Expressway .....	10-2
Table 10.1.3	Result of Project Cost Estimation .....	10-3
Table 10.1.4	Result of Economic Analysis .....	10-3
Table 10.1.5	Sensitivity Analysis.....	10-4
Table 10.2.1	Project Implementation Schedule between Vientiane and Pac Xan .....	10-5
Table 10.2.2	Preconditions of Financial Analysis between Vientiane and Pac Xan .....	10-5
Table 10.2.3	Result of Financial Analysis and Sensitivity Analysis .....	10-7
Table 10.3.1	Trends in Vietnam’s External Borrowing (percentage of GDP) .....	10-8
Table 10.3.2	Public Sector Debt (ratio of GPD) of Lao PDR .....	10-9
Table 10.3.3	Development Status of Law and Decree with regard to PPP in Vietnam.....	10-13
Table 10.3.4	Project Classification in Public Investment Law.....	10-14
Table 11.1.1	Outline of Construction Companies in Laos .....	11-2
Table 11.3.1	Proposed Composition of Construction Equipment and Estimated Project Cost .....	11-5
Table 11.3.2	Brief Explanation of Major Construction Equipment .....	11-6
Table 12.2.1	Proposed Agricultural Promotion Measures .....	12-3

List of Abbreviation	
AADT	Annual Average Daily Traffic
ACCC	ASEAN Connectivity Coordinating Committee
ADB	Asian Development Bank
AEC	ASEAN Economic Community
AFAFGIT	ASEAN Framework Agreement on the Facilitation of Goods in Transit
AH	Asian Highway
AHN	ASEAN Highway Network
AIDS	Acquired Immunodeficiency Syndrome
ASAM	ASEAN Single Aviation Market
ASEAN	Association of South-East Asia Nations
ASSM	ASEAN Single Shipping Market
ASW	ASEAN Single Window
ASYCUDA	Automated System for Customs Data
BCF	Border Control Facilities
BGS	British Geological Survey
BOT	Build, Operate and Transfer
BP	Biosphere Reserve
BP	Bypass
CBTA	Cross-Border Transport Agreement
CIQ	Customs, Immigration, Quarantine
DOAF	Department of Agriculture and Forestry
DOR	Department of Road
DPWT	Department of Public Works and Transport
DSM	Digital Surface Model
DWT	Deadweight Tonnage
ECAFE	Economic Commission for Asia and Far East
ECC	Environmental Compliance Certificate
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EPL	Environmental Protection Law
ERIA	Economic Research Institute for ASEAN and East Asia
ESCA	Endangered Species Conservation Area
ESD	The Environmental and Social Division
ESIA	Department of Environment and Social Impact Assessment
ESMMP	Environmental and Social Management and Monitoring Plan
ESOM	Environmental and Social Operations Manual
ETC	Electronic Toll Collection System
EU	European Union
F/S	Feasibility Study



FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FIRR	Financial Internal Rate of Return
GCP	Grand Control Point
GDP	Gross Domestic Product
GIS	Geographic Information System
GMP	Good Manufacturing Practice
GMRA	Greater Mekong Railway Association
GMS	Greater Mekong Sub-region
GPS	Global Positioning Satellite
HIV	Human Immunodeficiency Virus
HP	Home Page
IC	Interchange
ICD	Inland Container Depot
ICT	Information and Communication Technology
IEE	Initial Environmental Examination
IMF	International Monetary Fund
IoT	Internet of Things
IRR	Internal Rate of Return
ITS	Intelligent Transport System
IUCN	International Union for Conservation of Nature and Natural Resources
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
KOICA	Korea International Cooperation Agency
LACR	Land Acquisition and Compensation Report
LEP	Law on Environmental Protection
LIFFA	Laos International Freight Forwarders Association
MLIT	Ministry of Land, Infrastructure and Transport (Japan)
MOAF	Ministry of Agriculture and Forestry (Laos)
MONRE	Ministry of Nature Resources and Environment (Laos, Vietnam)
MOT	Ministry of Transport (Vietnam)
MPAC	Master Plan on ASEAN Connectivity
MPI	Ministry of Planning and Investment (Laos, Vietnam)
MPWT	Ministry of Public Works and Transport (Laos)
NATM	New Austrian Tunneling Method
NEDA	Neighboring Countries Economic Development Cooperation Agency
NLMA	National Land Management Authority
NR	National Road
NSE	North-South Expressway
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
OD	Origin Destination
ODA	Official Development Assistance

PCU	Passenger Car Unit
PIRR	Project Internal Rate of Return
PMU85	Project Management Unit 85 (Vietnam)
PPP	Public Private Partnership
PRC	People's Republic of China
PTRI	Public Transportation Research Institute
R&D	Research and Development
RAP	Resettlement Action Plan
RMS	Road Management System
RORO	Roll-on/Roll-off Ship
ROW	Right of Way
RTK	Real-time Kinematic
SDR	Safeguards Diagnostic Review
SEA	Strategic Environmental Assessment
SEZ	Special Economic Zone
SKRL	Singapore Kunming Rail Link
SPC	Special Purpose Company
TAD	Temporary Admission Document
TEDI	Transport Engineering Design Inc. (Vietnam)
TOR	Terms of Reference
TOT	Training of Trainers
TSS	Transport Sector Strategy
TTR	Transit Transport Route
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UPS	Uninterruptible Power Supply
USGS	United States Geological Survey
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
VEA	Vietnam Environmental Administration
VGF	Viability Gap Funding
VITRANSS	The Study on the National Transport Development Strategy in the Socialist Republic of Vietnam
VSIP	Vietnam Singapore Industrial Park
WB	World Bank
WCO	World Customs Organization
WCS	Wildlife Conservation Society
WREA	Water Resources & Environment Administration



# **Executive Summary**

## Executive Summary

### 1. Objective of the Survey

Mekong countries, including Laos and Vietnam, have a great development potential in the ASEAN economy, which has an enormous market with about 600 million people. In the situation of ever strengthening economic growth and regional integration driven by the establishment of ASEAN Economic Community (AEC) in 2015, economic development through economic corridor development in Mekong region has become one of the most important development challenges for the whole region. The objective of this survey is to propose the following plans through collection and analysis of information necessary for the study of hard and soft aspects of related issues, policies and measures to enhance the connectivity between Hanoi and Vientiane.

- (i) Road development plan by the construction of road expressway and/or improvement of existing roads between Hanoi and Vientiane.
- (ii) Regional transportation plan and soft measures for enhancing connectivity between Hanoi and Vientiane.

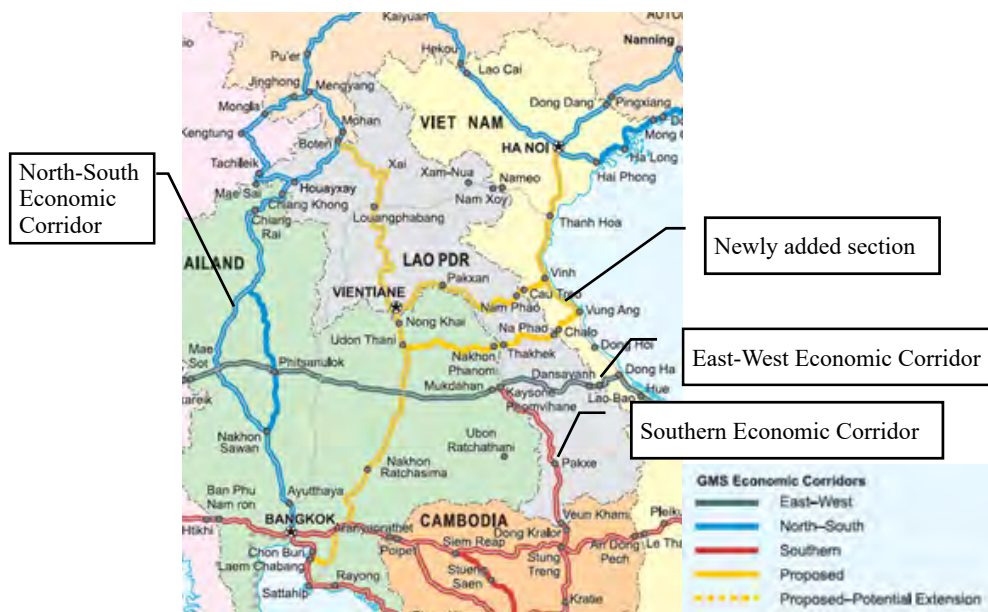
### 2. Current Condition for Enhancing Connectivity between Laos and Vietnam

#### 2-1. Roads

##### (1) Current status of the Mekong Economic Corridors

The development of the Mekong Economic Corridors has been pursued, on the initiative of the ADB, as a project of the Greater Mekong Subregion (GMS) Economic Development Program jointly by six countries, i.e., Cambodia, China (Guangxi Zhuangzu Autonomous Region, Yunnan Province), Laos, Myanmar, Thailand and Vietnam. The 8th GMS Ministerial Meeting in 1998 designated three corridors, i.e., the East-West Economic Corridor, the North-South Economic Corridor and the Southern Economic Corridor, as corridors to improve in priority and, with the support of ADB and donor countries, projects to maintain and expand existing major highways comprising those corridors and build international bridges across borders, etc. are underway.

Currently, the three economic corridors are comprised of seven sub-corridors, extending to about 9,000 km in total. Of those corridors, the one that connects Laos and Vietnam is only the East-West Economic Corridor linking Savannakhet, Laos, and Da Nang, Vietnam, through NR 9 of Laos. There is no corridor that directly connects Vientiane and Hanoi, the two countries' capitals. However, the 21st GMS Ministerial Meeting in 2016 added a sub corridor connecting Bangkok, Vientiane, and Hanoi to the North-South Corridor, which is expected to strengthen the connectivity in the future (see **Figure 2-1**).



Source: Review of Configuration of the Greater Mekong Subregion Economic Corridors (ADB, Feb 2018)

**Figure 2-1 GMS Corridors so far Designated**

## (2) Asian Highway Network and ASEAN Highway Network

As wide-area highway plans in the area besides the Mekong Economic Corridors, there are Asian Highway Network and ASEAN Highway Network. The Asian Highway Network is an initiative that has been around since the 1950s and the GMS Economic Corridors and the ASEAN Highway Network have been planned and worked on inspired by this mega-program. It was based on the road network plans envisioned by the Asian Highway Network that ASEAN Highways have been designated as highways that complement Asian highways and that, in the Mekong region, the GMS Economic Corridors are designated and intensively improved in the framework of regional economic cooperation. The problem with the Asian Highway Network is that there is no framework of multilateral agreements because it has been very difficult to coordinate and adjust the interests of all countries involved in the vast area covered by the network. This is why the countries concerned have dealt with the issues of road development and multilateral agreements in the ASEAN and GMS regions based on the Asian Highway Network, periodically discussing at ASEAN and GMS meetings and turning to the ADB for assistance as necessary.

### 2-2. Railways

In 2010, the ADB proposed a strategic framework for railway network development in the GMS region to the 16th GMS Ministerial Meeting and won the agreement of the countries concerned. Based on this framework, the ADB has planned a GMS Railway Network comprised of existing routes and potential new lines that will fill the missing links for priority routes as shown in the figure on the right. The new railways lines proposed are those that connect Vientiane and Vung Ang and Vientiane and Kunming.

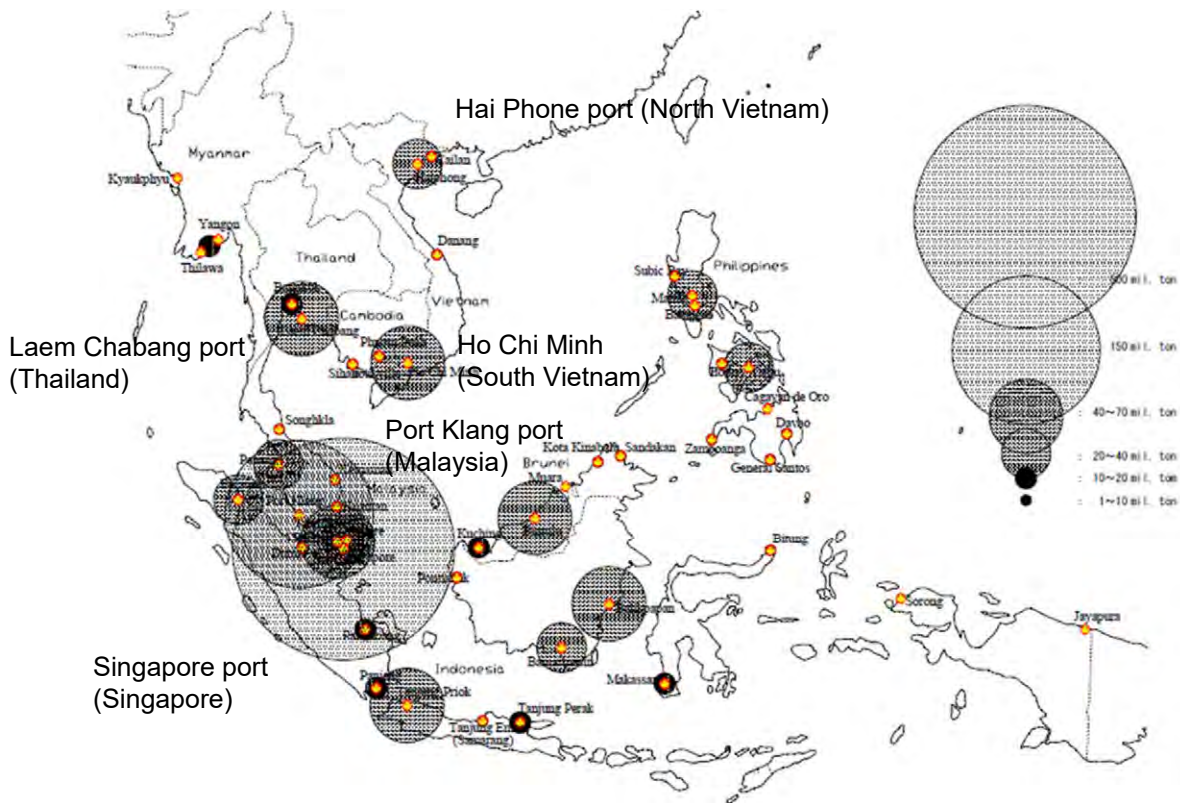
### 2-3. Ports

Ports play a vital role in international trade, but the number of ports with sufficient water depth and facilities is limited in the area. Ports that serve trunk routes and handle increased cargo volumes are only three: Laem Chabang (Thailand), Ho Chi Minh (South Vietnam), and Hai Phong (Northern Vietnam). Cambodia, Myanmar and Central Vietnam, etc. are still away from trunk routes and rely on feeder transport from major ports (see **Figure 2-3**). Meanwhile, Laos, an inland country and the only country on the Indochinese Peninsula that has no port at all, uses Laem Chabang (Thailand) and Vung Ang (Vietnam) as its main gates for import and export. In particular, the Vung Ang port, developed by the joint investment of Laos (20%) and Vietnam (80%) with the total investment cost amounting to approximately one billion Japanese Yen, is expected to be increasingly used for the regional trade.



Source: GMS portal (<http://portal.gms-eoc.org/>)

**Figure 2-2 Railways in the GMS Region: Existing, planned, and under construction (As of April 2016)**



Source: ASEAN Region: A benchmark survey for the development of a strategic maritime infrastructure (2010, JICA)

**Figure 2-3 Volumes of Cargo Handled by Major ASEAN Ports (2008)**

#### 2-4. Cross-border Transport Agreement (CBTA)

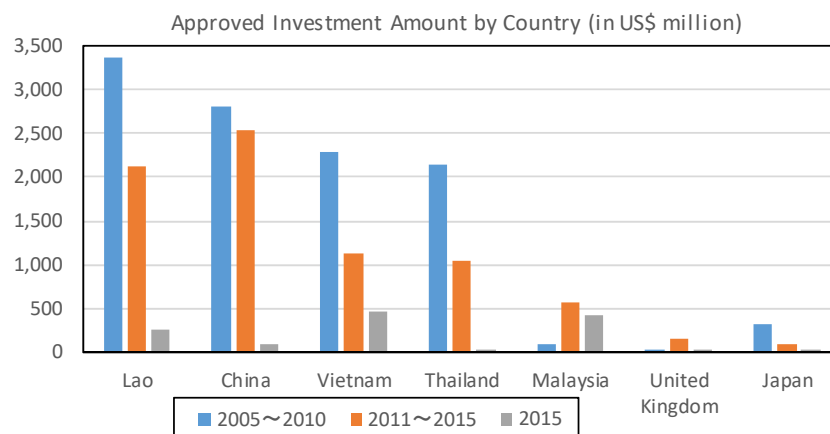
With the support of the ADB, the GMS region compiled a Cross-Border Transport Agreement (CBTA) to facilitate international transport of cargo and passengers and, by 2015, saw all the member countries ratify the main text, by-laws, and technical regulations. The CBTA is a comprehensive multinational agreement that packages in one document various aspects of issues to be dealt with in facilitating international transport, such as cross-border transport of people (issuance of visa, etc.), rights of way, exemptions of physical inspection at customs clearance, deposits, escort, requirements for animal and plant quarantine, requirements for exchange of commercial traffic rights, and development of transport infrastructure such as road and bridge design standards and traffic sign and signals and is roughly divided into two types of provisions: (a) provisions on single-window stop customs inspection and (b) provisions on international transport of goods (cargo) and people (passengers). Although the GMS/CBTA has been ratified by all GMS member countries, how to actually run it is still under discussion between the ADB and countries concerned and has not been implemented yet. Before the CBTA entered into force, countries in the Mekong region including China signed bilateral and tripartite agreements on mutual admittance of vehicles and implemented them one by one. Laos has such mutual admittance agreements with all of the Mekong region countries, except China plus Myanmar. Although it has been confirmed that vehicles are mutually admitted between Laos, Thailand and Vietnam, they are imposed a couple of restrictions. Specifically, vehicles must: (a) run only on prescribed routes; (b) report each voyage of transport in advance. For example, according to the mutual vehicle admittance agreement between Laos and Thailand, a Thai driver driving a Thai-registered truck till recently had to file in advance a declaration on the cargo he will carry and the itinerary he will follow within Laos when entering the country and cannot provide any other transportation services. As of February 2018, however, he could file declarations for additional transport services.

Having taken too much time to coordinate with individual member countries and adjust with their domestic legislation for implementation, GMS/CBTA has become obsolete before even being implemented. For this reason ADB/GSM is drafting a revised version of CBTA (CBTA 2.0) with the assistance of AusAid. However, the entry into effect of CBTA 2.0 being planned for 2019, ADB/GSM is working on an early harvest measure that they expect would have immediate effect. The early harvest measure consists in

allowing mutual admittance of up to 500 vehicles between member countries, except Myanmar, on the condition that the vehicle carries a document called Temporary Admission Document (TAD) (Myanmar will join the agreement in 2019).

## 2-5. Investment Incentives

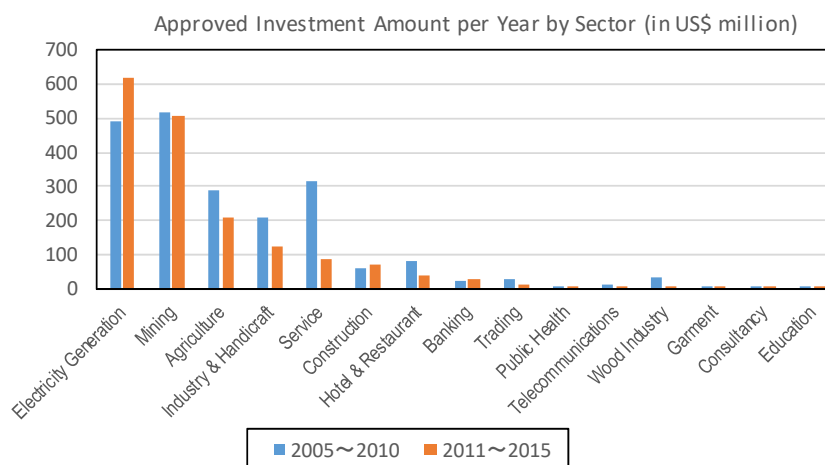
The total amount of investment approved in Laos (including investments by Lao public and private sectors) in recent years has been quite on the decrease: USD 12.5 billion (USD 2.1 billion per year) in the years 2005-2010, USD 8.6 billion in the years 2011-2015 (USD 1.7 billion per year), and USD 1.3 billion in 2015. By country, China, Vietnam, and Thailand occupy the top three places in any period. Especially China has invested a large amount of money, exceeding the amount approved of investment by Laos itself for the years 2011-2015 and more than doubling the amount invested by Vietnam and Thailand in the same period (see Figure 2-4).



Source: Investment Promotion Department, Ministry of Planning and Investment, Lao PDR

**Figure 2-4 Evolution of Approved Amounts of Investment in Laos**

Figure 2-5 shows the approved amount of investment per year by sector. Two sectors, power generation and mining, show definitely largest approval amounts of investment suggesting a high potentiality of development in both sectors, followed by agriculture, manufacture and handicrafts, services, construction, hotels and restaurants, finance, etc. that show larger amounts.



Source: Investment Promotion Department, Ministry of Planning and Investment, Lao PDR

**Figure 2-5 Approved Amount of Investment per year by Sector in Laos**

Investment incentives in Laos are stipulated in the Law on Investment Promotion (as amended) (Law No. 14 of 2017) that came into effect on April 19, 2017, varied according to the sector and region capital is invested. On the other hand, in Vietnam, investment incentives are defined in much more concrete terms so that potential investors are less likely to wonder whether their investment is eligible to each investment incentive or not. Regarding regional designation, too, the law clearly indicates which level of incentive the

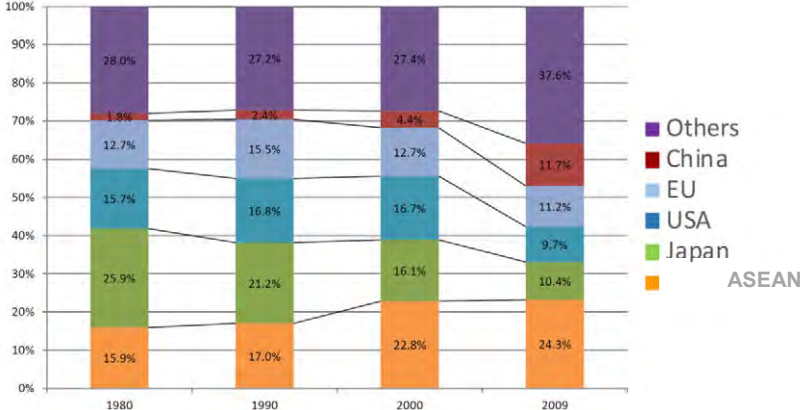


potential investor can expect in which district of which province. Further, the Thai Investment Committee’s Guide not only explicitly specifies the sectors and areas to which the investment incentives are applied, but also gives supplementary explanation based on past cases where issues came up in relation to investment incentives.

In order to bring about sufficient economic effects from the construction of the Hanoi-Vientiane expressway, it is particularly important to promote development in Laos so that a large amount of goods and people come and go along the expressway. For that to happen, it is essential to attract investments for roadside development and, for that, to invite foreign companies from Japan and other countries with advanced technologies and large amount of funds. It is desirable for Laos to review the examples of Vietnam and Thailand and develop an incentive policy that takes advantage of the country’s characteristics and enables it to overcome competition with neighbors in attracting investments.

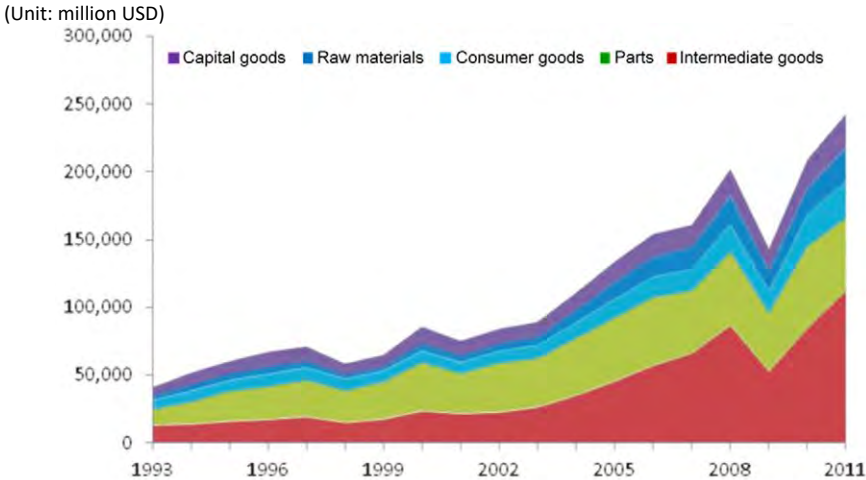
**2-6. International Division of Labor**

Figure 2-6 shows the trading partners/regions of the ASEAN countries between 1980 and 2009. In the 1980s, Japan, the United States, and the EU accounted for more than 50% of the trade partners of the ASEAN countries, but, in 2009, the trade volume with those countries and regions declined to around 30% while the proportion of trade with China and other ASEAN countries increased. Figure 2-7 shows the evolution between 1993 and 2011 of the export value by item within the ASEAN region. As export items, parts and intermediate goods have significantly increased. This seems to reflect the establishment of a supply chain in the ASEAN region by foreign (mainly Japanese) companies and the progress of horizontal division of labor within the supply chain.



Source: Towards an integrated ASEAN: JICA's efforts to help realize connectivity (The original data from IMF)

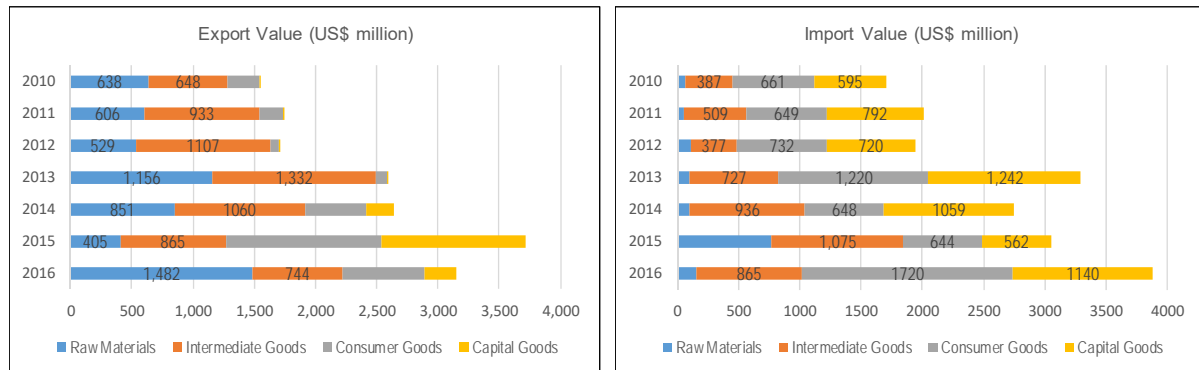
**Figure 2-6 ASEAN's Major Trade Partners/Regions**



Source: Economic corridors in the Mekong region (Japan Economic Research Institute. The original data from the Research Institute of Economy, Trade, and Industry)

**Figure 2-7 Values of ASEAN’s Exports of Capital Goods, Raw Materials, Consumer Goods, Parts, and Intermediate Goods**

On the other hand, as shown in **Figure 2-8**, the proportion of raw materials, intermediate goods, consumer goods, and capital goods in Lao's exports and imports varies significantly from year to year, but as far as it is seen in the last few years, there is no tendency for the proportion of intermediate goods in the total value of trade to be in the increase, which makes it unlikely that Laos is built in the value chain of Asian or ASEAN countries.



Source: World Integrated Trade Solution

**Figure 2-8 Import and Export of Raw Materials, Intermediate Goods, Consumer Goods, and Capital Goods in Laos**

To fit Laos into the world and ASEAN value chain network, the most promising scenario is to transplant part of the supply chain in Thailand that Japan and European countries have built onto Laos as a “Thailand Plus One” approach considering the soaring labor costs in the country. In fact, with the development of the East-West Corridor, Japanese companies, etc. that expanded into Thailand are opening factories in the special economic zone created in Savannakhet in southern Laos. Another possibility is to intercept and attract factories of Japanese, European, or US companies that are moving their supply chain from China to Vietnam. The problem however is that Vientiane's workers' wages have reached almost the same level as Hanoi in 2015, exceeding the wages in Da Nang, Phnom Penh, Yangon, etc. In other words, Laos can no longer beat neighboring countries, except Thailand and China, in competition to attract labor-intensive industries seeking for cheap labor.

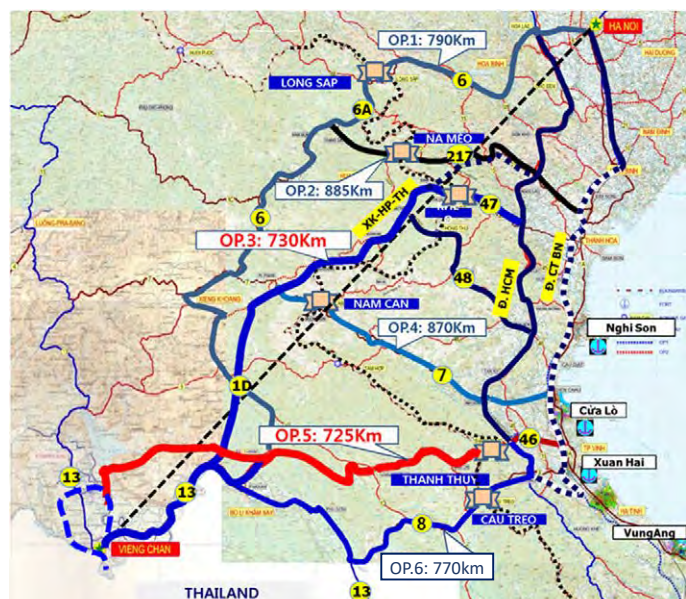
### 3. Examination of Route Plan of Hanoi-Vientiane Expressway

#### 3-1. Review of the Route Plans Presented by the Pre-F/S

The Pre-F/S study, which was conducted independently in 2016 and 2017 by the Vietnam and Laos Governments, compares six possible routes for the expressway that will connect Vientiane, the capital of Laos, and Hanoi, the capital of Vietnam. The first comparative study (comparison between OP.3 and OP.5), appreciated OP.5 from the viewpoints of total length, rapidity, investment amount, contribution to the regional development of Laos, etc. In the second comparative study (comparison between OP.5 and OP.6), OP.5 was chosen as the recommended route from the viewpoints of total length, topography, connectivity with the ASEAN region and land acquisition, etc.

The OP.5 recommended in the Pre-F/S study is a route that crosses the border between Thanh Thuy and Nam On with a total length between Vientiane and Vinh of about 400 km.

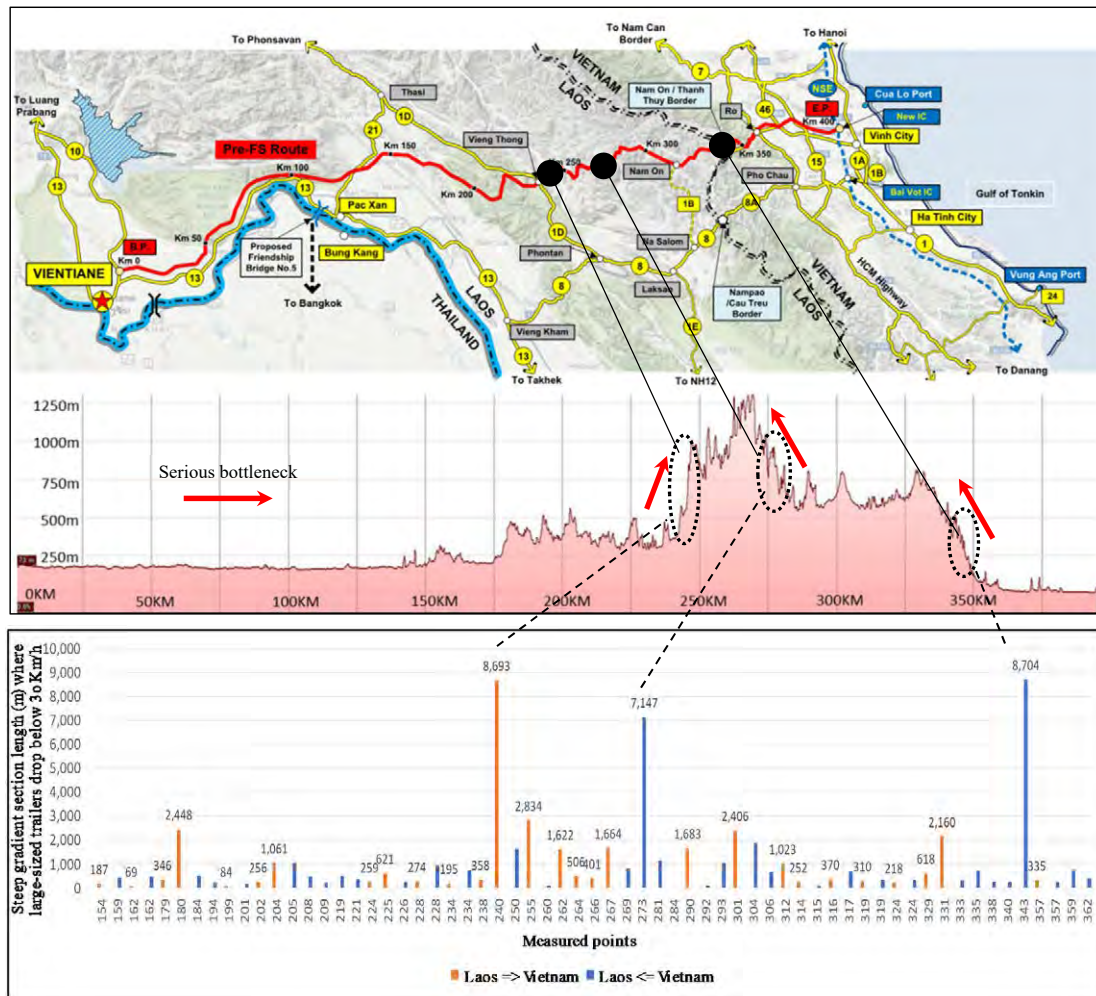
Focusing on the traveling speed of large-sized trailers that fulfill the wide-area physical



Source: Hanoi-Vientiane Expressway Project Pre-feasibility Study, TEDI

**Figure 3-1 Routes Studied in the Pre-F/S**

distribution function of the expressway, a close review was conducted by the JICA Survey Team on their speed reduction to less than 30 km/h in the steep gradient sections of the expressway route recommended in the Pre-F/S study. The number of sections where their speed drops below 30 km/h was 28 in the lanes connecting Laos and Vietnam (eastbound), totaling to 31.3 km (7.8 % of the total length) (all of which is in Laos) and 35 in the lanes connecting Vietnam and Laos (westbound), totaling to 34.3 km (8.6 % of the total length) (4 of which are in Vietnam, totaling to 10.1km). As to two or more successive sections where the speed drops below 30 km/h, there is a steep up-grade section extending to 8.7 km in both directions Laos to Vietnam (eastbound) and Vietnam to Laos (westbound) (See **Figure 3-2**).



**Figure 3-2 Speed-reduction Sections (bottlenecks) for Large-sized Trailers on the Expressway Route Recommended in the Pre-F/S**

### 3-2. Study of the Route in Alternative Plans

Although the route recommended in the prefeasibility study ("Pre-F/S") survey connects Hanoi and Vientiane along almost the shortest itinerary, more than 60% of the total length of the route inside Laos meanders through mountainous and valleys and thus there is a problem with the running performance of large-sized vehicles. In addition, it cannot expect almost any use by roadside population or development of roadside areas. Furthermore, it passes through nature preserved areas. There are also sections where the running performance of large-sized vehicles might be decreased. Thus, alternative routes, that can possibly be adopted instead of the one recommended in the pre-F/S, are examined. First of all, two proposals are selected: one is the Pre-F/S route recommended by TEDI and the other is NR 8 route, which runs in parallel to the National Road No.8 (which corresponds to the route AH15 of the Asian Highway Network) aligned 50 km to the south of the Pre-F/S Route. Further, two Composite Plans are selected to be studied – these routes are avoiding to pass nature preserved areas and mountainous areas, which gives us a total of four alternative plans to be examined. (See **Figure 3-3**).

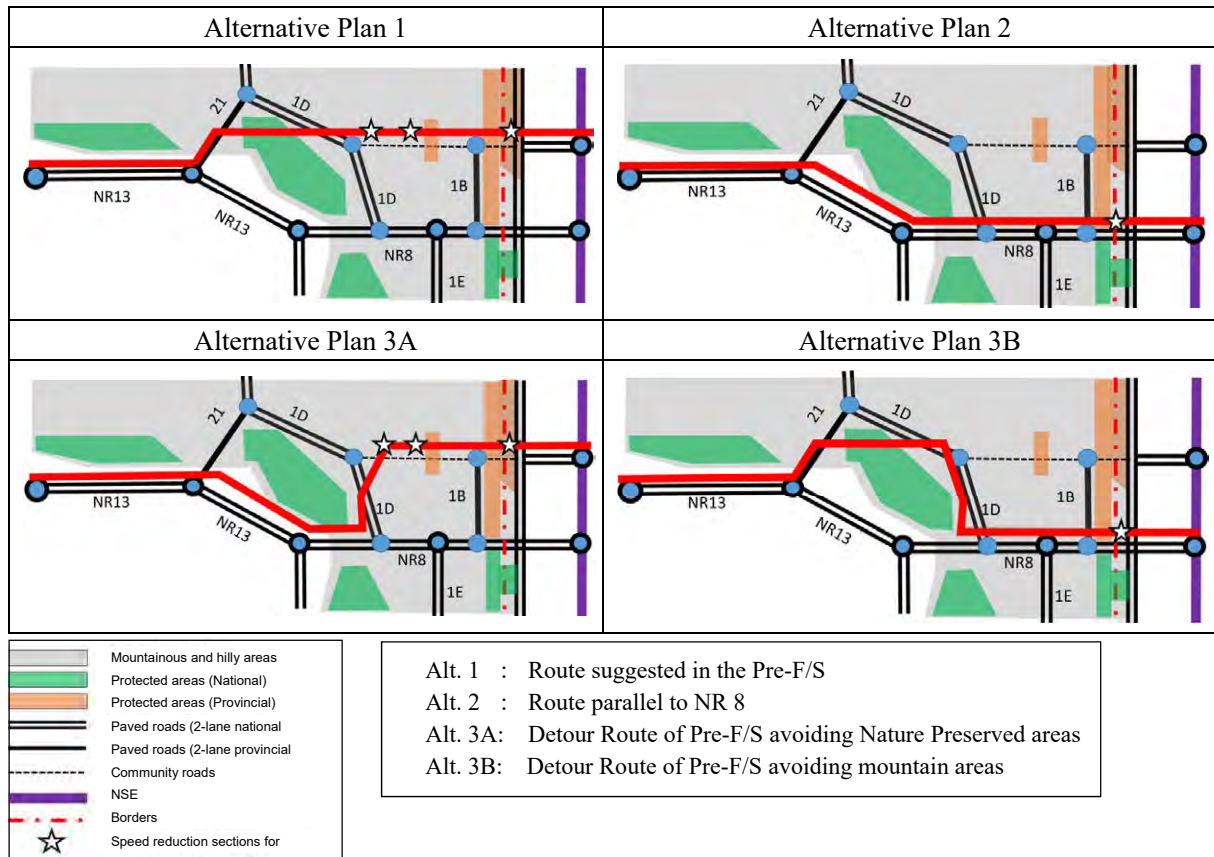


Figure 3-3 Proposed Draft Improvement Plans for the Expressway

## 4. Demand Forecast

### 4-1. Basic Policy

Since the Hanoi-Vientiane expressway is an expressway that runs through two countries, it is expected to be utilized as an industrial road for international transport of freight. Therefore, in forecasting its traffic demand, passenger transport and freight transport are separately calculated. As to the year of forecast, the year 2035 is chosen so that the results can be compared with those of the Pre-F/S study. A comparison of the method of traffic demand forecast in this survey and other surveys is shown below (**Table 4-1**). In this study, by adopting the “Four-step estimating method” which takes into account the traffic generated from regional development, the estimation is conducted on the basis that other new transport projects (expressways between Vientiane - Pakse and between Vientiane - Boten, railway between Vientiane – Vung Aung, etc.) are implemented.

Table 4-1 Comparison of Methods of Traffic Demand Forecast

	Creating an OD table	Estimating method		Consideration of other road development plan	Consideration of generated trips from the regional development	Considering the railway connecting Vientiane and Vung Ang	Expressway conversion rate
		Estimate by trend	Four-step estimate				
Pre-F/S	× <sup>1</sup>	✓ <sup>2</sup>	×	×	×	×	×
JICA Study Team	✓	×	✓	✓	✓	✓	✓
NR8(KOICA)	✓	×	✓	✓	?	×	×

Source: Created by JICA study team

### 4-2. Demand Forecasting Method (by passenger/by freight)

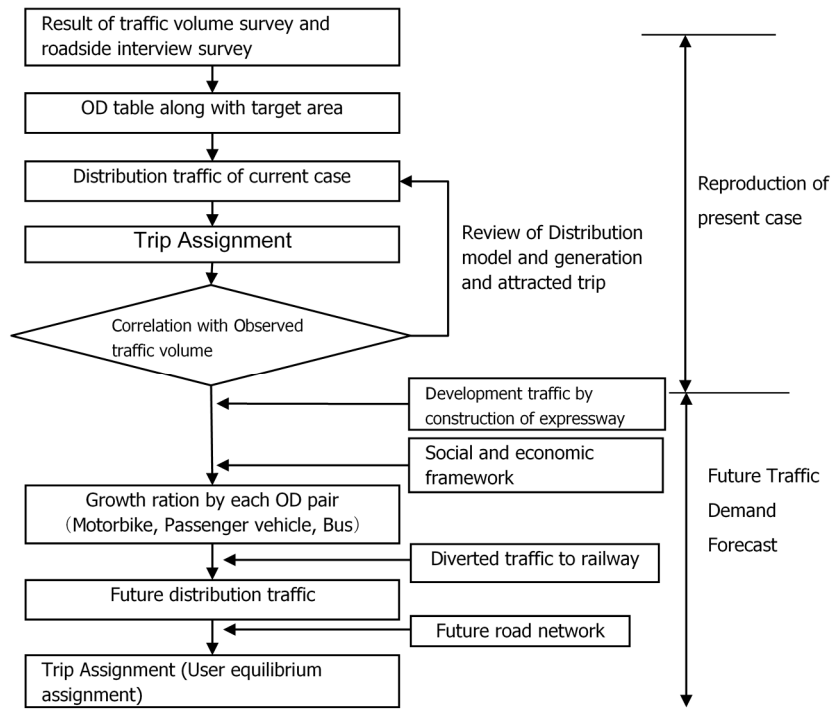
The procedure of prediction is shown in **Figure 4-1** and **Figure 4-2**.

<sup>1</sup> Utilize traffic volume of the target route

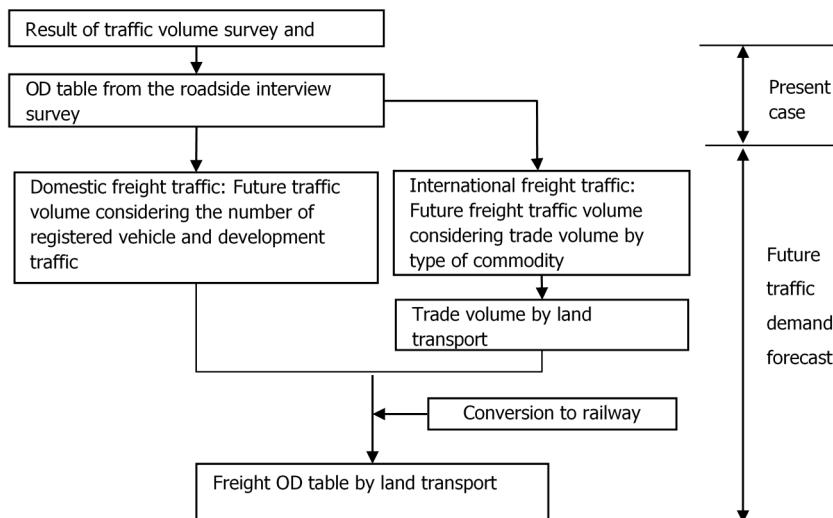
<sup>2</sup> Estimate the future traffic volume from socioeconomic indicators

The origin destination table (“OD table”) of passenger traffic was created by first creating a current status OD table as of the year 2018 along the target route based on the results of the traffic survey and the PTRI traffic volume data and then calculating the distribution traffic volume by gravity model. The congested traffic volume generated in the future was estimated from the growth rate of the number of vehicles owned by each province. The future distribution traffic volume was estimated by the average growth rate method using calculated growth rate of traffic volume.

The freight traffic was predicted by dividing domestic traffic and international traffic across countries. The growth rate for the domestic freight traffic was set taking into account the growth rate of the number of trucks and traffic from development projects. On the other hand, the volume of freight traffic across countries was calculated based on a future trade volume calculated based on trade statistics. Since the Hanoi-Vientiane expressway is expected to be used as an industrial road, the scope of freight traffic covers not only the areas along the expressway but the whole of the Indochina peninsula as well.



**Figure 4-1 Flow of Forecast of Future Demand of Passenger Traffic**



**Figure 4-2 Flow of Forecast of Future Demand of Freight Traffic**

### 4-3. Setting Forecast Cases

In forecasting traffic demand, two different cases are assumed: A high growth case where roadside development of the Hanoi - Vientiane expressway progresses and a low growth case where roadside development is sluggish. In the low growth case, it is assumed that the economy of the areas along the Hanoi-Vientiane expressway will grow at the same rate as the average real GDP growth rate of Laos. Meanwhile, in the high growth case, it is assumed that the economy of the areas along the expressway will grow at a rate higher than the average GDP growth rate of the country. For specific growth rates, the GRDP growth rate of Vientiane Capital City is referenced - described in the *Final Report on the Master Plan Development Project for Urban Development of Vientiane, the Capital of Laos* (JICA, 2011). As for road networks, a total of 5 types of alternative proposals are assumed: Four alternatives mentioned in the previous chapter and an alternative proposal that consists in not carrying out the Hanoi-Vientiane expressway development project.

**Table 4-2 Four Cases for Forecast**

Case	Expressway route	Economic growth	
		High	Low
1	Pre-F/S route	✓	-
2	Route along NR No. 8	✓	✓
3A	Composite route (i)	✓	-
3B	Composite route (ii)	✓	-
4	None	-	✓

Note: Basically, the high economic growth is supposed around the roadside of the Hanoi – Vientiane expressway, and the low growth case is calculated in the Alt. 2 for a comparison with the high growth case.

### 4-4. Future Traffic Volume by Road Section

Figure 4-3 shows the result of allocation for each case of forecast:

- The section Vientiane-Pac Xan shows the busiest traffic, around 40,000 PCU/day in any case and is obviously most suited to be developed as a toll road, followed by the section Pac Xan-Vieng Kham.
  - On Vietnam side, the traffic of Pre-F/S route is around 30,000 PCU/ day and that of NR 8 route is around 15,000 PCU/ day, showing that the former is nearly double of the latter. Since the both routes have similar traffic around the border area (10,000~12,000 PCU/day), this divergence is due to the difference in traffic volume on Vietnam side.
- Among all cases compared, Case 2 shows the largest traffic volume, suggesting that the route along NR 8 is most suited from the viewpoint of meeting existing demand.

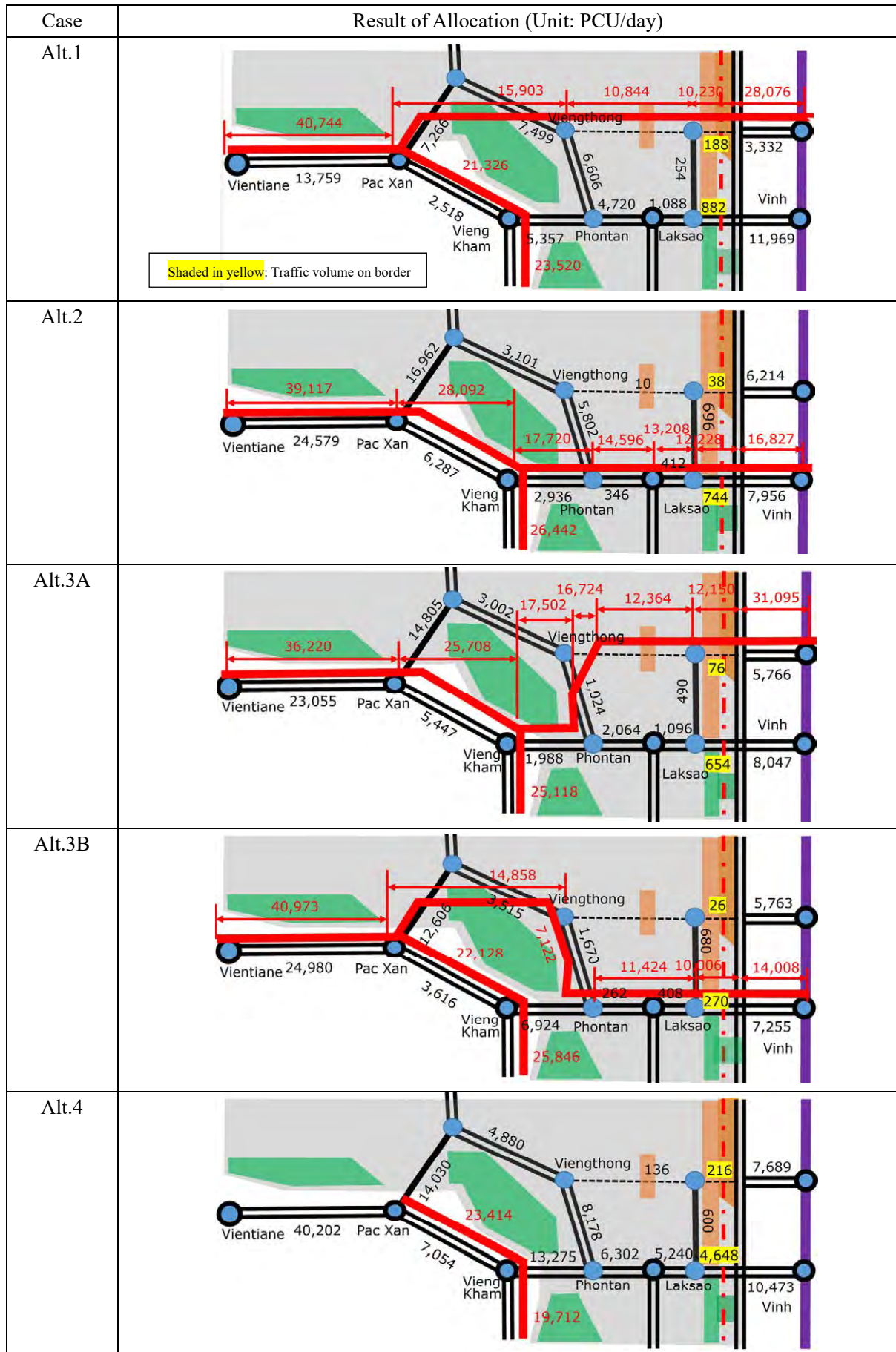


Figure 4-3 Results of Traffic Demand Forecast (As of year 2035)

#### 4-5. Comparison of Demand Forecast Result with Pre-F/S

The comparison between the demand forecast result in this study and that in the Pre-F/S is shown in **Table 4-3**. Compared to the result of Pre-F/S, this study estimated smaller demand. That is, the average traffic volume of all sections in 2035 is 37,236 PCU/day in the Pre-F/S whereas it is 22,652 in this study, showing 61% of the estimation in the pre-F/S.

**Table 4-3 Comparison of Demand Forecast Result**

(Unit: PUC/day)

	Initial Condition		2025	2035	
	2018	2020		JICA Study	Pre-FS
Section	JICA Study (reproduction of current situation)	Pre-FS	JICA Study	JICA Study	Pre-FS
Vientiane – Pac Xan	9,250	22,602	30,986	40,744	40,593
Pac Xan – Viengthong	4,042	18,018	8,685	15,903	37,090
Viengthong - Thanh Thuy	65	15,140	4,985	10,585	29,088
Thanh Thuy – Ro	15	15,898	4,802	10,230	30,543
Ro - Vinh	8,927	20,645	17,497	28,076	42,310
Average Traffic Volume	4,733	19,269	14,875	22,652	37,236
Growth Rate	-	-		4.3%/year	4.5%/year

### 5. Rough Design and Cost Estimate of Roads and Structures

#### 5-1. Geometric Structural Design Criteria

Road alignments were set as shown in **Table 5-1** based on the pre-F/S report, ASEAN Highway Standard and Vietnamese National Standard (TCVN-2012). Basically, it was decided that the alignments and sections of the route satisfy the ASEAN Highway Standard Class I so that they ensure the economy and safety of the expressway.

**Table 5-1 Cross Sectional Composition and Geometric Structural Specifications**

Geometric Design Criteria for JICA Data Collection Survey

Highway classification	Equivalent to Class I of ASEAN Highway			
Terrain classification	Level		Rolling + Mountainous	
Applying Section	Vientiane-Along NH13, HCM - NSE		Eastward from NH13 - HCM Road	
Design speed (km/h)	120	100	80	60
Width of Element (m)				
Traffic Lane	3.50			
Inner Shoulder	0.75		0.50	
Outer Shoulder	2.50 (BR:1.50, TN:1.00)		1.75 (BR:1.25, TN:0.75)	
Unpaved Shoulder	0.75			
Median	1.50		0.75	
Min. Horizontal curve radius (m)	650	450	250	150
Max. superelevation (%)	8.0			
Max. vertical grade (%)	4.0	5.0	6.0	
Min. vertical curve (m)				
Crest	12,000	6,000	3,000	1,500
Sag	5,000	3,000	2,000	1,000
Min. ver. clearance (m)	5.0			



## 5-2. Reviewing Major Structures

Generally, road structure is basically of earthwork (cut or filled) that is excellent in workability and economy. However, if there are constraints on site conditions, surrounding conditions, alignment, structures such as bridges, tunnels, retaining walls, and slopes are required. As in the pre-F/S report, this work positions bridges and tunnels, which have a significant impact on project cost, as main structures. Further, based on the results of the geological survey, measures to be taken for cut slope embankments are to be examined.

As for bridges, girder type concrete bridges are adopted as in the Pre-F/S study report, considering the easiness of maintenance and management and the track record in the host country, etc.

A mountain tunnel is usually dug while ensuring the stability of the ground by shotcreting over or driving rock bolts into the ground, etc. The pre-F/S report sorted out standard construction methods and reflected the results in the project cost. However, considering that the geological survey revealed the presence of highly weathered, fragile grounds around the route, it would be also necessary to use some auxiliary construction method. Auxiliary construction methods may be roughly classified into ground reinforcement, forepoling, mirror plane reinforcement, leg reinforcement, etc. Although there are many methods, it is considered that the long steel pipe forepoling method shown in the figure below is excellent in track record, economy, and many other points and is one of the most reliable auxiliary methods.

The pre-F/S report assumed a large-scale earth-cutting work through mountainous sections, sorted out slope stabilizing measures such as sodding, precast concrete pitching, mortar spraying, rock bolts, etc., and indicated a project cost assuming usual construction methods. However, considering that the geological survey revealed the presence of highly weathered, fragile grounds along the expressway route, there are concerns about a large-scale slope failure that the above methods alone could not prevent. There are many methods to avoid a large-scale slope failure such as pile works and drainage wells, but the ground anchor method is a method that is most reliable and that has been adopted most frequently.

## 5-3. Project Cost Estimate for Road and Structure Construction

### (1) Setting the Unit Price for Construction Cost

For the calculation of project cost, unit price are set based on the set unit price of the pre-F/S report and considering revision rates deemed reasonable from past experience. **Table 5-2** shows the revision rates and **Table 5-3** shows the corrected unit price thus set. Since the Pre-F/S states it is 2017 unit prices, no annual correction is thought to be necessary in this survey.

**Table 5-2 Revision Rates**

Work type	Revision rate	Concept of the Revision Rate
Earthwork	0.7-1.5	<ul style="list-style-type: none"> <li>✓ It was confirmed that the Pre-F/S set the unit prices based on the planned values of the Vietnamese North-South Expressway Design, etc.</li> <li>✓ Set at 0.7 for flat area assuming works done by local companies.</li> <li>✓ Set according to urbanization considering the cost increase due to crossing box culvert for local roads in flat/urban areas.</li> <li>✓ Set according to terrain features considering the increase of size of earth work in hilly/mountainous areas and measures against slope surface in unstable landforms.</li> </ul>
Bridges	1.2-1.5	<ul style="list-style-type: none"> <li>✓ It was confirmed that the Pre-F/S showed unit prices slightly lower than the planned values of the Vietnamese North-South Expressway Design, etc.</li> <li>✓ Set according to terrain features considering the cost increase due to construction of a high pier, access road and overhanging installation in steep/mountainous areas.</li> </ul>
Tunnels	1.3	<ul style="list-style-type: none"> <li>✓ It was confirmed that the Pre-F/S set the unit prices based on the planned values of the Vietnamese North-South Expressway Design, etc.</li> <li>✓ Set based on supporting works in unstable landform.</li> </ul>
Interchange and border facilities	-----	<ul style="list-style-type: none"> <li>✓ The Pre-F/S report implemented interchange plans, but did not reflect the cost in the project cost, so it is included in this survey.</li> <li>✓ IC: set based on Japanese experience as 500 mil. JPY for diamond shape and 1,500 mil. JPY for trumpet shape</li> <li>✓ BCF border control facility: set based on F/S report the 5th friendship bridge as 1,000 mil. JPY.</li> </ul>

**Table 5-3 Corrected Unite Price**

Terrain *		Item	Unit	6 Lane ( W= 30.5m)			4 Lane ( W= 20.75m)				
				Unit Cost (Pre-F/S)	Revision Rate	Unit Cost (Revised)	Unit Cost (Pre-F/S)	Revision Rate	Unit Cost (Revised)	Unit Cost (Revised)	
				Billion VND	Billion VND	Billion VND	Million JPY	Billion VND	Billion VND	Billion VND	Million JPY
1	Flat	EARTH	km	100	0.7	70	330	75			
		BRIDGE	m2	0.014	1.2	0.02	0.080	0.014			
2	Flat ** (Urban Area)	EARTH	km	140		Pre F/S route→		90	1.5	135	650
		EARTH	km	140		NH-8 route→		90	1.2	108	520
		BRIDGE	m2	0.014				0.014	1.2	0.02	0.080
3	Rolling	EARTH	km	110				85	1.2	102	490
		BRIDGE	m2	0.014				0.014	1.2	0.02	0.080
		TUNNEL	km	1,300				1,000	1.3	1,300	6,200
4	Mountainous	EARTH	km	160				110	1.3	143	680
		BRIDGE	m2	0.014				0.014	1.3	0.02	0.087
		TUNNEL	km	1,300				1,000	1.3	1,300	6,200
5	Steep Mountainous	EARTH	km	180				110	1.5	165	790
		BRIDGE	m2	0.014				0.014	1.5	0.02	0.100
		TUNNEL	km	1,300				1,000	1.3	1,300	6,200

\*Note: Criteria for the classification of terrain are as follows;

- Flat: flat area without densely clustered houses,
- Flat (Urban Area): flat area with densely clustered houses, areas possibly with soft ground conditions
- Rolling: areas with continuous gentle undulations or hills (height difference: 2 – 300m)
- Mountainous: areas with continuous mountains with a large height difference (300 – 500m)
- Steep Mountainous: areas with continuous mountains with a significantly large height differences (over 500m)

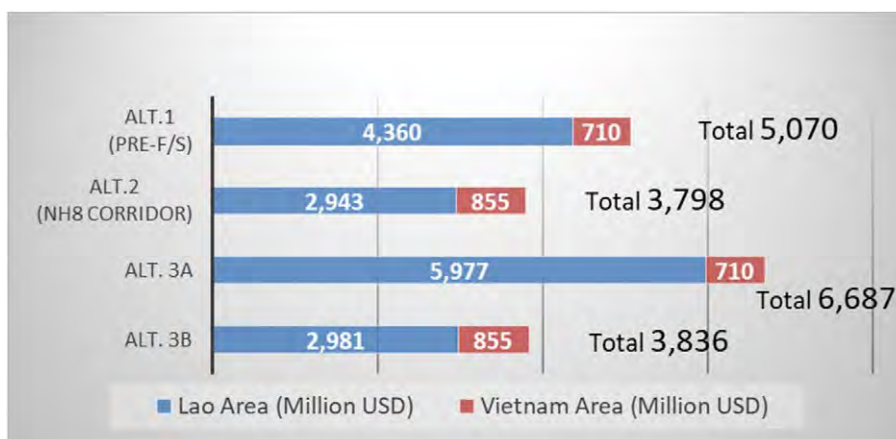
\*\*Note: As for unit price of earthwork, a higher revision rate is set for the Pre-F/S route than NR 8 route because the former passes through residential areas (Pre-F/S route: 1.5, NR 8 route: 1.2)

**(2) Composition of Project Cost**

Project cost is composed of direct work cost, indirect cost (direct cost×30%), VAT (10%), cost for land acquisition and resettlement. The direct work cost is composed of earth work cost, bridge cost and tunnel cost.

**(3) Result of Estimation**

Figure 5-1 shows the summary project cost of each alternative plan and Table 5-4 shows the detailed project costs. The traffic lane numbers is basically 4 lanes but only one section (Vientiane to Pac Xan) is 6 lanes. Of the four cases, Alternative 2 (NR 8 route), which has the shortest total length of mountainous sections, was found to need the smallest project cost. On the other hand, Alternative 3A, which has the longest total length of mountainous (steep) sections, was found to require the largest project cost.



**Figure 5-1 Summary Project Costs (Cost breakdown by country)**

**Table 5-4 Detailed Project Costs**

**1. Alternative 1 (Pre-F/S Corridor 400km)** Unit: Million USD

		Vientiane ~ Pac Xan	Pac Xan ~ Vieng Thong	Vieng Thong ~ Border			Lao Area	Border ~ HCM Road		HCM Road ~ Vinh	VietNam Area	Total
	Length (km)	118	119	102			339	26		35	61	400
	Terrain	Flat	Rolling	Steep Mountainous				Mountainous		Flat (Ubam Area)		
Main Structure (km)	Bridge	2.56	9.60	28.97				6.65		1.80		
	Tunnel			18.01								
Construction Cost	Lane	6 Lane	4 Lane	4 Lane				4 Lane		4 Lane		
1Direct Work Cost		434	642	1,962			3,038	246		243	489	3,527
2Indirection Cost	30% of 1	130	193	589			912	74		73	147	1,059
3Value Added Tax	10% of 1,2	56	84	255			395	32		32	64	459
Total	1+2+3	620	919	2,806			4,345	352		348	700	5,045
Compensation												
4 Land Acquisition		5	5	3			14	1		5	6	20
5 Resettlement		1	1	0			1	0		3	4	5
Total	4+5	6	5	4			15	1		8	10	25
<b>Total Project Cost</b>	<b>1+2+3+4+5</b>	<b>626</b>	<b>924</b>	<b>2,810</b>			<b>4,360</b>	<b>353</b>		<b>356</b>	<b>710</b>	<b>5,070</b>

**2. Alternative 2 (NH8 Corridor 403km)** Unit: Million USD

		Vientiane ~ Pac Xan	Pac Xan ~ Vieng Kham	Vieng Kham ~ Phontan	Phontan ~ Border		Lao Area	Border ~ NH-8	NH-8 ~ HCM Road	HCM Road ~ Vinh	VietNam Area	Total
	Length (km)	118	96	50	76		340	12	27	24	63	403
	Terrain	Flat	Rolling	Rolling	Rolling			Steep Mountainous	Rolling	Flat (Ubam Area)		
Main Structure (km)	Bridge	2.56	7.78	2.80	6.16			4.55	10.00	1.22		
	Tunnel		3.00	4.50				1.40				
Construction Cost	Lane	6 Lane	4 Lane	4 Lane	4 Lane			4 Lane		4 Lane		
1Direct Work Cost		434	675	517	420		2,046	219	232	144	595	2,641
2Indirection Cost	30% of 1	130	203	155	126	0	614	66	70	43	179	793
3Value Added Tax	10% of 1,2	56	88	67	55	0	266	29	30	19	78	344
Total	1+2+3	620	966	739	601	0	2,926	314	332	206	852	3,778
Compensation												
4 Land Acquisition		5	4	4	2		15	1	1	1	3	18
5 Resettlement		1	1	1	0		2	0	0	0	0	2
Total	4+5	6	5	4	2	0	17	1	1	1	3	20
<b>Total Project Cost</b>	<b>1+2+3+4+5</b>	<b>626</b>	<b>971</b>	<b>743</b>	<b>603</b>	<b>0</b>	<b>2,943</b>	<b>315</b>	<b>333</b>	<b>207</b>	<b>855</b>	<b>3,798</b>

**3. Alternative 3 (Detour of Nature Reserve 477km)** Unit: Million USD

		Vientiane ~ Pac Xan	Pac Xan ~ Vieng Kham	Vieng Kham ~ Phontan	Phontan ~ Vieng Thong	Vieng Thong ~ Border	Lao Area	Border ~ HCM Road		HCM Road ~ Vinh	VietNam Area	Total
	Length (km)	118	96	50	50	102	416	26		35	61	477
	Terrain	Flat	Rolling	Rolling	Mountainous	Steep Mountainous		Mountainous		Flat (Ubam Area)		
Main Structure (km)	Bridge	2.56	7.78	2.80	4.05	28.97		6.65		1.80		
	Tunnel	0.00	3.00	4.50	4.50	18.01						
Construction Cost	Lane	6 Lane	4 Lane	4 Lane	4 Lane	4 Lane		4 Lane		4 Lane		
1Direct Work Cost		434	675	517	578	1,962	4,166	246		243	489	4,655
2Indirection Cost	30% of 1	130	203	155	173	589	1,250	74		73	147	1,397
3Value Added Tax	10% of 1,2	56	88	67	75	255	541	32		32	64	605
Total	1+2+3	620	966	739	826	2,806	5,957	352		348	700	6,657
Compensation												
4 Land Acquisition		5	4	4	1	3	18	1		5	6	24
5 Resettlement		1	1	1	0	0	2	0		3	4	6
Total	4+5	6	5	4	1	4	20	1		8	10	30
<b>Total Project Cost</b>	<b>1+2+3+4+5</b>	<b>626</b>	<b>971</b>	<b>743</b>	<b>827</b>	<b>2,810</b>	<b>5,977</b>	<b>353</b>		<b>356</b>	<b>710</b>	<b>6,687</b>

**4. Alternative 3B (Bottle Neck Reduction 426km)** Unit: Million USD

		Vientiane ~ Pac Xan	Pac Xan ~ Vieng Kham	Vieng Kham ~ Phontan	Phontan ~ Border		Lao Area	Border ~ NH-8	NH-8 ~ HCM Road	HCM Road ~ Vinh	VietNam Area	Total
	Length (km)	118	119	50	76		363	12	27	24	63	426
	Terrain	Flat	Rolling	Mountainous	Rolling			Steep Mountainous	Rolling	Flat (Ubam Area)		
Main Structure (km)	Bridge	2.56	9.60	4.05	6.16			4.55	10.00	1.22		
	Tunnel			4.50				1.40				
Construction Cost	Lane	6 Lane	4 Lane	4 Lane	4 Lane			4 Lane		4 Lane		
1Direct Work Cost		434	642	578	420		2,074	219	232	144	595	2,669
2Indirection Cost	30% of 1	130	193	173	126	0	622	66	70	43	179	801
3Value Added Tax	10% of 1,2	56	84	75	55	0	270	29	30	19	78	348
Total	1+2+3	620	919	826	601	0	2,966	314	332	206	852	3,818
Compensation												
4 Land Acquisition		5	5	1	2		14	1	1	1	3	17
5 Resettlement		1	1	0	0		1	0	0	0	0	2
Total	4+5	6	5	1	2	0	15	1	1	1	3	18
<b>Total Project Cost</b>	<b>1+2+3+4+5</b>	<b>626</b>	<b>924</b>	<b>827</b>	<b>603</b>	<b>0</b>	<b>2,981</b>	<b>315</b>	<b>333</b>	<b>207</b>	<b>855</b>	<b>3,836</b>

#### (4) Comparison between Pre-F/S and this survey

Figure 5-2 shows the comparison of cost estimation between this survey and the pre- F/S survey for both Alternative 1 and 2. In this survey, a topographic map was created with a scale 1/5000 for mountainous and steep mountainous sections. Approximate quantity estimation for bridge and tunnel sections were calculated based on the created topographic map. Thus, the accuracy of construction cost of bridge and tunnel sections have relatively improved compared with the Pre-F/S survey. In addition, the construction cost of alternative 2 in the Vietnamese side has decreased significantly in this survey [855 Million USD] compared to the construction cost of the Pre-F/S survey [1,990 Million USD] as the adopted route in this survey has been moved 10 km to the south of the NR8 since it decreased the length of the bridge sections significantly.

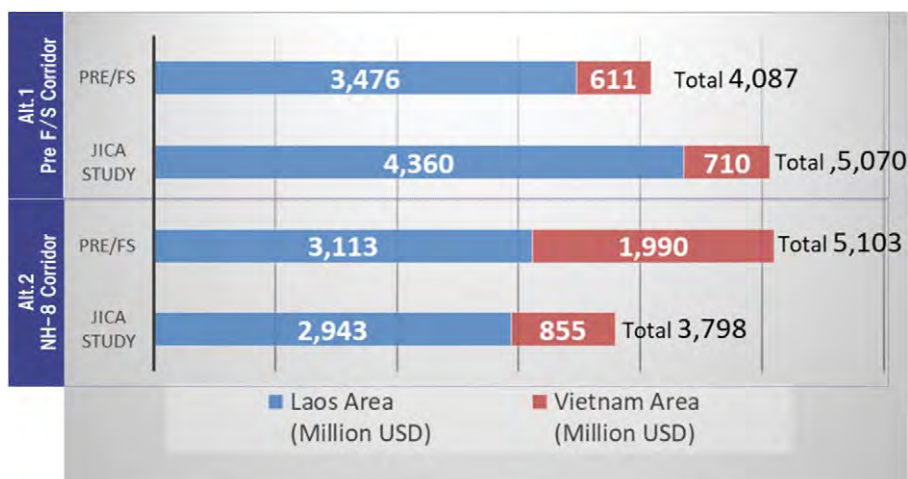


Figure 5-2 Comparison between Pre-F/S and this Survey

## 6. Evaluation of the Route in the Proposed Expressway Development Plan

### 6-1. Evaluation Method

The four proposed alternatives are evaluated and suggestions are made for a desirable development pattern for the Hanoi-Vientiane expressway. The indicators used in the evaluation included construction cost, traffic demand, travel time between major cities, contribution to regional development and impact on the environment etc. The items and indices used for the evaluation are shown in Table 6-1.

Table 6-1 Evaluation Items and Evaluation Indices of Alternative Plans

Evaluation Item	Evaluation Indices
Project Cost	Total project cost (sum of direct cost, indirect cost, land acquisition cost, compensation for resettlement and taxes, etc.)
Traffic Demand	Estimated traffic volume by each section (PCU/day)
Travel Time between Major Cities	Required travel time between ①Hanoi – Vientiane, ②Bangkok – Hanoi and ③Vientiane – Vung Aung port
Vertical Gradient	Length of steep gradient section ( $\pm 6\%$ )
Contribution to Regional Development	Size of flat and unused areas along the roadside
Impact on Environment	Inhabitancy of endangered species along the roadside
Resettled Structure	The number of resettled structure within ROW(60m)
Effectiveness of Phased Approach	Feasibility of mini bypass development

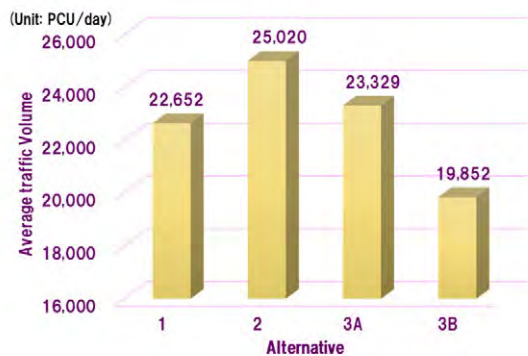
## 6-2. Evaluation Result

The evaluation result is shown in **Table 6-2**. Alternative 2 is found to be most desirable, followed by Alternative 3B. The other two, Alternative 1 and Alternative 3A, showed the lowest result. According to the result, the Alternative 2, despite showing a lower evaluation in terms of travel time between major cities (especially between Hanoi-Vientiane and Bangkok-Hanoi) than other alternatives, has high evaluation marks in all the other evaluation items. On the other hand, Alternative 1 selected in the Pre-F/S passes through long sections along the mountainous areas and has lower evaluation in terms of vertical gradient, contribution to regional development, etc. The overall low evaluation of Alternative 1 also results from the facts that it passes through the potential habitat of Saola, critically endangered species, and that the number of resettled structures on Vietnam side is large along the route.

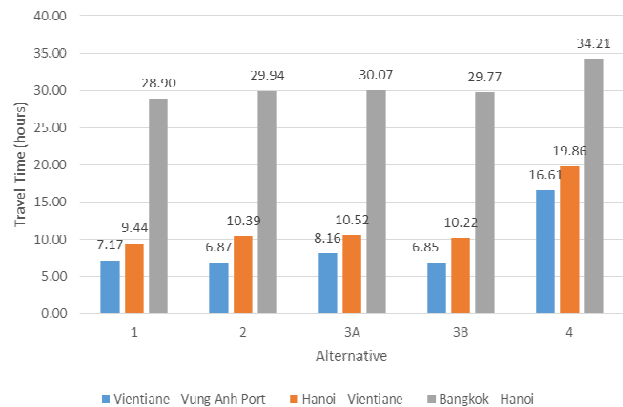
**Table 6-2 Evaluation Results of Alternative Routes**

Case	Construction cost	Traffic Demand	Travel time between major cities	Longitudinal slope	Contribution to Regional Development	Environmental Impact	Number of Resettled Structure	Effectiveness of Phased Approach	Overall Evaluation	
Alt.1	+:1	+:1	++:2	-:0	-:0	-:0	- : 0	-:0	4points	-
Alt.2	++:2	++:2	+:1	++:2	++:2	+:1	+:1	++:2	13points	++
Alt.3A	-:0	+:1	-:0	-:0	+:1	-:0	-:0	+:1	3points	-
Alt.3B	++:2	-:0	+:1	+:1	-:0	+:1	+:1	+:1	7points	+

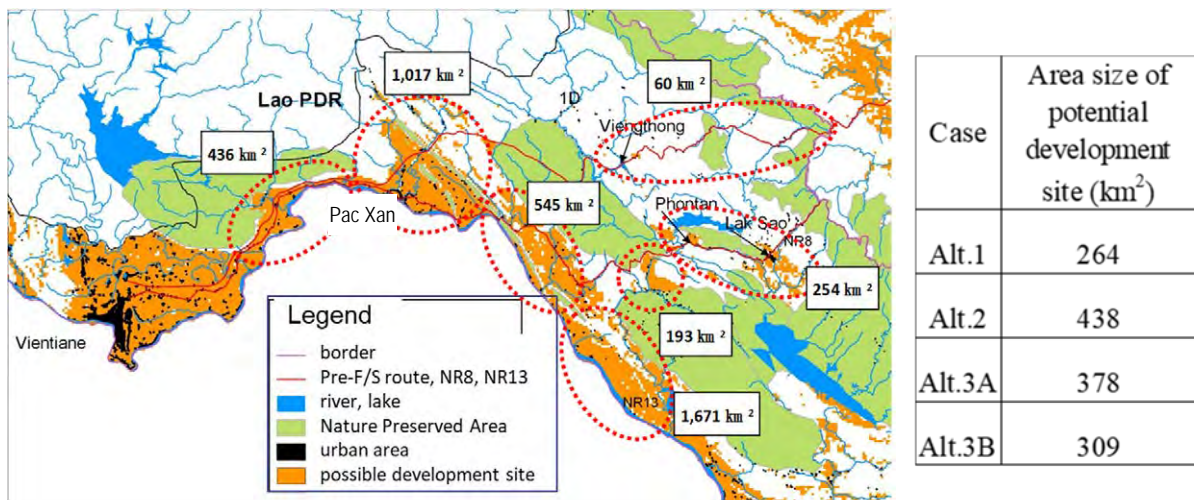
Note : ++ (Good) (2 points) + (Fair) (1 point) - (Bad) (0 point)



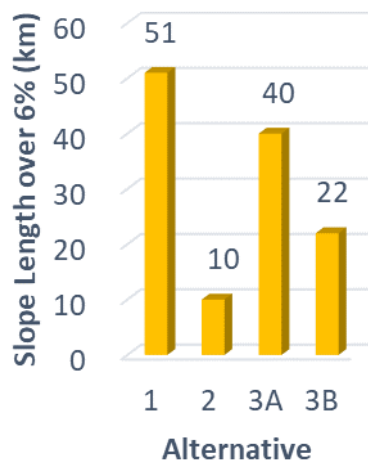
**Figure 6-1 Average Traffic Volume by Alternatives**



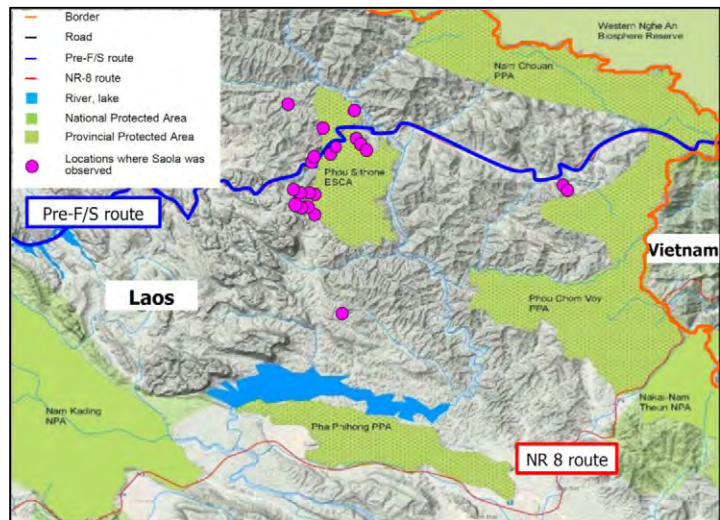
**Figure 6-2 Travel Time between Major Cities (PCU/day) (2035)**



**Figure 6-3 Contribution to Regional Development (Distribution of Developable Land)**

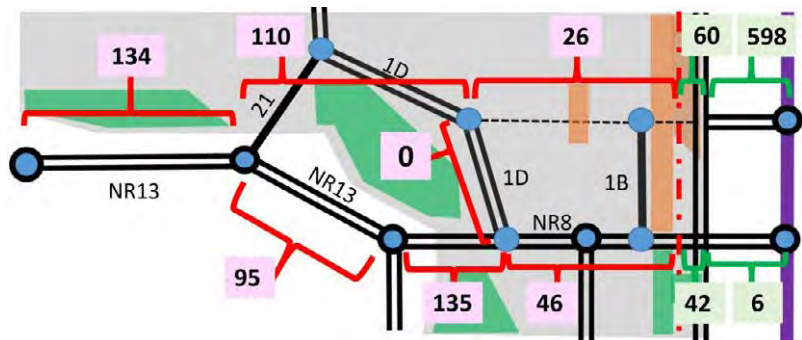
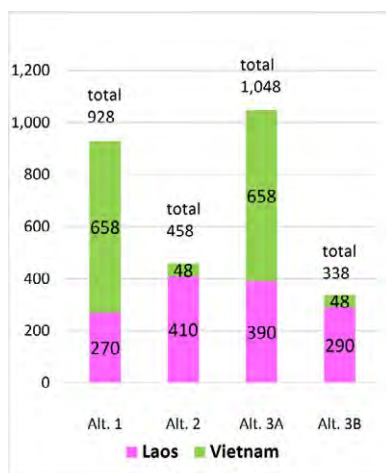


**Figure 6-4**  
Section Length of over 6% of Vertical Gradient



Source: Created by JICA Study Team based on Phommachanh et al. (2017) Tropical Conservation Science, vol. 10:1-15

**Figure 6-5**  
Habitat of Critically Endangered Species (Saola)



**Figure 6-6** Number of Resettled Structure by Route / Section

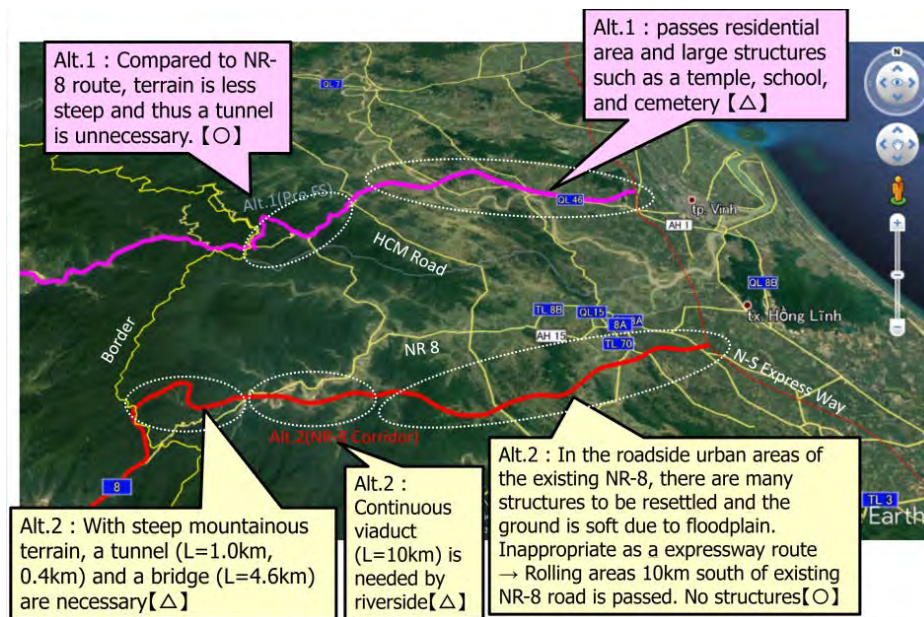
### 6-3. Study of Routes on Vietnam Side

As for Alternative 2 and Alternative 3B on Vietnam side, the route alignment passing around 10km south of the existing NR8 is adopted because there are dense residential areas and frequent floods in the nearby areas along NR8 (Figure 6-7).

Table 6-3 shows comparison result of the Pre-F/S route (Alt. 1 and 3A) and NR8 route (Alt. 2 and 3B). Although Pre-F/S route has higher evaluation than NR 8 in terms of length, construction cost and low-speed sections, the number of resettled structure along Pre-F/S route is found to be by far larger. This means that, except the number of resettled structure, the Pre-F/S route shows higher evaluation on Vietnam side alone. In this study, however, NR 8 route is selected as the most desirable route plan from a holistic point of view, because the Pre-F/S route has the following problems on the Laos side, which accounts for more than 80% of the total road length.

- 1) Since the Pre-F/S route passes many mountainous areas, the project cost becomes expensive (see Table 6-4). A detailed re-examination on the project cost of Pre-F/S route might be able to make a minor reduction, there is little possibility that the cost of Pre-F/S route becomes smaller than that of NR route.

- 2) It is considered internationally unacceptable as it passes through habitats of Saola, one of the critically endangered species (see **Figure 6-5**).
- 3) The route alignment runs on mountainous terrain with little potential for roadside development and it will serve no other use.



**Figure 6-7 Comparison of Routes on Vietnam Side**

**Table 6-3 Comparison of Alternatives on Vietnam Side**

Case	Length	Construction Cost	Low-speed sections due to steep slope (below 30km/h)	Environmental Impact Road passing through Nature preserved areas	The Number of Resettled Structure
Alt. 1, 3A (Pre-F/S route)	61km	Border - HCM road (mountainous, 4-lane) 354 Million USD HCM road - NSE (flat, 4-lane) 356 Million USD Total 710 Million USD	8.6km	<ul style="list-style-type: none"> <li>It passes through Biosphere Reserve.</li> <li>Road construction is not prohibited in BR (Biodiversity law, article No.7) but EIA and approval of Prime Minister is necessary.</li> </ul>	658 (including temple, school, and cemetery)
	1.00	1.00	1.00	-	1.00
Alt. 2, 3B (NR 8 route)	63km	Border - NR-8 (steep mountain, 4-lane) 315 Million USD NR-8 - HCM road (rolling, 4-lane) 333 Million USD HCM road - NSE (flat, 4-lane) 207 Million USD Total 855 Million USD	10.8km	<ul style="list-style-type: none"> <li>It does not pass through any protected areas</li> </ul>	48
	1.05	1.20	1.26	-	0.07

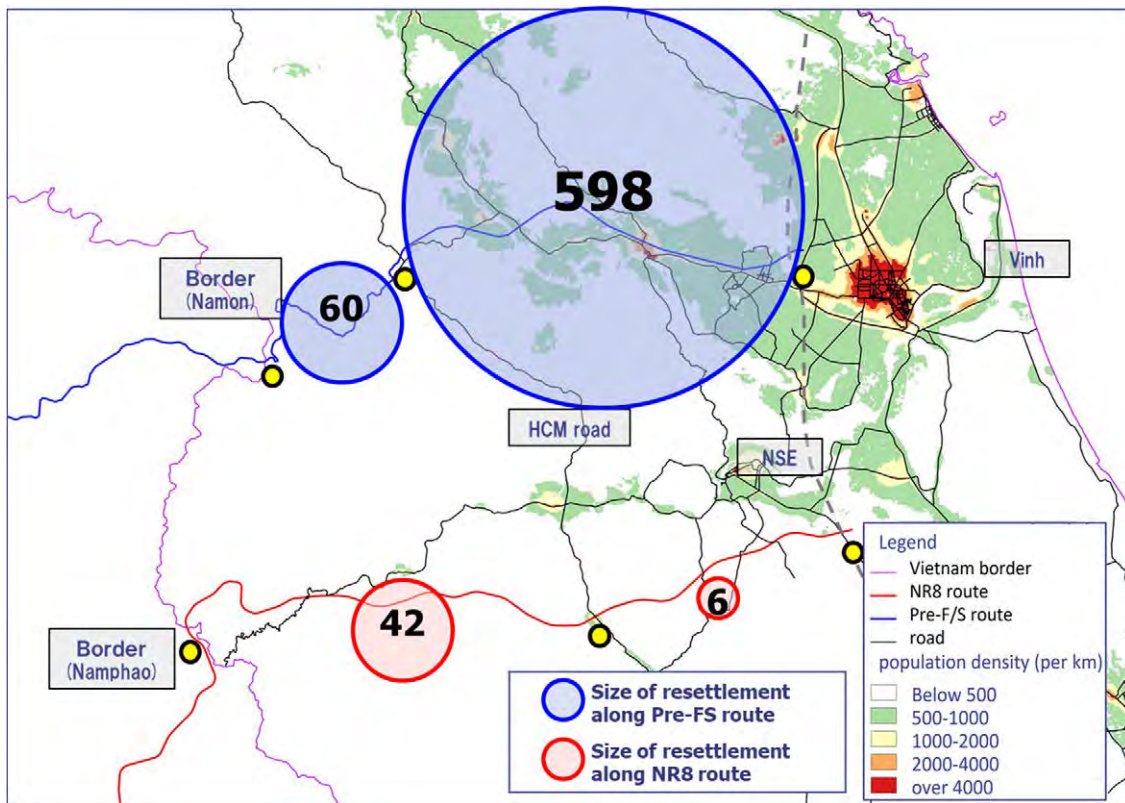


Figure 6-8 Comparison of the Number of Resettled Structure

Table 6-4 Comparison of Project Cost

	Project Cost (million USD)			(A)/(B)
	(A) Pre-F/S route	(B) NR-8 route	(A)-(B)	
Laos	4,360	2,943	1,417	1.48
Vietnam	710	855	-145	0.83
Total	5,070	3,798	1,272	1.33

## 7. Detailed Plan of Selected Route

### 7-1. Points to Consider along the Whole Alignment

A rough alignment for Alt. 2, the route parallel to NR 8, is examined using paper location with a 1/50,000 scale map, noting the control points. The section studied for Alt. 2 is between Vientiane and the connection point with NSE, with a total estimated length of 403 km<sup>3</sup> (Pre-F/S route length 400 km).

In this study, selection of rough route alignment is done only at the pre F/S level. Regarding the improvement project of NR 8 of which KOICA has carried out F/S study slightly ahead of this study, consideration has been made so as not to overlap the road lines. However, coordination with other plans such as railway development plan between Vientiane and Vung Ang port, Vientiane - Pakse expressway plan and Hong Linh - Huong Son expressway plan, as well as detailed route examination for reducing the project cost mainly by reducing the size of structures such as tunnels and bridges should be implemented during the future F/S as necessary. The required considerations for the NR 8 route are shown in **Table 7-1**.

<sup>3</sup> As no route comparisons were completed for the studied range, this 403 km is a reference value.



**Table 7-1 Points to Consider regarding Route Examination along NR 8**

Section	Route Summary	Required Route Considerations
Laos	[A] 118 km Vientiane – Pac Xan	Same route as in Pre-F/S <ul style="list-style-type: none"> <li>- Minimizing resettlement</li> <li>- Avoiding impact on high voltage power lines</li> </ul>
	[B] 96 km Pac Xan – Vieng Kham	Route parallel to NR 13 <ul style="list-style-type: none"> <li>- Minimizing resettlement</li> <li>- Avoiding impact on high voltage power lines</li> <li>- Possible crossing for Nam Kading River</li> <li>- Need for tunnels in the mountainous areas</li> </ul>
	[C] 50 km Vieng Kham – Phonthan	Route parallel to NR 8 <ul style="list-style-type: none"> <li>- Minimizing resettlement</li> <li>- Avoiding impact on high voltage power lines</li> <li>- Steep terrain in Knoun Ngeun-Ban Khounkeo section (current road is steep with sharp corners)</li> <li>- Steep terrain in Na Hin-Nong Coc section (current road is steep with sharp corners)</li> <li>- Theun Hinboun Hydropower Plant in Na Hin</li> <li>- Distance from existing road in the flat terrain</li> <li>- Need for tunnels in the mountainous areas</li> <li>- Intersection plan with the existing road</li> <li>- Relationship with KOICA F/S plan.</li> </ul>
	[D] 76 km Phonthan – Border	Same as above <ul style="list-style-type: none"> <li>- Minimizing resettlement</li> <li>- Avoiding impact on high voltage power lines</li> <li>- Bypass for central Laksao</li> <li>- Impact on protected area (Phouchomvoy PPA)</li> <li>- Minimizing the impact on small hydropower facilities</li> <li>- Securing land for new border facilities</li> <li>- Relationship with KOICA F/S plan</li> </ul>
Vietnam	[E] 39 km Border – HCM road	Same as above <ul style="list-style-type: none"> <li>- Minimizing resettlement</li> <li>- Border (Cau Treo)-Vung Tron steep section consists of a sharp terrain (with an altitude difference of 710 m) (Current road is steep with sharp corners)</li> <li>- Huong Son Hydropower Plant in Son Kim</li> <li>- Need for tunnels in the mountainous areas</li> </ul>
	[F] 24 km HCM road - NSE	Approximately 8 km south of NR 8 <ul style="list-style-type: none"> <li>- Minimizing resettlement</li> <li>- Avoid frequent flood areas.</li> </ul>

[A] For Vientiane- Pac Xan, almost the same alignment as Pre-F/S route has been adopted. In the future F/S, it has been considered necessary to coordinate with the Vientiane- Vung Ang port railway development plan. [B] As for the section between Pac Xan and Vieng Kham, a linear tunnel is introduced that extends to a part of the existing mountainous areas and avoids the influence on existing facilities as much as possible. [F] For the section between HCM road and NSE, an alternative route has been adopted that goes through the area of about 10 km to the south of the existing NR8 so as to minimize resettlement and avoid floodplain (frequent flood areas). In future F/S, adjustment with planned Hong Linh ~ Huong Son expressway would be necessary.

Points ① to ④ of the sections [C] [D] [E] shown in **Figure 7-1** below are considered as bottlenecks along NR 8 route and hence their structural countermeasures have been examined, and summarized in the next section.

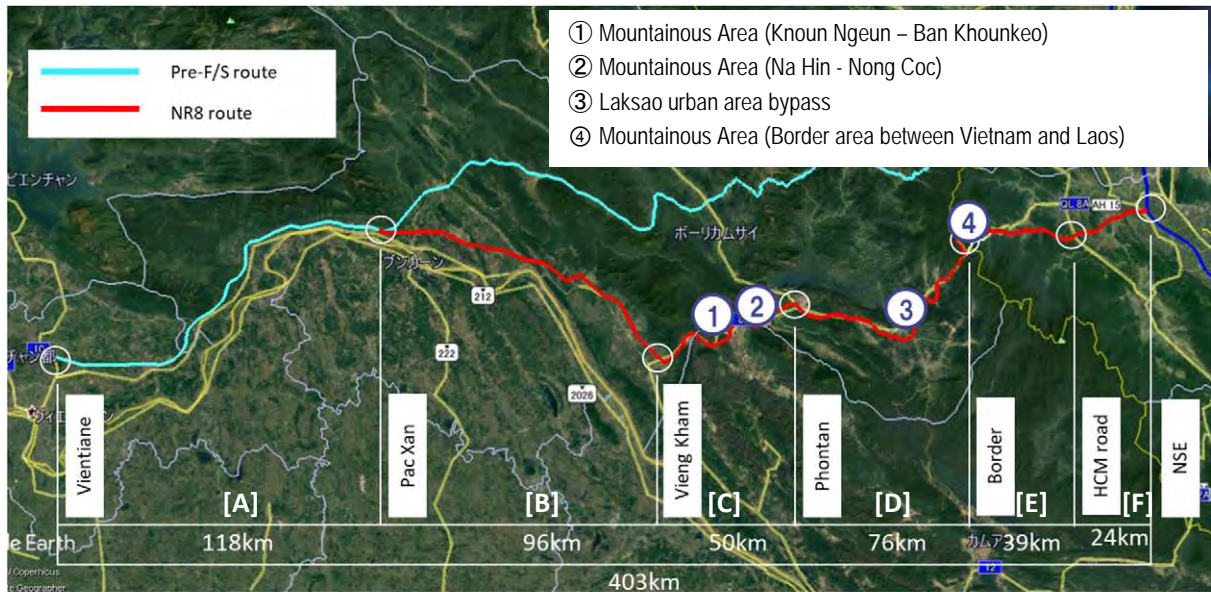


Figure 7-1 Target Sections along the NR 8 route.

## 7-2. Study Results by Section

### (1) Mountainous Area (Knoun Ngeun – Ban Khounkeo)

In the following valley terrain section, basically, road alignment plan to ensure separation from existing NR8 is made. In addition, intersection plan has been made for sections where intersection with existing NR8 is necessary. As for the intersection points with the existing road and the locations where the separation from the NR8 is not possible, additional structures such as retaining walls, bridges and box culverts, etc. are considered necessary, and they have been reflected in the approximate construction cost.



Figure 7-2 Improvement of NR 8 route Alignment (Valley Terrain Section).

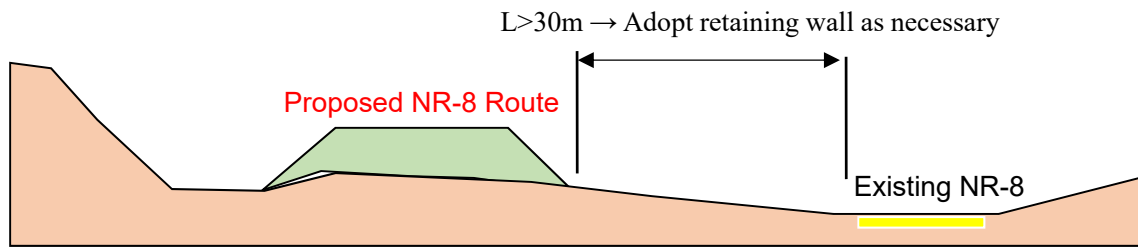


Figure 7-3 A-A Cross section (Parallel to NR8 Route)

Also, in the following locations, the vertical gradient of the existing road is about 8%, posing a problem for traveling of large-sized vehicles. The traveling performance of large-sized vehicles has been improved by constructing a 2.9 km-long tunnel through mountainous sections.

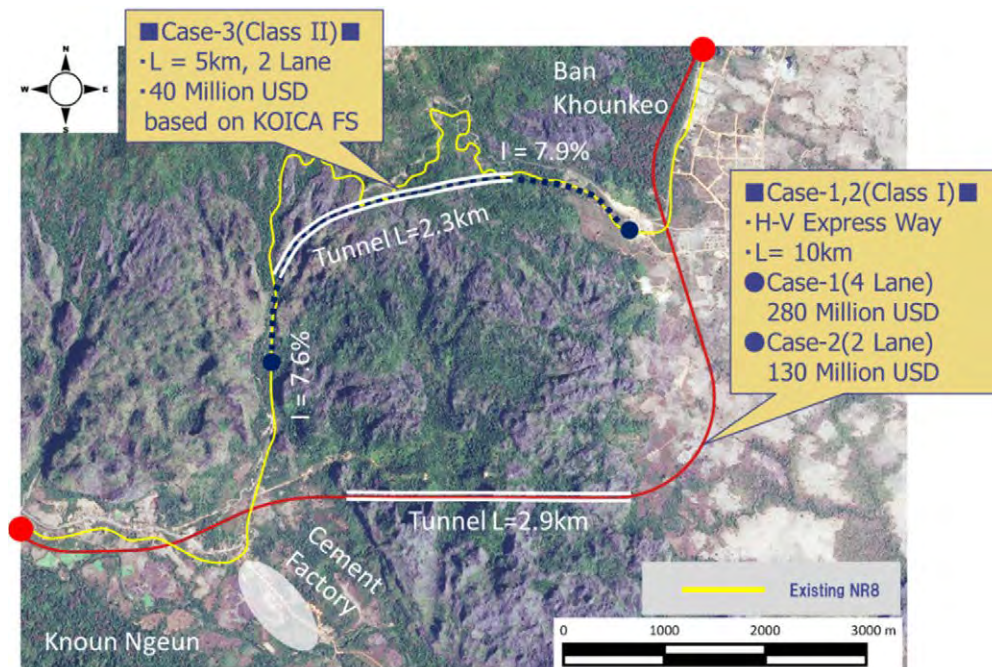


Figure 7-4 Improvement of NR 8 Route (tunnel through mountainous sections 1)

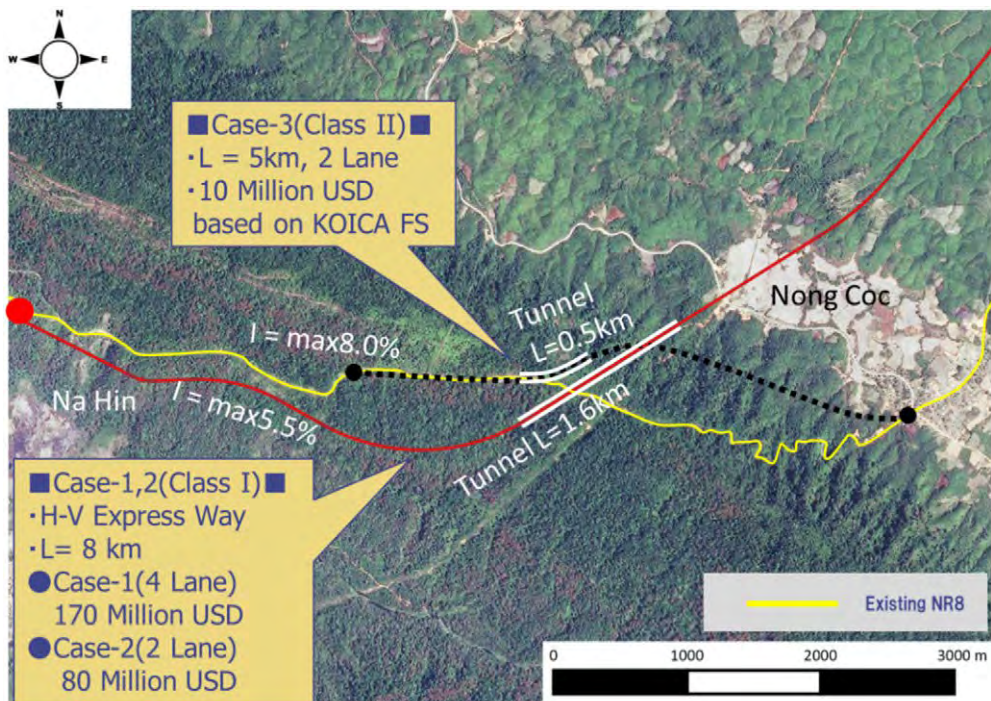
**(2) Mountainous Area (Na Hin - Nong Coc)**

The Theun Hinboun hydroelectric power station, located in Na Hin, is considered as a control point in the linear alignment and the planned road has shifted to the mountainous side. In addition, regarding the existing catchment area, structures such as a bridge would be necessary, and that has been reflected in the approximate construction cost.



**Figure 7-5 Improvement of Route Alignment along NR8 (Theun Hinboun Hydropower Station)**

Also, in the following locations, the vertical gradient of the existing road is about 8%, posing a problem for traveling of large-sized vehicles. The traveling performance of large-sized vehicles has been improved by constructing a tunnel of 1.6 km in length through mountainous sections.



**Figure 7-6 Improvement of NR 8 Route (tunnel through mountainous sections 2)**

### (3) Laksao Urban Area Bypass

In order to prevent large-sized vehicles from entering into Laksao urban areas and thereby to contribute to the improvement of urban roadside environment as well as to the reduction of traffic accident, the construction of bypass around urban areas is proposed.

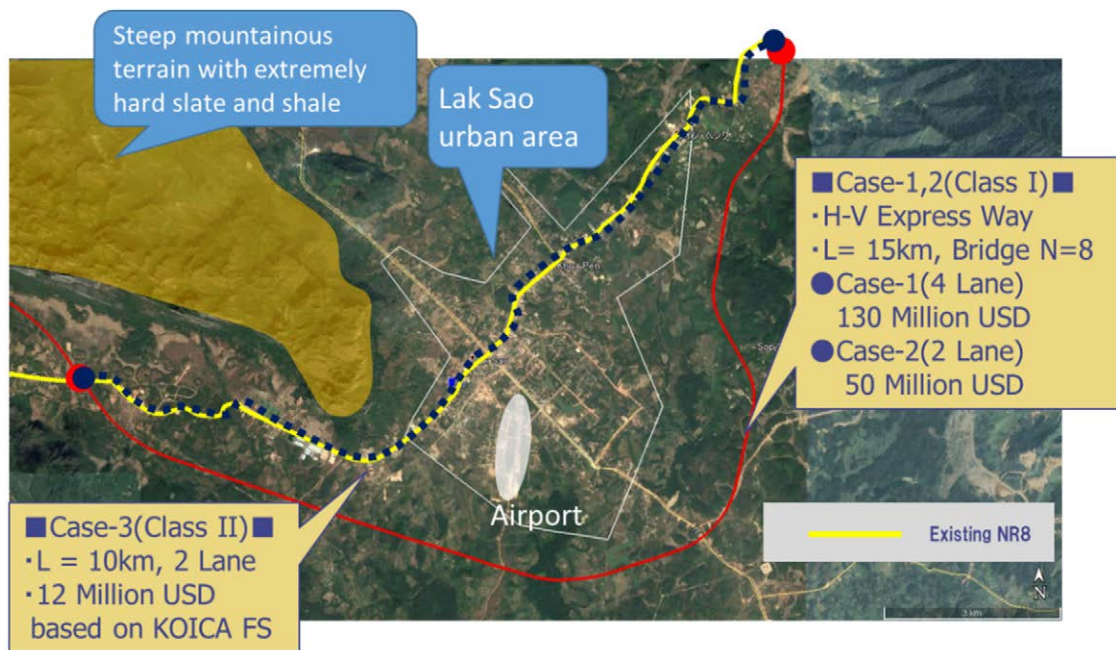


Figure 7-7 Improvement of NR 8 route (Laksao BP)

### (4) Mountainous Area (Border area between Laos and Vietnam)

The sections on Vietnam side within some 20 km from the border with Laos have about 8% of vertical gradient and continuous sharp curves, making it hard for traffic to flow. Therefore, it is proposed that border control facilities are built 5 km north of the existing facilities, enabling a new alignment with less gradient.

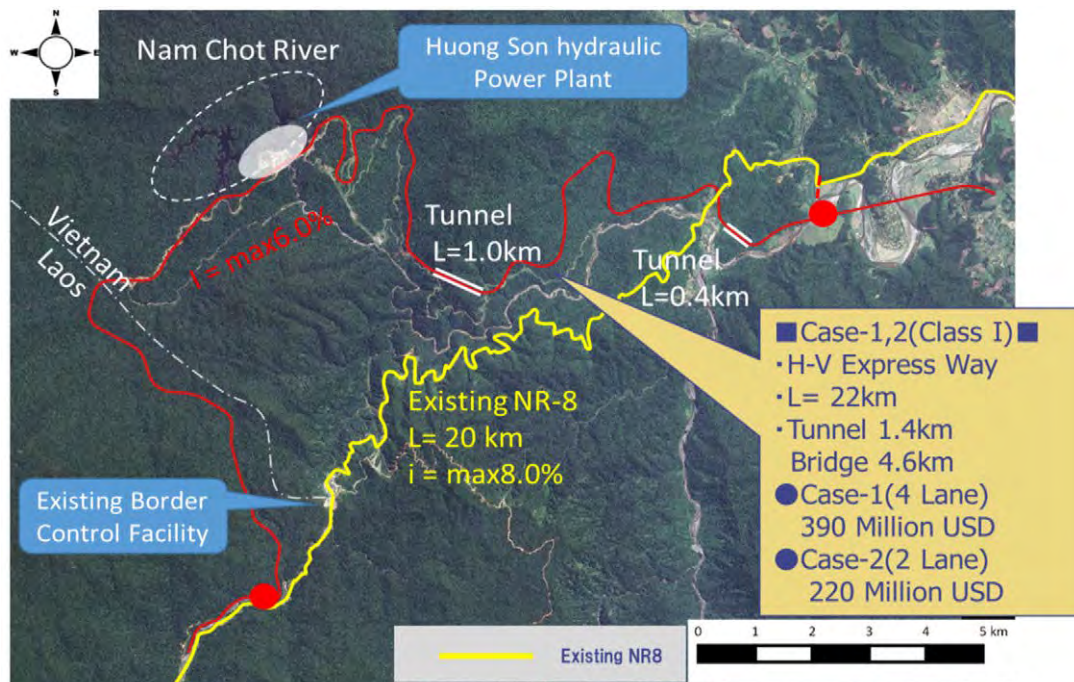


Figure 7-8 Improvement of NR 8 Route (alignment change around border areas)

As the proposed route passes near the Huong Son Hydropower Plant, structures such as bridges and slant surface countermeasures such as ground anchor work, etc. are slated and reflected in the approximate construction cost. In addition, The area proposed for a new border crossing facilities for expressway users is planned to be located 5 km to the north of the current facilities (Laos: Nam Phao; Vietnam: Cau Treo). A field survey has been conducted and the existence of flat terrain on which the new border facilities could be constructed has been confirmed.

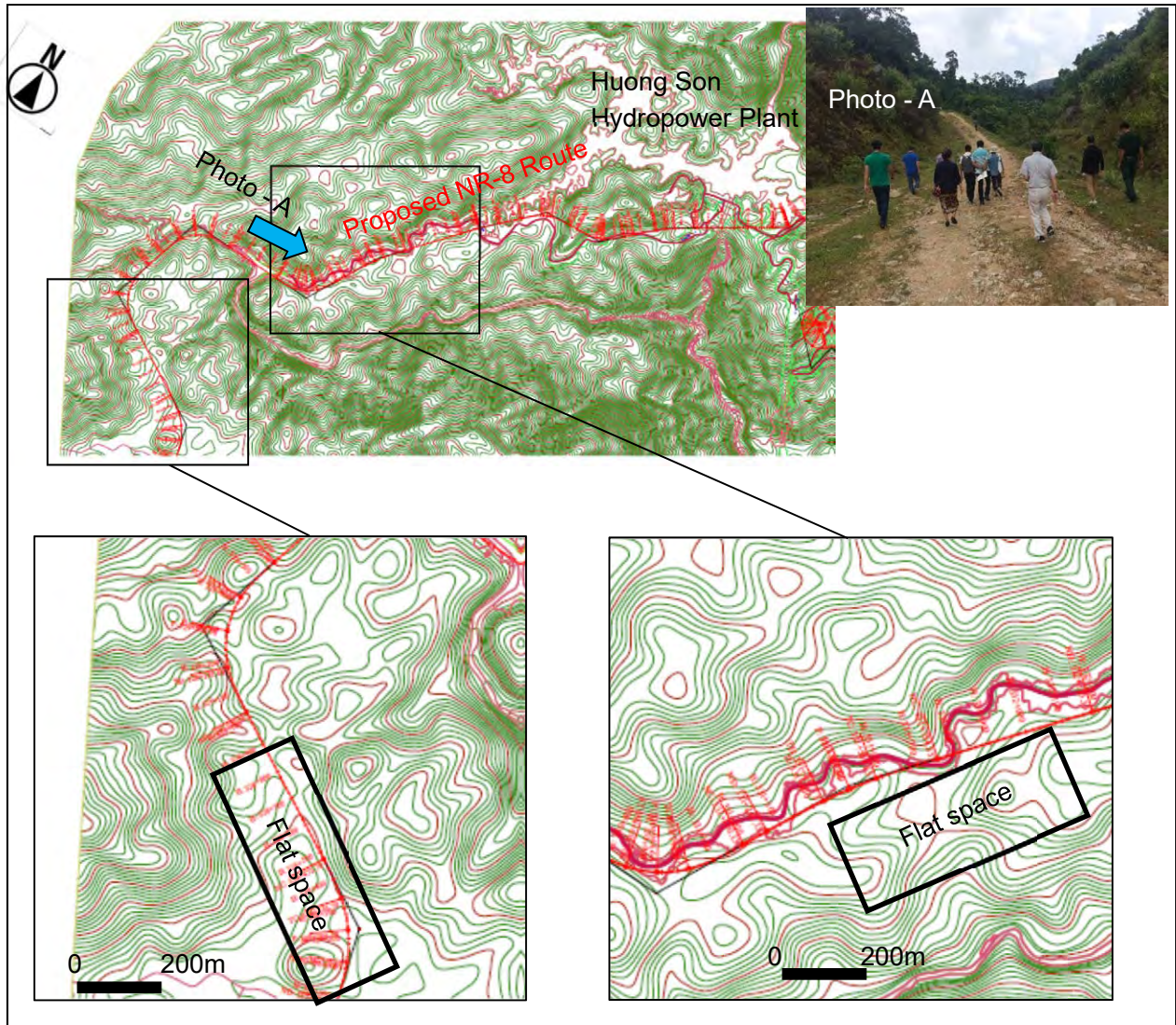


Figure 7-9 Potential Location for the New Border Facility

## 8. Phased Approach for Expressway Development

From the viewpoint of financing, it is not practical to construct an expressway of over 400 km in total length in one go. It is necessary to select sections that realistically can be developed in view of their priority and economy and carry out the project in phases from the following viewpoints:

- Elimination of the current traffic problems (traffic congestion, elimination of sections preventing the passage of large-sized vehicles)
- Response to future traffic demand
- Filling missing links
- Feasibility of project (project scale, financing, etc.)

### 8-1. Study for Phased Development Plan by Section

Figure 8-1 shows the relationship between yearly traffic demand and traffic capacity (existing road + expressway) by section of NR 8 route.

- In the first place, as for the section between Vientiane-Vieng Kham, the demand exceeds the capacity of existing road by 2025 and the development of expressway (4-lane) is desirable as soon as possible.
- Next, as for sections between Vieng Kham-Laksao and HCM road- NSE, the demand exceeds the capacity of existing road at some point during the period from 2027 to 2031. The development of expressway (4-lane) by 2030 desirable.
- Lastly, the development of road section between Laksao-HCM road through the border between Vietnam and Laos by 2035 is desired. However, in case there is a disruption in the logistics function caused by traffic increase around border area and the consequent increase of time required for customs procedure, earlier development of this section together with the construction of customs facilities may as well be considered.
- It should be noted, however, that the practical feasibility needs to be studied from the debt sustainability point of view, because the above-mentioned implementation period is the one considered desirable according to demand forecast only.

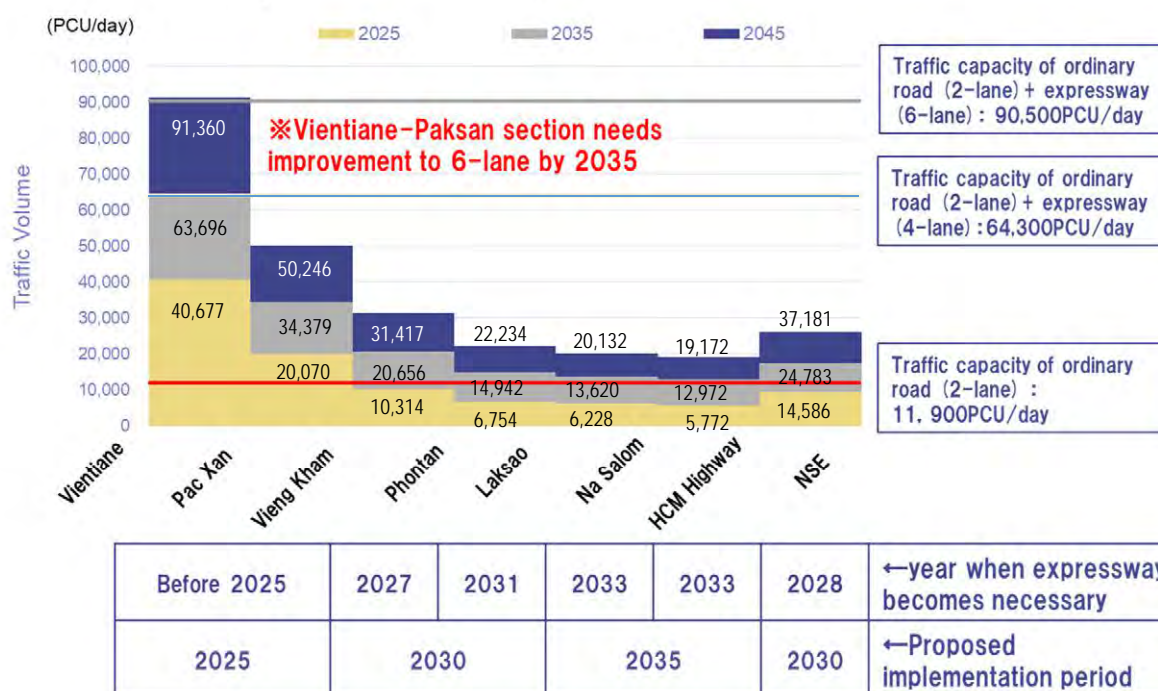


Figure 8-1 Implementation Period by Section from the Viewpoint of Traffic Demand

## 8-2. Study for Phased Development Plan

The phased development plan is proposed in

Figure 8-2. It is noted, however, that this proposal is made based solely on the result of demand forecast.

### (1<sup>st</sup> phase : 2019~2024)

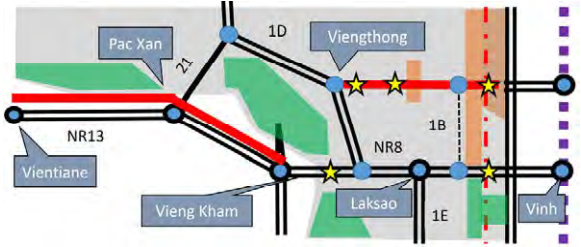
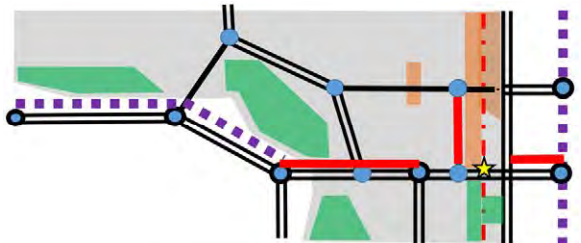
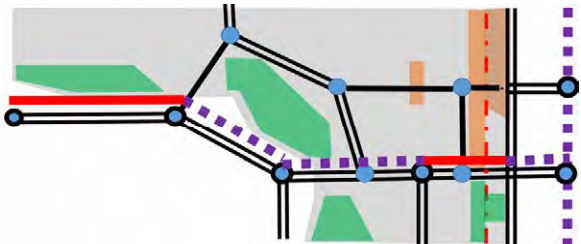
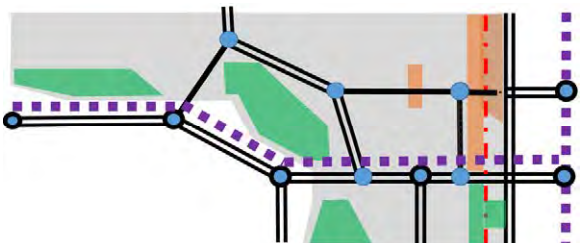
The section between Vientiane – Vieng Kham is developed as an expressway (Pac Xan – Vieng Kham section is planned to be developed under BOT scheme as a part of Vientiane-Pakse expressway project). In addition, a regional road (width 7-9 m) is constructed to fill missing link between Viengthong – Nam On (Thanh Thuy). Also, it is expected that the elimination of bottleneck section proceeds according to the F/S of NR 8 conducted by KOICA.

### (2<sup>nd</sup> phase : 2025~2029)

The sections between Vieng Kham-Laksao and HCM road- NSE, which have the largest traffic demand after Vientiane-Vieng Kham section in Hanoi – Vientiane expressway, are developed. The improvement of Prefectural Road 1B, which is a missing link around the border, is completed.

### (3<sup>rd</sup> phase : 2031~2035)

The remaining section in Hanoi-Vientiane expressway, Laksao-HCM road section, is developed. At the same time, the section between Vientiane – Pac Xan is improved from 4-lane to 6-lane road.

Phase	Hanoi – Vientiane Expressway Development	Other Main Roads
<p><b>1<sup>st</sup> Phase (2019~2024)</b></p> 	<ul style="list-style-type: none"> <li>◆ Expressway development between Vientiane-Vieng Kham (Pac Xan – Vieng Kham section is planned to be developed under BOT scheme as a part of Vientiane - Pakse expressway project)</li> </ul>	<ul style="list-style-type: none"> <li>◆ Elimination of bottleneck of NR8 (proposed in KOICA F/S)</li> <li>◆ Resolution of missing links (7~9m in width) between Vieng Thong-Nam On</li> </ul>
<p><b>2<sup>nd</sup> Phase (2025~2029)</b></p> 	<ul style="list-style-type: none"> <li>◆ Expressway development between Vieng Kham - Laksao, HCM road - NSE</li> </ul>	<ul style="list-style-type: none"> <li>◆ Improvement of PR 1B</li> <li>◆ Elimination of bottleneck of NR8 (proposed in KOICA F/S)</li> </ul>
<p><b>3<sup>rd</sup> Phase (2031~2034)</b></p> 	<ul style="list-style-type: none"> <li>◆ Expressway development between Laksao - NSE</li> <li>◆ Improvement of expressway between Vientiane - Pac Xan (to 6-lane)</li> </ul>	
<p><b>Ultimate road network (2035~)</b></p> 	<ul style="list-style-type: none"> <li>◆ Completion of expressway between Hanoi - Vientiane</li> </ul>	<ul style="list-style-type: none"> <li>◆ Development of missing links</li> <li>◆ Improvement of NR-8 (KOICA F/S)</li> </ul>

**Figure 8-2 Proposed Phased Development Plan**



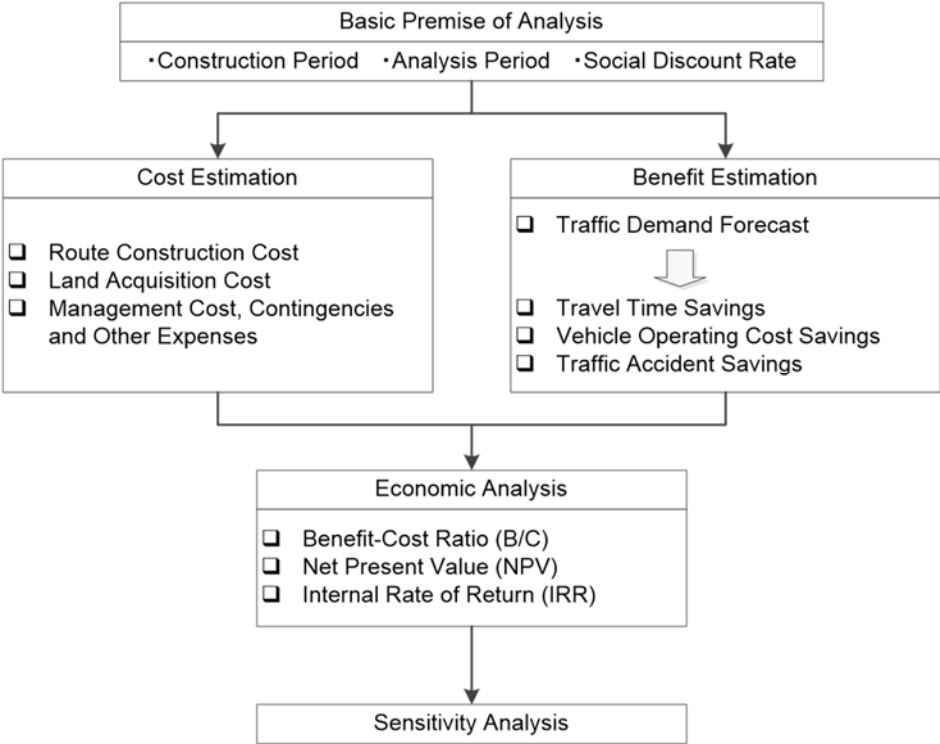
**9. Economic and Financial Analysis**

**9-1. Economic Analysis**

**(1) Analysis Method**

Economic analysis is to evaluate a project through cost-benefit analysis, by comparing direct economic benefit produced by the project and economic cost.

The evaluation flow is shown in **Figure 9-1**. Both cost and benefit are calculated in economic price. The indicators for benefit analysis is limited to the ones most directly expected from the project, which include (1) vehicle operation cost saving, (2) travel time saving and (3) traffic accident saving. These benefits are calculated based on the result of traffic demand estimation. The conditions for economic evaluation are illustrated in **Table 9-1**.



**Figure 9-1 Method of Economic Analysis**

**Table 9-1 Conditions for Economic Analysis**

Calculation Condition	<ul style="list-style-type: none"> <li>❑ Construction Period: 3 years before operation based on the Phased Development Plan</li> <li>❑ Analysis Period : 30 years from the Commencement of Operation (Operation: 2025~)</li> <li>❑ Social Discount Rate: 12%</li> </ul>															
Conversion to Economic Cost	<ul style="list-style-type: none"> <li>❑ 85% of initial cost, O&amp;M cost</li> </ul>															
Unit Price for Time Value	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="5">USD/vehicle·hour</th> </tr> <tr> <th>Classification</th> <th>Motorcycle</th> <th>Car</th> <th>Bus</th> <th>Truck</th> </tr> </thead> <tbody> <tr> <td>Lao PDR</td> <td>1.64</td> <td>4.01</td> <td>18.55</td> <td>2.10</td> </tr> </tbody> </table> <p>Source: Feasibility Study for the Railway Link from Vientiane to Vung Ang</p>	USD/vehicle·hour					Classification	Motorcycle	Car	Bus	Truck	Lao PDR	1.64	4.01	18.55	2.10
USD/vehicle·hour																
Classification	Motorcycle	Car	Bus	Truck												
Lao PDR	1.64	4.01	18.55	2.10												

Vehicle Operating Cost	USD/km				
	Vehicle Type	Motorcycle	Car	Bus	Truck
	Speed				
	10 km/h	0.13	1.01	1.88	1.05
	20 km/h	0.11	0.86	1.59	0.86
	30 km/h	0.10	0.73	1.34	0.70
	40 km/h	0.08	0.63	1.13	0.58
	50 km/h	0.07	0.55	0.97	0.48
	60 km/h	0.07	0.48	0.84	0.41
	70 km/h	0.06	0.44	0.76	0.37
	80 km/h	0.06	0.42	0.72	0.36
	90 km/h	0.06	0.42	0.73	0.38

Source: Feasibility Study for the Railway Link from Vientiane to Vung Ang

### (2) Economic Analysis of Pre-F/S route and NH-8 route

Table 9-2 shows the result of economic analysis. The EIRRs of the Pre-F/S route and NR-8 route are 11.59% and 12.40% respectively. The EIRR of the NR-8 route exceeds the social discount rate and it justifies the necessity of the project.

**Table 9-2 Economic Analysis Results of Hanoi-Vientiane Expressway**

Items	Pre-F/S route	NR-8 route
EIRR (Economic Internal Rate of Return)	11.59%	12.40%
NPV (Net Present Value)	-US\$ 31.92 million	US\$ 58.83 million
B/C (Benefit Cost Ratio)	0.98	1.03

### (3) Feasibility of the Vientiane - Pac Xan Section

The economic analysis was conducted with a target of solely Vientiane – Pac Xan section with the highest traffic demand. The project cost is estimated based on the premise that the Vientiane-Pac Xan section is developed as 4-lane road by 2025 and improved to 6-lane road by 2035. Result of economic analysis is shown in Table 9-4. The cost and benefit calculated in economic prices for the period of 30 year are compared and then the cash flow is prepared. The IRR (Internal Rate of Return) drawn from this cash flow showed as high as 23.4%, exceeding the social discount rate of 12% by far, suggesting that this project is economically feasible.

Table 9-5 shows the result of sensitivity analysis, illustrating how the IRR changes when values of cost and benefit are changed. It is clearly found that, even when the cost increases by 20% and the benefit decreases by 20%, the economic feasibility of this project is not critically affected.

**Table 9-3 Result of Project Cost Estimation**

(Unit: Million USD)

Item		Stage -1	Stage - 2	Total
		4 Lane	4→6 Lane	
<b>Construction Cost</b>				
1) Direct Work Cost		334	211	544
	Earth Work Cost	266	191	457
	Bridge	36	19	55
	IC trumpet Shape	14	0.0	14
	IC Diamond Shape	18	0.0	18
2) Indirect Cost and Consulting Cost and Others	30% of 1	100	63	163

3) Value Added Tax	10% of 1,2	43	27	70
Total	1+2+3	477	301	777
Compensation				
4) Land Acquisition		5	0	5
5) Resettlement		1	0	1
Total	4+5	6	0	6
Total Project Cost	1+2+3+4+5	483	301	783

**Table 9-4 Result of Economic Analysis**

(Unit: Million USD)

Year	Cost						Benefit				Cash Flow
	Construction Cost (I)	Reparing & Upgrade Cost	Operating Cost	Launch Cost of SPC	Administrative Cost of SPC	Total Cost	TTC Savings	VOC Savings	VAC Savings	Total Benefit	
-3 2022	123.17			5.10	1.53	129.80				0.00	-129.80
-2 2023	164.22				1.53	165.75				0.00	-165.75
-1 2024	123.17				1.53	124.70				0.00	-124.70
1 2025			12.32		1.53	13.85	13.80	100.92	0.39	115.11	101.26
2 2026			12.32		1.53	13.85	14.76	107.98	0.42	123.17	109.32
3 2027			12.32		1.53	13.85	15.73	115.05	0.45	131.23	117.38
4 2028			12.32		1.53	13.85	16.70	122.11	0.48	139.28	125.44
5 2029			12.32		1.53	13.85	17.66	129.17	0.50	147.34	133.49
6 2030			12.32		1.53	13.85	18.63	136.24	0.53	155.40	141.55
7 2031			12.32		1.53	13.85	19.59	143.30	0.56	163.46	149.61
8 2032			12.32		1.53	13.85	20.56	150.37	0.59	171.51	157.67
9 2033		127.93	12.32		1.53	141.77	21.53	157.43	0.61	179.57	37.80
10 2034		127.93	16.15		1.53	145.61	22.49	164.50	0.64	187.63	42.02
11 2035			19.99		1.53	21.52	26.46	193.50	0.76	220.71	199.19
12 2036			19.99		1.53	21.52	27.37	200.17	0.78	228.32	206.80
13 2037			19.99		1.53	21.52	28.28	206.84	0.81	235.92	214.40
14 2038			19.99		1.53	21.52	29.19	213.51	0.83	243.53	222.01
15 2039	41.06		19.99		1.53	62.58	30.10	220.18	0.86	251.14	188.56
16 2040			19.99		1.53	21.52	31.02	226.84	0.89	258.75	237.22
17 2041			19.99		1.53	21.52	31.93	233.51	0.91	266.35	244.83
18 2042			19.99		1.53	21.52	32.84	240.18	0.94	273.96	252.44
19 2043			19.99		1.53	21.52	33.75	246.85	0.96	281.57	260.05
20 2044			19.99		1.53	21.52	34.66	253.52	0.99	289.18	267.65
21 2045			19.99		1.53	21.52	35.58	260.19	1.02	296.78	275.26
22 2046			19.99		1.53	21.52	36.35	265.85	1.04	303.23	281.71
23 2047			19.99		1.53	21.52	37.12	271.50	1.06	309.68	288.16
24 2048			19.99		1.53	21.52	37.90	277.16	1.08	316.13	294.61
25 2049		25.59	19.99		1.53	47.11	38.67	282.81	1.10	322.59	275.48
26 2050			19.99		1.53	21.52	39.44	288.47	1.13	329.04	307.51
27 2051			19.99		1.53	21.52	40.22	294.12	1.15	335.49	313.96
28 2052			19.99		1.53	21.52	40.99	299.78	1.17	341.94	320.42
29 2053			19.99		1.53	21.52	41.76	305.43	1.19	348.39	326.87
30 2054			19.99		1.53	21.52	42.54	311.09	1.21	354.84	333.32
Total	451.61	281.44	526.84	5.10	50.49	1315.47	877.61	6418.56	25.05	7321.23	
EIRR:		24.04%		NPV:		US\$534.83		B/C:		2.07	

**Table 9-5 Sensitivity Analysis**

	IRR	NPV (Million USD)	B/C
Base Case	24.04%	534.83	2.07
Change of Cost	-20%	634.58	2.59
	-10%	584.71	2.30
	+10%	484.96	1.88
	+20%	435.08	1.73
Change of Benefit	-20%	328.12	1.66
	-10%	431.48	1.87
	+10%	638.19	2.28
	+20%	741.55	2.49

## 9-2. Financial Analysis

### (1) Introduction

#### 1) Objectives

As shown in project cost estimation in this chapter, the construction cost for Hanoi-Vientiane expressway project (NR 8 route) is approximately 3,798 million USD. The costs to be borne by Lao PDR and Vietnam are 2,943 million USD and 855 million USD, respectively. The amounts cannot be easily shouldered by the both Governments considering their current fiscal conditions. Therefore, both Governments are expecting to utilize private funds or PPP for the implementation of the Hanoi-Vientiane expressway project as much as possible.

With these backgrounds, financial viability of the entire section (between Hanoi and Vientiane) is firstly evaluated. Then, financial viability with the highest traffic volume (Vientiane-Pac Xan) is evaluated to see the possibility of application of PPP.

#### 2) Analytical Method

Regarding the entire section (NR 8 Route), toll revenue, operation and maintenance (O&M) cost and repayment cost were estimated. Preliminary evaluation is made to check whether the total amount of toll revenue from the commencement of service to the end of project exceeds the total amount of O&M cost, repayment cost and construction cost.

Then, regarding Vientiane-Pac Xan section, based on the precondition specified in **Table 9-1**, a cash flow analysis is made to assess the financial viability of the project assuming application of PPP. Sensitivity analysis is also made to check conditions which enables the project financially viable.

### (2) Preliminary Evaluation of Financial Viability of the Entire Section

In case of NR 8 route, as seen in project cost estimation in this chapter, construction cost for the expressway project is approximately 3,798 million USD. And, the total amount of O&M cost during the same period is expected to be 2,949 million USD. Moreover, re-paving of the road, that cost is expected to be 390 million USD, will be conducted once every 15 years. Therefore, the total amount of the costs is approximately 7,137 million USD.

Meanwhile, assuming the project period is 30 years, based on the demand forecast in this study, the total amount of toll revenue over 30 years is expected to be 3,541 million USD.

The total amount of the toll revenue (3,541 million USD) is below the total amount of these costs (7,137 million USD), and the gap is 3,596 million USD. From this preliminary evaluation, it is interpreted that the profitability of NR 8 route is quite low and this does not work on a commercial basis.

Based on this result, the following section focuses on Vientiane-Pac Xan section, which has the highest traffic demand among the entire section, to check its financial viability as well as possibility of application of PPP.

### (3) Financial Evaluation of Vientiane-Pac Xan Section

#### 1) Project Implementation Schedule

The schedule of implementation of the Vientiane-Pac Xan section is shown in **Table 9-6**.

**Table 9-6 Project Implementation Schedule between Vientiane and Pac Xan**

	2018	2019	2020	2021	2022	2023	2024	2025
F/S								
Tendering of Contractor								
Environmental Impact Assessment								
Detailed Design								
Approval from Laos gov.								
Land acquisition and Resettlement								
Construction work								
Commencement of service								

Source: JICA Study Team

It is assumed that the feasibility study will be conducted from 2018 to 2019. After tendering of contractor, environmental impact assessment and detailed design of the section will be conducted. In 2021, this project will be given approval by the Government of Lao PDR, and land acquisition and construction work will be started. The operation of the section is expected to start in 2025.

## 2) Precondition of Financial Analysis

The precondition of financial analysis between Vientiane and Pac Xan is shown in the **Table 9-7**.

Firstly, a section to be conducted financial analysis is Vientiane-Pac Xan (118km), which is expected to be the most traffic demand in NR 8 route. The PPP type is concession (BOT), the project period is assumed to be 33 years, consisting 3 years of construction phase and 30 years of operation and maintenance phase.

Secondly, the initial investment by private company is 500 million USD, of which the facility construction cost (4-lane) is 483 million USD and the other 17 million USD<sup>4</sup>. The Vientiane-Pac Xan section will be upgraded from 4-lane to 6-lane in the two years from 2033 to 2034. The upgrade cost is expected to be 301 million USD. Land acquisition cost and resettlement cost are included in construction cost.

**Table 9-7 Preconditions of Financial Analysis between Vientiane and Pac Xan**

Item	Precondition	Remarks
Section	Vientiane-Pac Xan (118km)	—
Type of PPP	Concession (BOT)	—
Project period	Construction phase : 3 year	—
	Operation & Maintenance phase : 30 year	—
Revenue and Expense	Construction cost (4-lane) : 483 Million USD	Including land acquisition cost etc.
	Upgrade cost (6-lane) : 301 Million USD	Ditto
	Launch cost of SPC : 3 Million USD	Assumed by JICA Study Team
	Traffic demand, revenue forecast : refer to Figure 9-2	Forecast by JICA study Team
	Toll (Passenger car) : 2.65 USD/Vehicle	Assumed by JICA Study Team (Same level as Vientiane- Vang Vieng highway)
	Toll (Bus, Truck) : 5.30 USD/Vehicle	Ditto
	Toll increase rate : 63% ( by 2035 )	6 lanes after widening
	Administrative cost of SPC : 1 Million USD/year	Assumed by JICA Study Team
	Ratio of operating cost : 3% of construction cost	Ditto
	Ratio of repairing cost : 10% of construction cost	Once every 15 years
Financing	Debt Equity Ration 70:30	Assumed by JICA Study Team
	Number of execution of loan : 5 times <sup>5</sup>	Ditto
	Interest rate : 10%	No commercial banks available for loans in Laos
	Payment period : 10 year period (level payment)	Assumed by the JICA Study Team
	Equity IRR hurdle rate : 15%	Ditto
	WACC=FIRR hurdle rate : 11.5%	—
Taxes and other public duties	Profit tax rate : 24%	Tax Law in Laos
	Depreciation : 20 year (Straight-line method)	Assumed by JICA Study Team
Other	Inflation rate : 0%	Tentatively

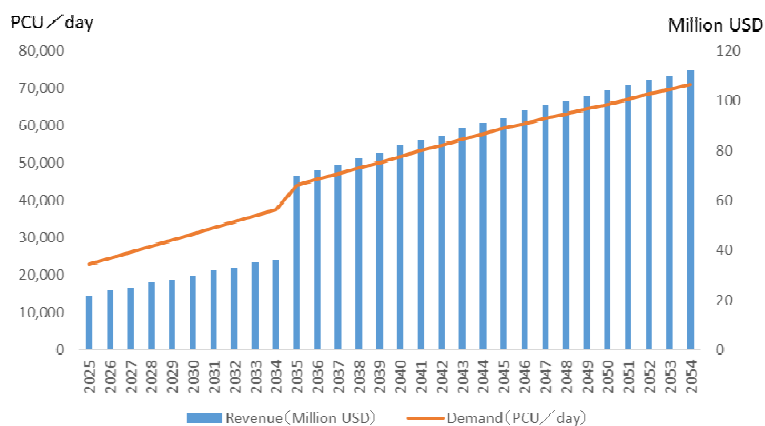
Source: JICA Study Team

<sup>4</sup> Other 17 million USD includes launch cost of SPC etc. Unused funds are reserved.

<sup>5</sup> The number of execution of loan for upgrade to 6-lane is supposed to be 2 times.

The demand and revenue forecast of the section is shown in **Figure 9-2**. As for revenue, it consists of toll<sup>6</sup> from passenger car, truck and bus<sup>7</sup>. Demand and revenue sharply increases in 2035 due to the section upgraded 4-lane to 6-lane.

Finally, regarding financing the debt equity ratio is 70:30. The interest rate was set at 10% with assumption of loans by ECA of other countries since there are no commercial banks that can loan this project in Lao PDR. The payment period is for 10 years from the first year of operation and maintenance phase. Payment method is level payment. The hurdle rate of equity IRR was set at 15% by reference to case of other countries. As a result, the hurdle rate of FIRR was 11.5%. In other words, if FIRR above that hurdle rate of FIRR is obtained from the project, the applicability of PPP is recognized in terms of finance.



Source: JICA Study Team

**Figure 9-2 Demand and Revenue Forecast between Vientiane and Pac Xan**

### 3) Result of Financial Analysis

The result of financial analysis and sensitivity analysis are shown in **Table 9-8**.

**Table 9-8 Result of Financial Analysis and Sensitivity Analysis**

Change rate of revenue \ Change rate of construction cost	Change rate of revenue		
	0%	+10%	+20%
0%	0.79% (4.64%)	1.84% (6.08%)	2.82% (7.46%)
-10%	1.91% (6.15%)	2.98% (7.67%)	4.00% (9.15%)
-20%	3.18% (7.91%)	4.30% (9.54%)	5.35% (11.00%)

Note : The upper shows the result of FIRR without VGF and the lower shows the result of FIRR with VGF50% .  
Source : JICA Study Team

FIRR of this project was 0.79% in base case. In addition, in case of provided VGF which is 50% of construction cost, FIRR was 4.64%. Sensitivity analysis regarding revenue and construction cost was also conducted because there is no private company who has sufficient experience of toll road operation in Lao PDR. Even the revenue increased by 20% and the construction cost including upgrading cost decreased by 20% from base case, FIRR of the project was 5.35%. Furthermore, at the same condition,

<sup>6</sup> As for toll, it is set by reference to Vientiane-Vamgbien project.

<sup>7</sup> Originally, in the expressway business, revenue from the service area and parking area is also anticipated as additional business. However, it is not included in this financial analysis.

in case of provided VGF which is 50% of construction cost, FIRR was 11.00%. In each cases, FIRR was below FIRR hurdle rate of 11.5%. The reason for low profitability are as follows.

- For private company, traffic demand is not sufficient.
- Toll level is low.
- High cost of financing.

Net cash will be negative between 2025 and 2034 due to low toll revenue. Therefore, the deficit is compensated by equity. One of the reasons that net cash will be negative is due to the burden of high payment principal and interest. The payment principal and interest account for about 79% of the amount of cash out between 2025 and 2032.

Even in the Vientiane-Pak Xan section with the highest traffic demand, the FIRR was below the FIRR hurdle rate, and as the result of preliminary evaluation, the profitability of NR 8 route is quite low. Therefore, the FIRR in NR 8th route will be lower than that of Vientiane-Pak Xan.

### **9-3. Study of the Project Scheme**

#### **(1) Operating Structure of Expressway in Laos**

In terms of the operating structure, independent operating bodies are to be established for Vietnamese section and Lao section.

As for the Vietnamese side, several entities can be the candidate, i.e. MOT, VEC, and private companies in consideration of the current practice of expressway development and operation. However, as the financial analysis result shows, the demand and profitability of the section is low from the commercial point of view and it is unlikely that VEC and private companies will show high interest without any government support.

As for the Lao side, there is no state-owned nor private company in Laos which has an abundant experience in operating toll road. Therefore, regardless of whether the project is financed by the government or by PPP, an operating company in Laos inevitably needs support from foreign companies which have a great deal of related experience. Therefore, the following two patterns can be expected as a proponent of this project.

- SPC (Special Purpose Company) or JV consisting of Laotian company(s) and foreign company(s) experienced in toll road operation
- Laotian company with the foreign support from road operation company(s) or governmental agency(s)

In either case above, it is essential to make sure that technical transfer on toll road operation is duly implemented to, and capacity development is undertaken for the government officials and companies in Laos. Especially, considering that several studies are being carried out to examine the adoption of PPP, technology transfer and capacity development of PPP are the urgent matter for Lao PDR.

#### **(2) Profitability and funding method of this project**

The Government of Lao PDR suffers from serious government debt and it is deemed difficult to procure all necessary funds from its own budget. Therefore, it is worth considering application of PPP (Public-Private Partnerships) where the project utilized capacities of the private sector, including design, build, finance, and operate.

In fact, the Government of Lao PDR has been promoting use of PPP in recent years. However, its legal and institutional frameworks have not been established yet. It is reported that the Government of Lao PDR has been preparing a draft PPP decree with support from ADB, however, it is uncertain when it will be completed and become effective. Also, there are also strong needs of capacity building both for public officers and private company staff because, as mentioned above, they do not have sufficient capacity and experience of toll road projects.

This financial analysis is conducted as an exercise of hypothetical application of PPP. However, it should be well recognized the PPP-enabling environment of Lao PDR is still immature and there are many hurdles to be overcome before application of PPP to concrete projects including Vientiane-Pac Xan toll way.

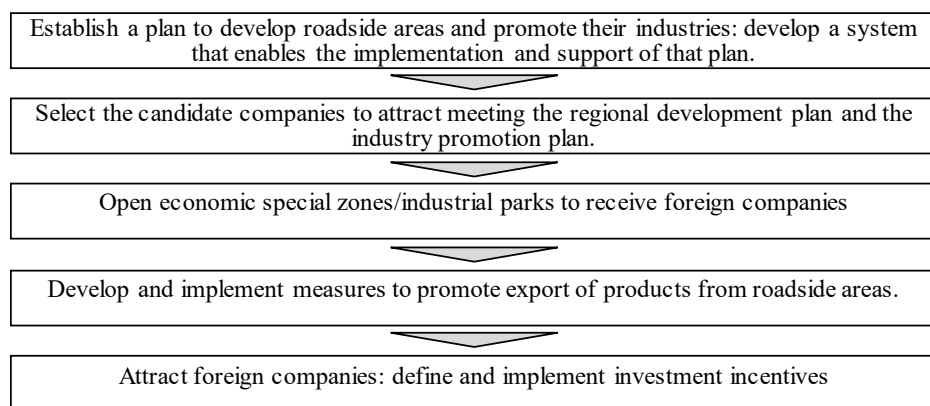
## 10. Soft Component for the Enhancement of Connectivity

### 10-1. Necessity of Enhancing Connectivity in Non-physical Aspects

To get economic benefits worth the huge amount of investment in the development of the Hanoi-Vientiane expressway, we need to, in addition to improving roads (i.e., enhancing connectivity by improving physical infrastructure): (i) promote investment and trade to bring Laos into the value chain of the GMS countries so that the expressway transports freight and passenger in a way true to its name; (ii) improve the system and operation of cross-border traffic (CIQ) across Laos and Vietnam as well as GMS/ASEAN member countries, thereby reducing time and cost necessary for physical distribution. In other words, we need to enhance connectivity in non-physical aspects, e.g., taking measures to prevent the transit time (especially customs clearance procedures) from getting longer than the time earned by the reduction of traveling time by the expressways. Shown below are measures we propose to achieve these two objectives in Laos. Since these measures are related to each other, it is essential that the relevant government agencies (relevant agencies of the central government and local governments in roadside areas) and relevant private sectors cooperate with each other to promote these measures from the very stage of detailed planning. It will be also necessary when establishing and implementing the plan, to coordinate with neighboring countries and utilize and adjust with GMS/ASEAN programs and projects.

### 10-2. Measures to Realize Freight Transport in an Amount True to the Name of Expressway

While taking measures to develop a physical infrastructure called expressways that require a huge amount of investment, we need also to ensure amount of physical distribution true to the name of an expressway and recover investment made by collecting tolls or taxes. For that purpose, we propose activating the roadside economic activities according to the procedure described in **Figure 10-1** and promote the export of products produced in roadside areas. For the Lao government, which has little experience in the promotion of full-scale investment outside of Savannakhet (attracting foreign companies), it would be best if they could determine specific measures to promote foreign investments and export of their own products while listening to requests and wishes about such measures of foreign companies considering investment into Laos. The procedure we propose is as shown below:



**Figure 10-1 Proposed Procedure for the Development of Roadside Areas**

### 10-3. Non-physical Measures to Reduce Time and Cost for Physical Distribution

To fully gain the benefits of the newly built expressway, to reduce Laos' physical distribution cost higher than neighboring countries, to support the development of Lao industries, to take advantage of its location at the center of the GMS countries, it is vital for Laos to implement the following non-structural measures and reduce time and cost for physical distribution:

- 1) Promote and improve the digitization of customs clearance/quarantine procedures
- 2) Realize a single window system for customs clearance/quarantine procedures; extend the single stop inspection system;
- 3) Improve existing agreements on cross-border traffic
- 4) Enhance cross-border facilities and increase the number of customs employees
- 5) Educate and train customs employees
- 6) Raise Lao distributors, attract foreign distributors, and build a network of foreign and Lao distributors



## **11. Conclusion and Future Challenges**

### **11-1. Conclusion**

- 1) As for the Hanoi-Vientiane expressway, considering the evaluation results of alternative routes including Pre-F/S route, Alternative 2 (route parallel to NR8) is proposed as the most desirable route. Although Pre-F/S route has the lower cost and a larger expected demand when looking at Vietnam side alone, Alternative 2 is regarded as the most appropriate from the perspective of Hanoi-Vientiane expressway as a whole.
- 2) The section with highest priority is the one between Vientiane- Vieng Kham, which is desirable to be developed by 2025 given the demand forecast. Next comes Vieng Kham – Laksao section (Laos), HCM road- NSE section (Vietnam), and then Laksao-HCM road at last. In case a bottleneck is caused in the border control facility due to the traffic increase, the early development of these area together with the improvement of custom facilities should be studied.
- 3) As for the traffic lanes, 4-lane development for all sections can deal with the demand in the initial phase. However, the section between Vientiane – Pac Xan should be improved to 6-lane by 2035.
- 4) The project cost for all 400km expressway is approx. 3,798 million USD. It is currently difficult to implement this large investment project as a public project. Therefore, as one of options to solve the issue, it is significant to consider using private funds (or PPP).
- 5) The EIRR, Economic Internal Rate of Return (EIRR), of the NR 8 route is estimated at 12.4%, and it justifies the necessity of the project. However, NR 8 route will not stand on a commercial basis because its profitability is quite low. Even in the section with the highest traffic demand, i.e. Vientiane-Pac Xan section, the FIRR is estimated as 0.79% and it is not enough to attract private investment. Moreover, PPP-enabling environment of Lao PDR is yet to be developed and capacities of government officers as well as private companies regarding toll road operation are still immature. These evaluation results indicate that it is realistic to develop the road on a non-commercial basis, using state budgets.

### **11-2. Future Challenges**

- 1) The Pre-F/S route has been agreed upon for Hanoi-Vientiane expressway by both the Laotian and the Vietnamese governments in November 2016. According to the MOT's revision of expressway masterplan of Vietnam, it is listed as a road section expecting an investment by the year 2030. However, this study evaluated route plans throughout whole length including both Laos and Vietnam and proposes the route parallel to NR 8 (NR 8 route) as the optimum plan. Meanwhile, the ultimate decision shall be made by discussion between the two governments, and in doing so, it is desirable to consider the project cost and the economic ripple effect on the region, etc., along with strengthening of logistics functions required for the Hanoi-Vientiane expressway.
- 2) As this is a Pre-F/S level survey, it is necessary to examine the feasibility of the project in detail by conducting a more precise survey as a next step. Specifically, the following areas need to be studied closely.
  - Traffic demand forecast
  - Geodesic alignment plan and re-examination of project cost
  - Formulation of regional development plan integrating expressway development
  - Project scheme and method of fund securement
- 3) The possible impacts on regional development from expressway development and on traffic demand from railway plans are already examined in this study report. In the next step, it is necessary to look into factors such as induced traffic of wider areas, modal shift from sea transportation and conversion rate from ordinary road to expressway.

- 4) In this study, design of road alignment and estimation of project cost are conducted roughly for the purpose of route evaluation. To estimate project cost more accurately, it is necessary to elaborate the dimension and quantity of structures and in doing so, there is a need to examine geodesic alignment and estimate project cost based on detailed geographic survey. In addition, there are some transport plans such as expressway plans, railway plans and bridge plans related to this project. The coordination with these projects will be necessary in terms of competition, connection and project schedule. In particular, the route alignment of the Vientiane-Pakse expressway and this project are overlapping in the section between Pac Xan and Vieng Kham. The F/S of that section will be implemented by the awarded Chinese company, but in order to ensure connectivity and continuity with this expressway, it is important to unify the design standards and the fee system. Thus, it is desirable that a clear policy on how to connect them and on cost sharing would be presented.
- 5) Expressway development is expected to promote regional development. To make this Hanoi-Vientiane expressway a trigger for regional development, it is essential to consider formulation of regional development plan integrating the expressway development together with the strategies to promote it.
- 6) As the result of this financial analysis, it is difficult to implement the project in the entire section as well as Vientiane-Pac Xan section on a commercial basis. And it is not also practical to construct the entire section as a public project by the government fund. It is required to make it clear its demarcation on the role of public and private sectors by section as well as to analyze traffic characteristics and applicable fare structure, and possibility to assist by Laos and Vietnamese governments. Furthermore, PPP legal system has not yet been developed in Lao PDR, nor has the capacity of both government officers and private companies regarding PPP projects and toll road operation. Therefore, it is necessary to develop PPP legal system in Lao PDR, and improve the knowledge and skills of government officers and private companies regarding PPP projects and toll road operation through capacity building.
- 7) Regarding Thanh Thuy, the Vietnamese side already has development plans for border facilities and access roads, and the development has started to advance gradually. Regarding to Laos side (Vienthong to Thanh Thuy), although development of an ordinary road started in 2009, the construction has been stopped due to budget shortage. Since this section passes through areas with low road maintenance levels in Laos, it is desirable that an ordinary road, not expressway, to be developed to secure access to roadside areas. When this is done, the planned border facilities in Thanh Thuy and access roads will be effectively used. The possibility of connecting Thanh Thuy and Laksao by expressway has also been discussed, but it has to additionally pass through more than 50 km of mountainous areas in Laos. Thus, the increase in the project cost would be significant, and the validity of the development would be low.

# **Chapter 1**

## **Outline of the Survey**

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## Chapter 1 Outline of the Survey

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### 1.1 Background and Objective of the Survey

#### 1.1.1 Background

##### (1) Laos and Vietnam in the Mekong region

The development of logistics infrastructure focusing on expressway has been progressing in the Mekong region, which is composed of the Lao People's Democratic Republic (hereinafter referred to as "Laos"), the Socialist Republic of Vietnam (hereinafter referred to as "Vietnam"), the Kingdom of Thailand (hereinafter referred to as "Thailand"), the Kingdom of Cambodia (hereinafter referred to as "Cambodia") and the Republic of the Union of Myanmar (hereinafter referred to as "Myanmar"). In terms of level of development, the Mekong countries may roughly be divided into two groups: the first group including Thailand and Vietnam, which have made significant progress in industrialization, and the second group including Cambodia, Laos and Myanmar, which relatively lag behind in terms of industrial development. In particular, Laos has the smallest GDP and trade value among all the Mekong countries. They respectively account for only 3% and less than 2% of those of Thailand, which has the largest GDP and trade value (see Table 1.1.1).

**Table 1.1.1 Economic Outline of the Mekong Region (2015)**

County	Area (1,000 km <sup>2</sup> )	Population (Million people)	GDP (Billion USD)	GDP per capita (USD)	Trade (Million USD)
Cambodia	181	15.41	18.5	1,199	25.6
Lao	237	6.90	12.6	1,831	8.1
Myanmar	677	52.48	65.4	1,246	34.8
Thailand	513	68.98	395.7	5,737	529.2
Vietnam	331	91.71	193.4	2,109	355.4
Mekong Region (Total)	1,938	235.48	685.6	2,911	953.1

Note: "Trade" shows the sum of exports and imports.

Source: ASEAN Secretariat Statistics

##### (2) Cause of delay in development in Laos and others countries

There are several reasons why Laos, Cambodia and Myanmar have not developed as much as Thailand and Vietnam have. The reasons cited in the previous survey research include (1) delay in development of domestic infrastructure due to internal conflicts continued for a long time, (2) adoption of socialist economic system in the past and delay in the introduction of market economy and free trade, and (3) the presence of the Mekong River, many mountains and valleys that characterize the geographical features of the Mekong region, which makes the development of logistics networks challenging.

However, the recent rise in labor cost in Thailand and Vietnam has promoted the decentralization of production bases on the Indochinese Peninsula and has resulted in an increase in the amount of trade in Laos, Myanmar and Cambodia.

In addition, the establishment of the ASEAN Economic Community (AEC) in 2015 has facilitated the movement of people, goods and money in the region through the elimination of tariffs and promotion of active trade. Through these measures, further economic growth and development in these regions are expected and foreign companies including Japanese companies are becoming more interested in investing the Mekong region.

### **(3) Issues to be solved**

One of the challenges for enterprises willing to invest in the region is the inadequacy of logistics infrastructure, inefficient customs clearance, immigration control and quarantine (CIQ) and the resulting high logistics cost. At present, economic activities in the region are not big enough to generate a freight volume high enough to raise the loading rate of trucks, and thus logistics cost cannot be lowered. Particularly, a poor connectivity between Hanoi and Vientiane is a severe problem for the entire region. Although cargo and passenger transport between Hanoi and Vientiane, mainly through Laos National Road No. 8 (NR 8), is used as a major logistics route from Laos and Thailand to northern Middle Vietnam, improvement of existing roads and smoother custom clearance procedures, etc. seem to be necessary.

Under these circumstances, the Pre-Feasibility Study on the Hanoi-Vientiane expressway project started in the beginning of 2016 under the agreement between the governments of Laos and Vietnam. Furthermore, when the Vietnam Communist Party General Secretary visited Laos in November of the same year, the two governments signed a memorandum of understanding on the same expressway. Then, they requested the assistance of the Japanese government at the Vietnam-Laos summit meeting held in June of 2017.

#### **1.1.2 Objective of Study**

The objective of this study is to collect and analyze information necessary for examining challenges, policies and measures, both hard and soft, for the enhancement of connectivity between Hanoi and Vientiane and to propose the following plans:

- ① Road development plan consisting of a construction of new expressway and/or improvement of existing roads between Hanoi and Vientiane
- ② Regional transportation plan and soft measures for enhancing connectivity between Hanoi and Vientiane

#### **1.1.3 Target Areas**

The following areas in Laos and Vietnam, which are related to enhancing connectivity between Hanoi and Vientiane (see the Target Areas Location Map on the first page), are targeted:

- ① Areas planned as the Hanoi - Vientiane Expressway Project in the Pre-F/S
- ② Road sections parallel to the planned expressway route in the Pre-F/S (Laos National Road No. 8, Vietnam National Road No. 8, etc.)
- ③ Vietnamese ports (Vung Ang Port, Gyeong Port, and Cua Lo Port)

Furthermore, the study, when needs arise, collects information on Thailand (border facilities, Bangkok - Bung Khan road, the 5th Laos Thailand Mekong friendship bridge construction plan, related organizations in Bangkok etc.).

### **1.2 Contents of the Study**

The work flow of the study is shown in Figure 1.2.1, and outlines of each study content are described below.

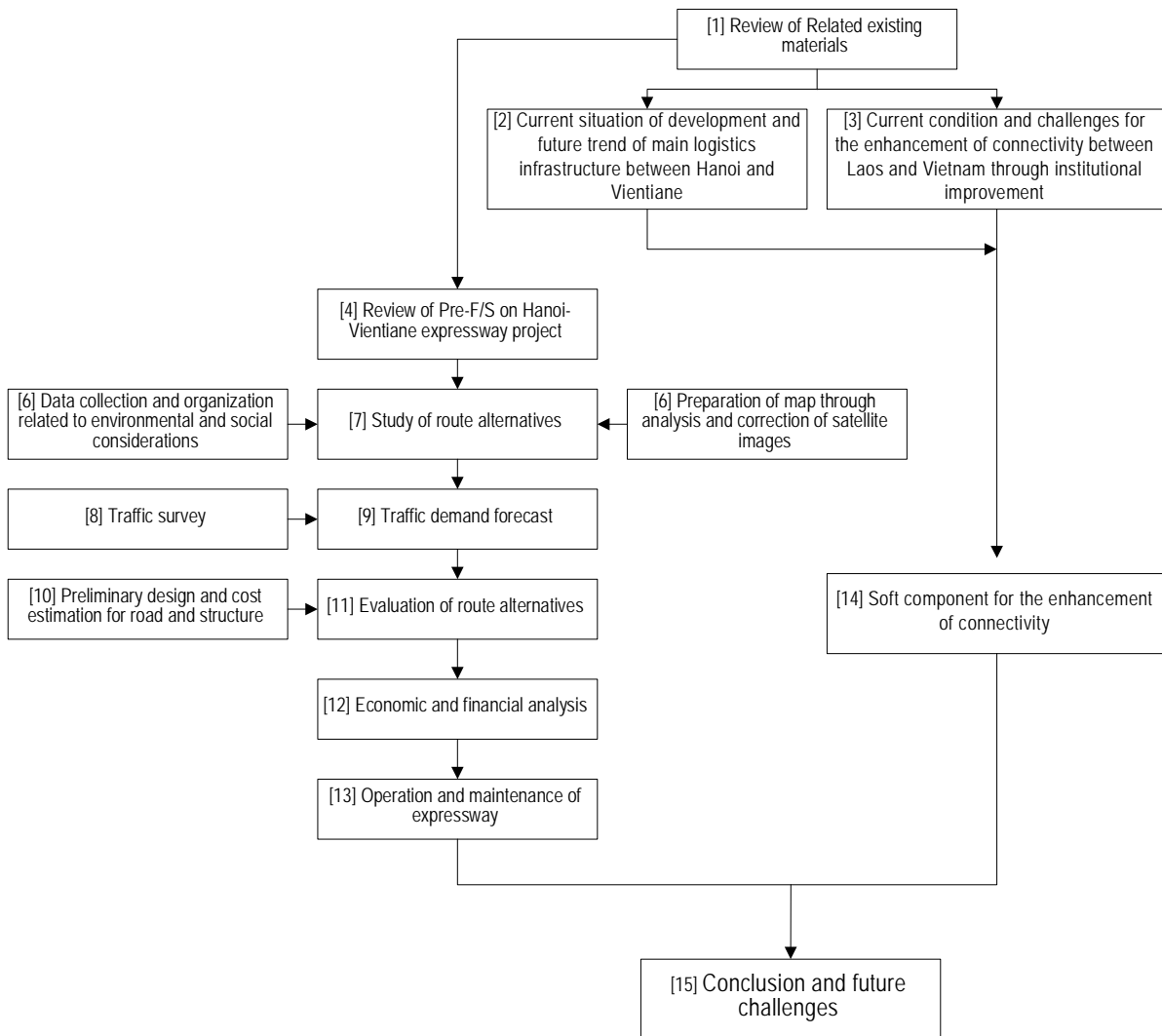
#### **(1) Review of related existing documents**

Various survey reports related to the target area (e.g. the Pre-F/S of Hanoi-Vientiane expressway, related study of Laos NR 8, Route 12, Route 9, logistics survey of the Mekong region, etc.) are collected, and their relationship with this study are organized.

#### **(2) Current situation of development and future trend of main logistics infrastructure between Hanoi and Vientiane**

Current status of development and future plans of logistics infrastructure between Hanoi and Vientiane, including regional roads, railways, ports, airports in the GMS corridor and Asian Highway

network and ASEAN Highway network, are organized in order to create an outline map of the Mekong region. In addition, information on key priority policies of both Laos and Vietnamese governments on strengthening the connectivity between Vientiane and Hanoi and on the existing traffic plan and condition is collected through the review of existing materials and interviews with concerned agencies. Based on this information, infrastructure outline map showing the main logistics consisting of roads, railroads, ports and airports, etc. is created. In addition, information on present conditions and future plans of major Vietnamese ports<sup>1</sup> to be accessed from Laos is gathered by interviewing relevant persons and by reviewing existing materials. Based on this, roles, potentials and issues of each port are summarized.



**Figure 1.2.1 Entire Workflow**

<sup>1</sup> Target ports are Vung Ang Port, Gyeong Port, and Cua Lo Port

### **(3) Current condition and challenges for enhancing connectivity between Laos and Vietnam through institutional improvement**

A study on the border area of the Hanoi-Vientiane expressway route agreed in the Pre-F/S (Thanh Thuy border gate in Nghe An Province of Vietnam, Nam On border gate in Bolikhamsai Province of Laos) is conducted focusing on the following three areas: ① implementation and operational condition of single window and single stop service, ② establishment and operational condition of electronic customs clearance system, and ③ human resource and personnel distribution for CIQ. The study is implemented in the form of field survey and interview with related government agencies, namely, Laos's Ministry of Public Works and Transport (MPWT) and the Ministry of Finance (MOF), and Vietnam's Ministry of Transport (MOT) and the Ministry of Finance (MOF).

Based on the results of existing studies conducted by JICA and other agencies, the following routes are examined<sup>2</sup>:

- ① Vientiane - Laos NR 8 - Nam Phao border gate - Cau Treo border gate - Vinh - Hanoi
- ② Bangkok - Nakhon Phanom border gate - Takhek border gate - Laos NR 12 - Naphao border gate - Cha Lo border gate - Vinh - Hanoi
- ③ Mekong Region East - West Economic Corridor (Myanmar Yangon - Laos NR 9 - Da Nang Port).

Furthermore, a survey on the current status and future prospects of infrastructure development is carried out, focusing on the fields such as incentives for investment in transportation infrastructure, industrial parks, logistic parks for promoting trade and investment among Thailand, Vietnam and Laos.

At the same time, additional surveys are conducted through interviews with relevant agencies (logistics suppliers and shipping companies) in Japan, Laos, Thailand and Vietnam to find out bottlenecks or opinions of logistics companies engaged in trade activities involving Laos, Thailand and Vietnam.

### **(4) Review of Pre-F/S on Hanoi – Vientiane expressway project**

The Pre-F/S on Hanoi–Vientiane expressway that has been carried out by the Vietnamese government is reviewed to clarify the items to be referred to in this survey and items to be reviewed.

### **(5) Data collection and organization related to environmental and social considerations**

This study does not require implementation of SEA. However, considering the contents of SEA or EIA that may be carried out in the future, the environmental impact assessment items that should be taken into consideration in the planned location and the contents and implementation method of the field survey are reviewed. In addition, the baseline information of the planned location are collected by re-entrustment and summarized.

### **(6) Preparation of map through analysis and correction of satellite images**

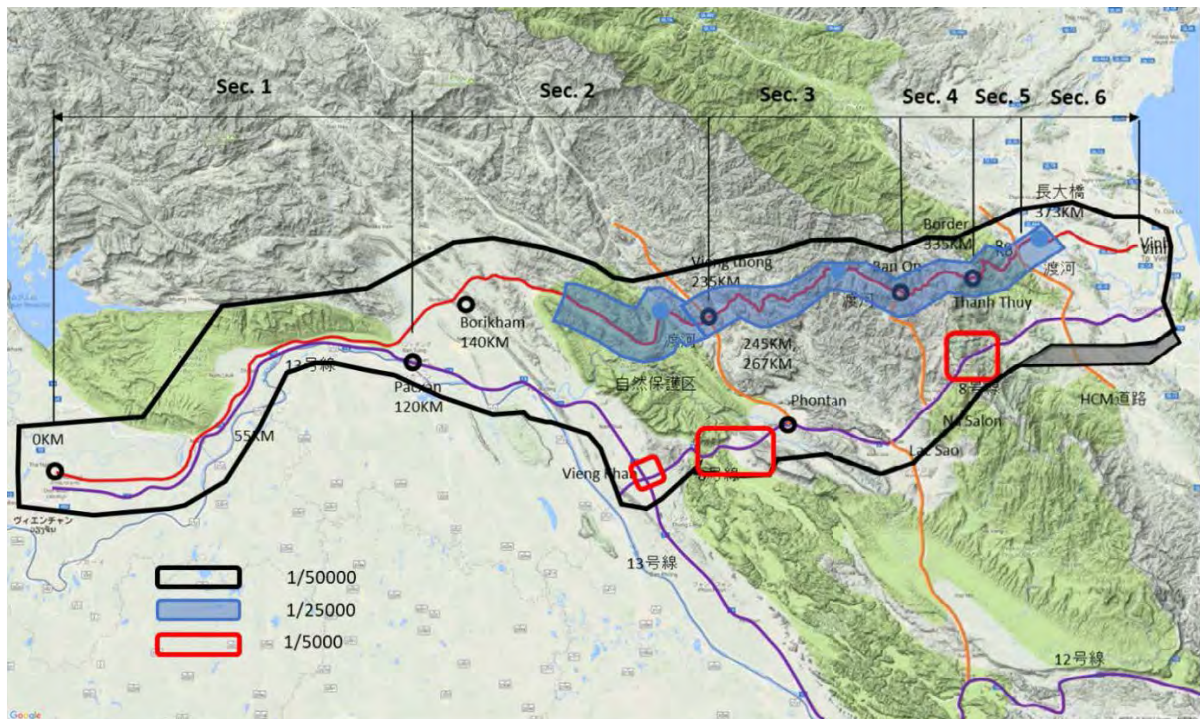
A digital topographic map is created based on satellite image to examine the proposed route of Hanoi - Vientiane expressway and access from existing roads and for other development purposes. Table 1.2.1 and Figure 1.2.2 show usage, information level, drawing range of the topographic map.

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<sup>2</sup> Additional survey will be conducted if necessary

**Table 1.2.1 Summary of Topographic Map Preparation**

Contents	Review of the entire Route	Review of Access Road	Sections requiring detailed inspection
Propose	The entire route of the planned expressway will be inspected.	Inspection of the access road from the previous road leading to the planned expressway route	Detouring by steep terrain • Elevation and tunnels, Structural considerations such as bridging by river
Area	About 13,530km <sup>2</sup>	About 1,600km <sup>2</sup>	About 320km <sup>2</sup>
Satellite	SPOT6&7 Archive/Single Image	SPOT6&7 Archive/Single Image	WorldView2/3, GeoEye Archive/Single Image
Geometric Resolution	1.5m	1.5m	50-60cm
Format	Ortho image + contour line	Digital topographic map	Digital topographic map
Scale	1/50,000	1/25,000	1/5,000
Contour line (created from DSM)	20m	10m	5m



**Figure 1.2.2 Topographic Mapping Range**

**(7) Study of route alternatives**

Based on the baseline survey results of field surveys and environmental and social considerations, the route examined in the Pre-F/S is reviewed. Although the route set in the Pre-F/S connects Hanoi with Vientiane through the shortest distance, more than 60% of route section in Laos is in a mountainous terrain, and roadside regional development is hardly expected. Therefore, alternative route plans, considering regional development along the expressway, connection with other road networks and environmental impacts, etc., are proposed.

**(8) Traffic survey**

Traffic volume survey and roadside interviews are conducted on NR 8, which runs parallel to the proposed Hanoi-Vientiane expressway, NR 13 and general roads connected to NR8.



**Table 1.2.2 Roadside Interview Survey List**

1. General	Age, Gender, Income
2. Trip info	Purpose, Place of departure, destination, transportation method, fee, required time
3. Cargo info	Cargo item, cargo weight, cargo packing, customs clearance location, loading / unloading location
4. Rate Resistance	Preference (a combination of choices of road usage fee and the travel time)

**(9) Traffic demand forecast**

Future traffic volume necessary to formulate road development plan is estimated by conducting traffic demand forecast.

**(10) Preliminary design and cost estimation for road and structure**

A preliminary design and estimation of project cost for the road and structure considered in (7) are carried out. They are done by utilizing maps created through the analysis and correction of satellite images, or the baseline survey results on field survey and environmental and social considerations. Table 1.2.3 shows working policy of the design and cost estimation.

**Table 1.2.3 Design and Cost Estimation Policy in this Study**

Item	Pre-F/S Corridor	NR 8 Corridor
Typical Cross Section	Prepared	Prepared
Study of Overall Route	Pre-F/S route is adopted	Route is outlined in a 1/50,000 scale by paper-based examination
Study of Detailed Route	Route in mountainous area is examined in a 1/25,000 scale by CAD	Three routes in mountainous area are examined in a 1/5,000 scale by CAD
Project Cost Estimation	Update of unit price, approximate estimation of project cost	Update of unit price, approximate estimation of project cost

**(11) Evaluation of route alternatives**

The alternative routes set in (7) are evaluated. Evaluation indicators include construction cost, service level (travel time between Hanoi and Vientiane), traffic volume, contribution to regional development along the expressway, environmental and social considerations, ease of construction (i.e. phased construction, funding) for the comparison. Furthermore, based on the selected optimum plan, short-term, medium-term and long-term development phases are drafted.

**(12) Economic and financial analysis**

Economic and financial analyses are conducted for the whole route and prioritized section of the selected route. And the financing challenges will be clarified by analyzing the financial conditions and financing policies of Laos and Vietnam, along with the operation scheme which is based on the expected traffic volume and project cost.

**(13) Operation and maintenance of the expressway**

Laws and regulations regarding operation and maintenance method in both Laos and Vietnam are summarized. Based on this, the most suitable method for this project is proposed.

**(14) Soft component for the enhancement of connectivity**

Based on the present condition and challenges in the enhancement of connectivity between Laos and Vietnam as identified in the item (3), the following measures are proposed:

- ① measures to strengthen connectivity through institutional improvement concerning smooth cross-border transportation on Hanoi-Vientiane expressway
- ② measures to promote trade, investment and distribution including Thailand.

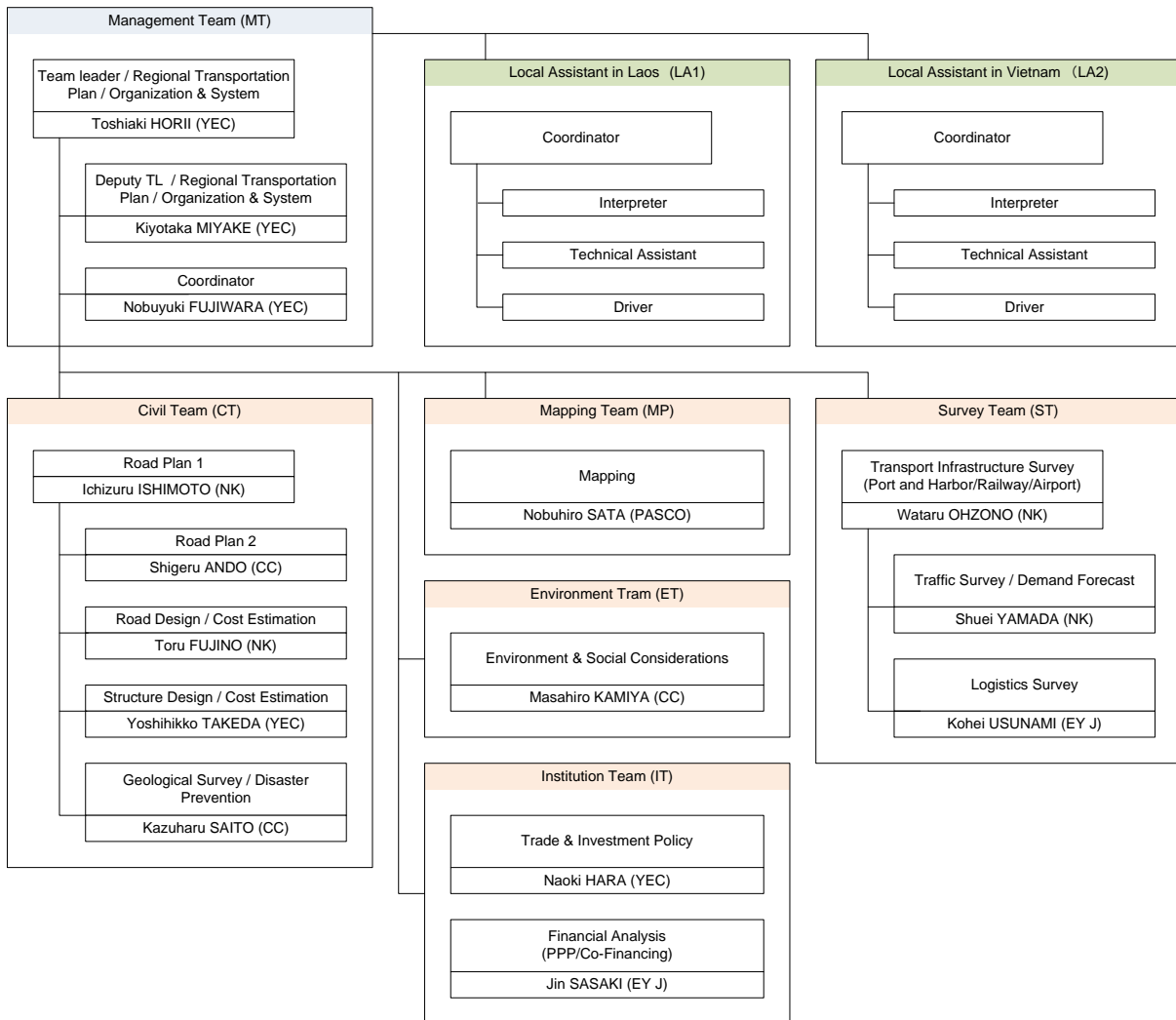
**(15) Conclusion and future challenges**

Considering all the points mentioned above, overall conclusions and future challenges in the enhancement of connectivity between Hanoi and Vientiane are outlined.

**1.3 Structure of Study Team**

The team conducting this study consists of six subgroups: a management team, a civil engineering team, a survey team, a mapping team, an environmental team, and an organization/system team. Each subgroup carries out its work while complementing others. Local staff also supports the Japanese expert team in Vietnam and Laos, respectively.

The structure of the study team is shown in Figure 1.3.1.



**Figure 1.3.1 Structure of Study Team**



**Chapter 2**  
**Data Collection and Analysis of**  
**Logistics Sector for the Enhancement of**  
**Connectivity between Laos and Vietnam**

## Chapter 2 Data Collection and Analysis of Logistics Sector for the Enhancement of Connectivity between Laos and Vietnam

### 2.1 Current Development Situation and Future Trend of Main Logistics Infrastructure in the Indochina Peninsula

#### 2.1.1 The Mekong Economic Corridor

Development of the Mekong economic corridor has been performed as one of the flagship projects of the Greater Mekong Subregion (GMS) economic cooperation program implemented by six countries, Lao People’s Democratic Republic (Lao PDR), Vietnam, Cambodia, Myanmar, Thailand, and the People’s Republic of China (PRC, specifically Yunnan Province and Guangxi Zhuang Autonomous Region), under the Asian Development Bank (ADB)’s initiative. Three corridors such as East-West economic corridor, North-South economic corridor, and Southern economic corridor are designated as priority development corridors, and a project for rehabilitation/widening of the existing main arterial roads, which include a network of the corridors, and international bridges has been carried out under the assistance of the ADB and other donors.

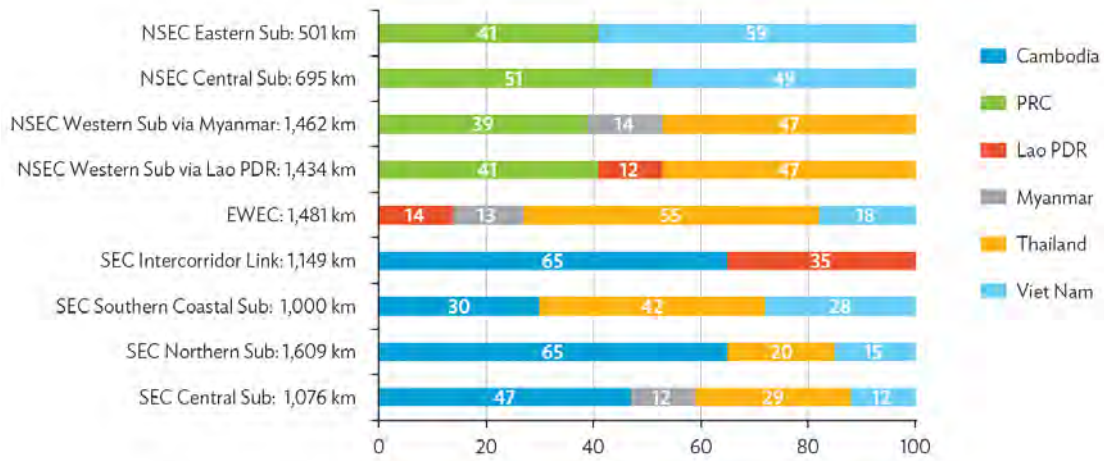
As of now, the three corridors are formed from seven sub corridors<sup>1</sup> after the adoption of “Strategies and Action Plans (2009-2010)” and additional designation of Bangkok-Dawei route as one part of Southern economic corridor. Its total length run to approximately 9,000 km. Table 2.1.1 shows the list of economic corridors with their basic information. However, the Lao PDR and Myanmar have not considered these designated routes properly in their plans, and neighboring countries paid different level of attention”. The Figure 2.1.1 shows intercountry distribution of GMS economic corridors, and Figure 2.1.2 shows current network of GMS economic corridors.

**Table 2.1.1 Each Route and Corridor Length of GMS Economic Corridors**

Economic Corridor	Route	Length
<b>North-South Economic Corridor</b>		
Western Subcorridor	Kunming-Chiang Rai-Bangkok via the Lao PDR or Myanmar	1,462 km (via Myanmar) 1,434 km (via Lao PDR)
Central Subcorridor	Kunming-Ha Noi-Hai Phong	695 km
Eastern Subcorridor	Nanning-Ha Noi via Dong Dang (or via Fangcheng and Mon Cai)	501 km
East-West Economic Corridor	Yangon (Thilawa)-Da Nang	1,481 km
<b>Southern Economic Corridor</b>		
Central Subcorridor	Dawei-Bangkok-Phnom Penh-Ho Chi Minh City-Vung Tau	1,076 km
Nothern Subcorridor	Bangkok-Siem Reap-Stung Treng-Pleiku-Quy Nhon	1,609 km
Southern Coastal Subcorridor	Bangkok-Trat-Kampot-Ha Tien-Nam Can	1,000 km
Intercorridor Link	Sihanoukville-Phnom Penh-Stung Treng-Pakse-Savannakhet	1,149 km

Source: Review of Configuration of the Greater Mekong Subregion Economic Corridors (ADB, Feb 2018)

<sup>1</sup> In 2007, nine corridors have been designated including three economic corridors on “GMS Transport Sector Strategy, 2006-2015 (ADB)”. These nine corridors forms almost same network with seven sub corridors network, though some parts are different. As of March 2018, “Transport Sector Strategy, 2018-2030” was in the process of preparation.



Source: Review of Configuration of the Greater Mekong Subregion Economic Corridors (ADB, Feb 2018)

**Figure 2.1.1 Intercountry Distribution of the GMS Economic Corridors (%)**



Source: Review of Configuration of the Greater Mekong Subregion Economic Corridors (ADB, Feb 2018)

**Figure 2.1.2 Current GMS Economic Corridors**

Based on the existing documents and information, the current situation of three economic corridors (North-South, East-West, and Southern) is summarized as follows:

- North-South Economic Corridor: This is an international corridor consisting of the routes from Kunming (Yunnan Province) to Chiang Rai and Bangkok via Lao PDR/Myanmar, and from Kunming to Hai Phone (Vietnam) via Hanoi, from Nanning (Guangxi Zhuang Autonomous Region) to Hanoi (Vietnam) Via Dong Dang or Mong Cai. In December 2013, it became possible to travel continuously from Yunnan Province (Kunming) to Thailand (Bangkok) by the opening of the 4th Thai-Laos Friendship Bridge, which was constructed with the financial assistance of China and Thailand.
- East-West Economic Corridor: This is an international route connecting Danang port (Vietnam) and Mawlamyaing (Myanmar) via Savannakhet (Lao PDR) and Mukdahan (Thailand). In December 2006, the route connecting Vietnam (Danang), Lao PDR, and Thailand was opened by completion of the 2nd Thai-Lao Friendship Bridge, which was constructed with the financial assistance of the government of Japan.
- Southern Economic Corridor: This is an international corridor consisting of several routes; (1) from Vung Tau (Vietnam) - Ho Chi Minh - Phnom Penh (Cambodia) - Bangkok - Dawei (Myanmar), (2) Bangkok - Siem Reap - Quy Nhon (Vietnam), (3) Bangkok - Sihanoukville - Nam Can, (4) Sihanoukville - Phnom Penh - Pakxe - Savannakhet.
- In April 2015, Tsubasa (Neak Loeng) Bridge over the Mekong River was opened, and it connected Vietnam (Ho Chi Minh), Cambodia, and Thailand (Bangkok). South Coastal Corridor is regarded as a sub-corridor.

In addition to the above, additional routes were proposed and adopted at the 21st GMS ministerial conference in 2016. The additional routes were as follows:

- Extension of East-West economic corridor from Mawlamyaing or Myawaddy to Yangon (Thilawa) or Patheingyi,
- Additional specified route of North-South economic corridor between China and Myanmar (from Kunming - Mandalay - Nay Pyi Daw - Yangon, or Mandalay - Monywa or Shwebo - Tamu),
- Additional specified route of North-South economic corridor and Southern economic corridor between Lao PDR and Thailand (Boten - Luang Prabang - Vientiane - Nakhon Ratchasima - Leam Chabang),
- Addition to the North-South economic corridor between Bangkok and Hanoi (Bangkok - Udon Thani - Thakhek - Vung Ang - Vinh - Hanoi),
- Addition to the North-South economic corridor between Hanoi and Vientiane (Vientiane - Pac Xan - Nam Phao - Vinh or Vung Ang)

Current GMS economic corridor network including the added and proposed routes is shown in Figure 2.1.3.



Source: Review of Configuration of the Greater Mekong Subregion Economic Corridors (ADB, Feb 2018)

**Figure 2.1.3 New GMS Economic Corridor (Yellow line route: added/proposed routes)**

The development status as of 2015 is shown in Table 2.1.2.



**Table 2.1.2 Current Development Status: E-W, N-S, South Economic Corridor Action Plan**

Focal Sectors	No. of Projects or Measures	Completed	Ongoing	Pending*	Completed and Ongoing/No. of Projects (%)
<b>East-West Economic Corridor</b>					
Infrastructure of which:	10	5	4	1	90.0
– Roads	6	3	3	0	100.0
Trade and investment	11	6	2	3	72.7
Tourism	4	4	0	0	100.0
Agriculture and agro-industry	3	1	0	2	33.3
Social development	5	3	2	0	100.0
Environment	3	1	2	0	100.0
<b>Total</b>	<b>36</b>	<b>20</b>	<b>10</b>	<b>6</b>	<b>83.3</b>
<b>North-South Economic Corridor</b>					
Environment	6	4	2	0	100.0
Health	5	4	1	0	100.0
Infrastructure of which:	29	18	1	10	65.5
– Roads	16	13	0	3	81.2
– Rail	8	2	0	6	25.0
Transport and trade facilitation	6	0**	3	3	50.0
Investment promotion/facilitation	19	9	6	4	78.9
of which:					
– Logistics	6	1	3	2	66.7
– Tourism	9	5	3	1	88.9
– Manufacturing	2	8	1	1	50.0
Capacity building and institutional development	10	0**	6	4	60.0
<b>Total</b>	<b>75</b>	<b>35</b>	<b>19</b>	<b>21</b>	<b>72.0</b>
<b>Southern Economic Corridor</b>					
Infrastructure of which:	22	11	1	10	54.5
– Roads	7	4	1	2	71.4
– Rail	2	1	0	1	50.0
– Power	6	2	0	4	33.3
Transport and trade facilitation	8	0**	6	2	75.0
Investment promotion/facilitation of which:	27	8	13	6	77.8
– Logistics	4	1	3	0	100.0
– Tourism	9	2	4	3	66.7
– Agriculture	3	1	1	1	66.7
Health, skills development and migration	12	6	3	3	75.0
Environment	5	2	3	0	100.0
Private sector participation	7	0**	6	1	–
<b>Total</b>	<b>81</b>	<b>27</b>	<b>32</b>	<b>22</b>	<b>72.8</b>

\* Includes projects/measures included in the RIF Implementation Plan (2014-2018) and those on which updated information is needed.

\*\* Some activities have been completed, but overall efforts are continuing. Individual projects not specified in the Action Plans (e.g., name of RETAs).

Source: Revisiting the GMS Economic Corridor Strategies and Action Plan (ADB, 2015)

## 2.1.2 Infrastructure Development Status of Target Area

Target areas of this survey are Lao PDR and Vietnam, but infrastructure development status of both countries is described in Section 2.2. Section 2.1.2 and 2.1.3, however, discuss the situation in the GMS.

### (1) Road

#### 1) Asian highway

Asian Highway<sup>2</sup>, which was adopted at the general assembly meeting of Economic Commission for Asia and the Far East (ECAFE) in 1959, consists of the road network linking Asia and Europe with the objectives of contributing to the economic and social development between regions and cultivating trade and tourism industries. Total length of this road network, which is crisscrossing 32 Asian countries, is approximately 141,000 km, and it utilizes existing roads mainly. In the GMS region, the specified routes are AH-1, 2, 3, 11, 12, 13, 14, 15, 16, 18, 19.

According to the database of United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), the current total length is approximately 143,000 km, and GMS countries cover approximately 20,000 km of them as shown in Table 2.1.3. Cambodia, Lao PDR, and Myanmar account for over half of the roads under CLASS III, which are not in a good condition compared with other GMS countries. “ASIAN HIGHWAY HANDBOOK (2003, United Nations)” defines the CLASS as shown in Table 2.1.4. The Asian Highway network in GMS region is shown in Figure 2.1.4.

**Table 2.1.3 Total Length of Asian Highway in GMS Countries (As of Sep. 2017)**

Country	Primary	Class I	Class-II	Class III	Below Class III	Total	Status (Year)
	km	km	km	km	km	km	
Cambodia	0.00	0.00	633.00	1321.00	0.00	1954.00	2017
China *	1728.05	51.16	394.61	0.00	4.49	2178.32	2015
Laos	0.00	0.00	244.00	2307.00	306.00	2857.00	2010
Myanmar	0.00	320.26	574.74	1702.08	1927.91	4524.99	2015
Thailand	572.25	4075.32	848.44	26.52	0.00	5522.53	2017
Viet Nam	0.00	1201.74	1914.82	0.00	0.00	3116.56	2017
Total	2,300.30	5,648.48	4,609.60	5,356.60	2,238.40	20,153.39	
Percentage	11.41%	28.03%	22.87%	26.58%	11.11%	100.00%	

\*: Yunnan and Guangxi Zhuang Autonomous Region. This data does not include potential Asian Highway routes.

Source: JICA Study Team prepared based on the UNESCAP Web site

(<http://www.unescap.org/resources/status-asian-highway-member-countries>, <http://www.unescap.org/our-work/transport/asian-highway/database>)

<sup>2</sup> The GMS Economic Corridor is infrastructure development/improvement project related to the main road, cross border system, etc. which is striding GMS countries (Thailand, Cambodia, Lao PDR, Vietnam, Myanmar, and China (Yunnan Province and Guangxi Zhuang Autonomous Region)) based on the Economic Development Cooperation Program which aimed to promote the economic development and growth of the Mekong basin. Asian Highway was planned for aiming modern Silk Road, and it is designated throughout the Asian region. The objectives are to connect Asian countries by the trunk road network organically, to promote economic/cultural exchange, friendship, and goodwill, and to facilitate peaceful development throughout the Asian countries.

**Table 2.1.4 Asian Highway Design Standard**

Highway classification	Primary (4 or more lanes)				Class I (4 or more lanes)				Class II (2 lanes)				Class III (2 lanes)							
Terrain classification	L	R	M	S	L	R	M	S	L	R	M	S	L	R	M	S				
Design speed (km/h)	120	100	80	60	100	80	50		80	60	50	40	60	50	40	30				
Width (m)	Right of way				(50)				(40)				(40)				(30)			
	Lane				3.50				3.50				3.50				3.00 (3.25)			
	Shoulder		3.00		2.50		3.00		2.50		2.50		2.00		1.50 (2.00)		0.75 (1.50)			
	Median strip		4.00		3.00		3.00		2.50		N/A		N/A		N/A		N/A			
Min. radii of horizontal curve (m)	520	350	210	115	350	210	80		210	115	80	50	115	80	50	30				
Pavement slope (%)	2				2				2				2 - 5							
Shoulder slope (%)	3 - 6				3 - 6				3 - 6				3 - 6							
Type of pavement	Asphalt/cement concrete				Asphalt/cement concrete				Asphalt/cement concrete				Dbl. bituminous treatment							
Max. superelevation	10				10				10				10							
Max. vertical grade (%)	4	5	6	7	4	5	6	7	4	5	6	7	4	5	6	7				
Structure loading (minimum)	HS20-44				HS20-44				HS20-44				HS20-44							

Source: ASAIAN HIGHWAY HANDBOOK (2003, United Nations)



Source: UNESCAP (<http://www.unescap.org/resources/asian-highway-route-map>)

**Figure 2.1.4 Asian Highway Network in GMS region (As of November, 2016)**

## 2) ASEAN highway

Based on the Ministerial Memorandum (Ministerial Understanding on the Development of the ASEAN Highway Network Project) on the implementation of the ASEAN Highway Network Project approved in September 1999, the ASEAN Highway is a road network of approximately 38,400 km and 23 routes as shown in the figure below. It is a network that complements the Asia Highway within the ASEAN region, and it shall be upgraded to CLASS I or CLASS II roads based on ASEAN standard by 2020. Fifteen of the 23 routes are in the GMS area.



Source: ASEAN Logistics Network Map study (2009, JETRO)

**Figure 2.1.5 ASEAN Highway Network**

Furthermore, Transit Transport Routes (TTR) shown below have been identified as priority route in the appendix of the ASEAN Framework Agreement on the Facilitation of Goods in Transit (AFAFGIT).



Note: No. on the figure indicates route number of the ASIAN HIGHWAY.

Source: ASEAN Strategic Transport Plan 2011-2015 Final Report (2010, ERIA)

**Figure 2.1.6 Transit Transport Routes (TTR) in ASEAN Highway**

The “ASEAN STRATEGIC TRANSPORT PLAN 2011-2015 (2010, ERIA)” provides detailed information on the development status and road CLASS of each route of the ASEAN Highway. More specifically, the “ASEAN Connectivity Project Information Sheets 2012 (2011, ASEAN)” indicates priority projects to be implemented by 2015. As shown in the Table below, it is planned that the remaining missing links are to be eliminated and roads under CLASS III designated by TTR are to be upgraded.

**Table 2.1.5 ASEAN Highway Priority Projects**

Remaining Missing Links		
(i)	Myanmar: AH112	Lehnya – Khlong Loy, 60km
(ii)	Myanmar: AH123	Dawei (deep seaport) – Maesamee pass (Phu nam Ron), 132km+18km (150km)
Upgrading of the remaining “Below Class III” TTRs		
(i)	Lao PDR: AH11	Vientiane – Veunkham, 861km
(ii)	Lao PDR: AH12	Vientiane – Luang Prabang, 393km -completed
(iii)	Lao PDR: AH15	Ban Lao – Namphao, 98km
(iv)	Lao PDR: AH3	Houaysay – Boten, 88km
(v)	Lao PDR: AH13	Odomxay – Tai Chang, 202km
(vi)	Lao PDR: AH16	Savannakhet – Densavanh, 240km
(vii)	Myanmar: AH1	Tamu – Mandalay – Bago – Myawadi, 781km
(viii)	Myanmar: AH2	Meikthila – Loilem – Kyaington – Tachikeik, 593km
(ix)	Myanmar: AH3	Mongla – Kyaington, 93km
(x)	Myanmar: AH14	Mandalay – Muse, 453km
(xi)	Myanmar: AH111	Thibaw – Loilem, 239km

Source: ASEAN Connectivity Project Information Sheets 2012 (2011, ASEAN)

According to the “MASTER PLAN ON ASEAN CONNECTIVITY 2025 (2016, ASEAN)”, on the maintenance situation in 2015, the missing links in ASEAN Highway network decreased, and the road under CLASS III decreased from 5,311.2 km in 2010 to 2,454 km in 2015

The "KUALA LUMPUR TRANSPORT STRATEGIC PLAN 2016 - 2025" formulated in 2015 has prepared a road map for the road transport related development in ASEAN countries by 2025. This is described in Section 2.1.3.

The Asian Highway project is an approach in place since the 1950s, and the GMS Economic Corridor and the ASEAN Highway, which is described in Section 2.1.1 has been planned and constructed under this approach. ASEAN Highway Network, as mentioned earlier, is designated as the main road for complementing the Asian Highway in the ASEAN region based on the network, which was designated by the Asia Highway Initiative. In the Mekong region, the GMS Economic Corridor has been designated and implemented under the project of the regional economic cooperation framework.

The Asian Highway has a broad scope and it is difficult to coordinate among the many countries related. Furthermore, there is no framework for concerning multilateral agreements. Therefore, in reality, ASEAN highway projects and GMS programs are implemented by having regular discussions among related countries in ASEAN and GMS meetings, by receiving assistance of the ADB or other agencies when necessary.

## (2) Railway

### 1) GMS rail links

ADB formulated a strategic framework for railway network development in the GMS region in 2010, and it was announced at the 16th GMS Ministerial Meeting and approved by the countries concerned. Based on this, after consultation with ADB and related countries, the routes linking Bangkok, Phnom Penh, Vientiane, Ho Chi Minh, Hanoi, Nepido, Kunming and Nanning were designated as priority routes. For the establishment of the priority routes, the GMS railway network is envisioned; it includes existing routes and potential new lines that complete the missing links as shown in the Figure 2.1.7.



Source: GMS Portal (<http://portal.gms-eoc.org/>)

**Figure 2.1.7 Railway Network in the GMS Region (as of April, 2016)**



## 2) Trans-Asian railway

This network has been considered under the leadership of UNESCAP since the 1960's with the goal of networking the Eurasian Continent. This is the base of GMS Rail Link, but the coordination with each country has not been very successful. In the GMS and ASEAN regions, discussions and development are carried out through mainly meetings in these areas. Figure 2.1.8 shows the Trans-Asian network which was designated by UNESCAP.



Source: UNESCAP (<http://www.unescap.org/resources/trans-asian-railway-network-map>)

**Figure 2.1.8 Trans-Asian Railway Network in GMS Region (as of November, 2016)**

### (3) Port

The current major ports in the GMS region are shown in Figure Figure 2.1.9. The port is a very important facility in international trade, and most of the logistics among GMS countries passes through these ports. However, the number of ports, which have adequate equipment for water depth and facilities, is limited, and the northern and central parts of Vietnam, Cambodia, Myanmar, etc. are out of the main trunk route. Therefore, they have to be linked to the truck route by feeder roads. In addition, the shipping route which bypasses the Malaysian Peninsula and the Indochinese Peninsula (Yangon - Bangkok, Bangkok - Hanoi etc.) has a problem that the transit time is longer than that of the land transportation.



#### Legend

- |                               |                                  |                                  |
|-------------------------------|----------------------------------|----------------------------------|
| □ Capital city                | — Economic Corridor              | — North-South Corridor Extension |
| ○ Province capital (PR China) | — Central Corridor               | — Northeastern Corridor          |
| ⚓ GMS Sea ports               | — Central and Southern Corridor  | — Northern Corridor              |
| — National border             | — East-West Corridor             | — Northern and Western Corridor  |
| — Province border (PR China)  | — Eastern Corridor               | — Southern Coastal Corridor      |
|                               | — Eastern Corridor Extension     | — Southern Corridor              |
|                               | — Eastern and East-West Corridor | — Western Corridor               |
|                               | — North-South Corridor           |                                  |

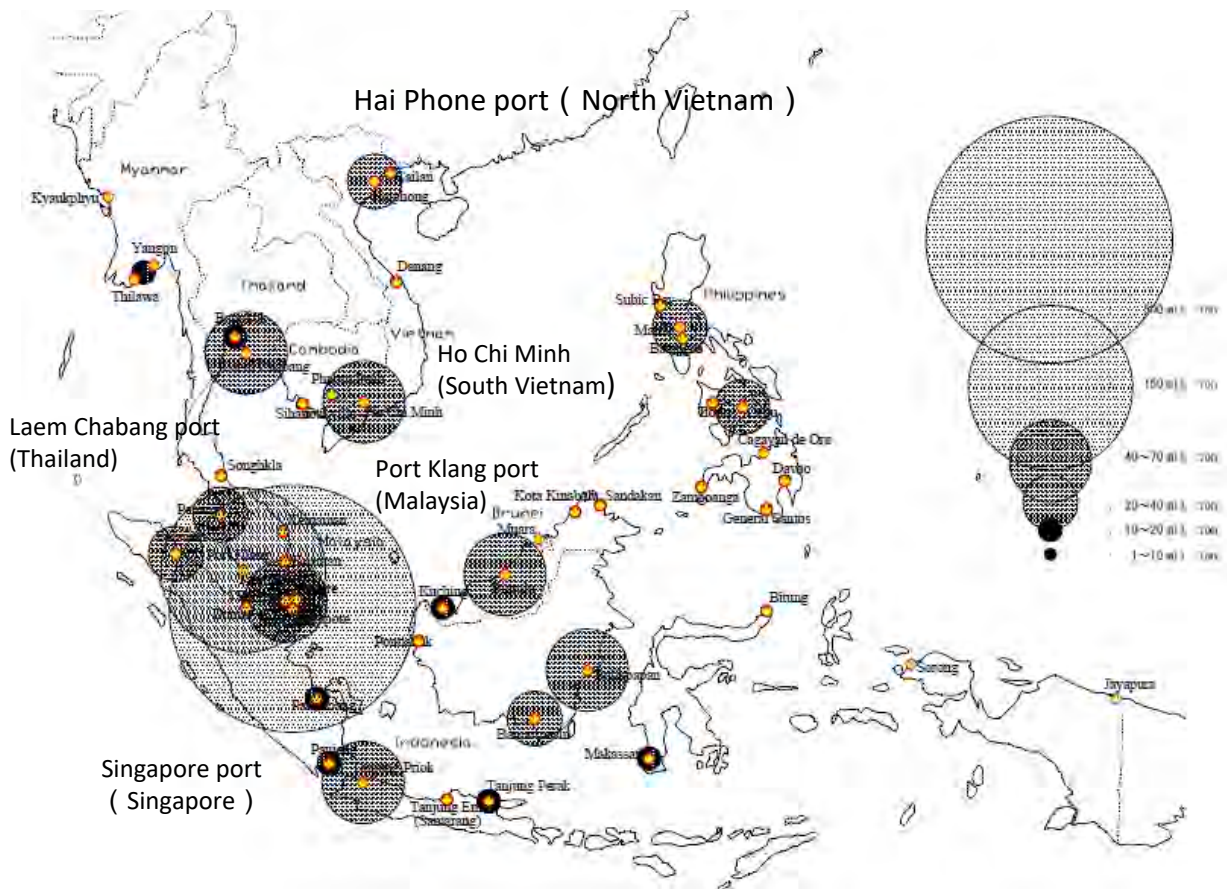
0 85 170 340 Km

ADB GREATER MEKONG SUBREGION CORE ENVIRONMENT PROGRAM

Boundaries are not necessarily authoritative.

Source: GMS Portal (<http://portal.gms-coc.org/>)

**Figure 2.1.9 Current Situation of Port in GMS Region (as of April, 2016)**



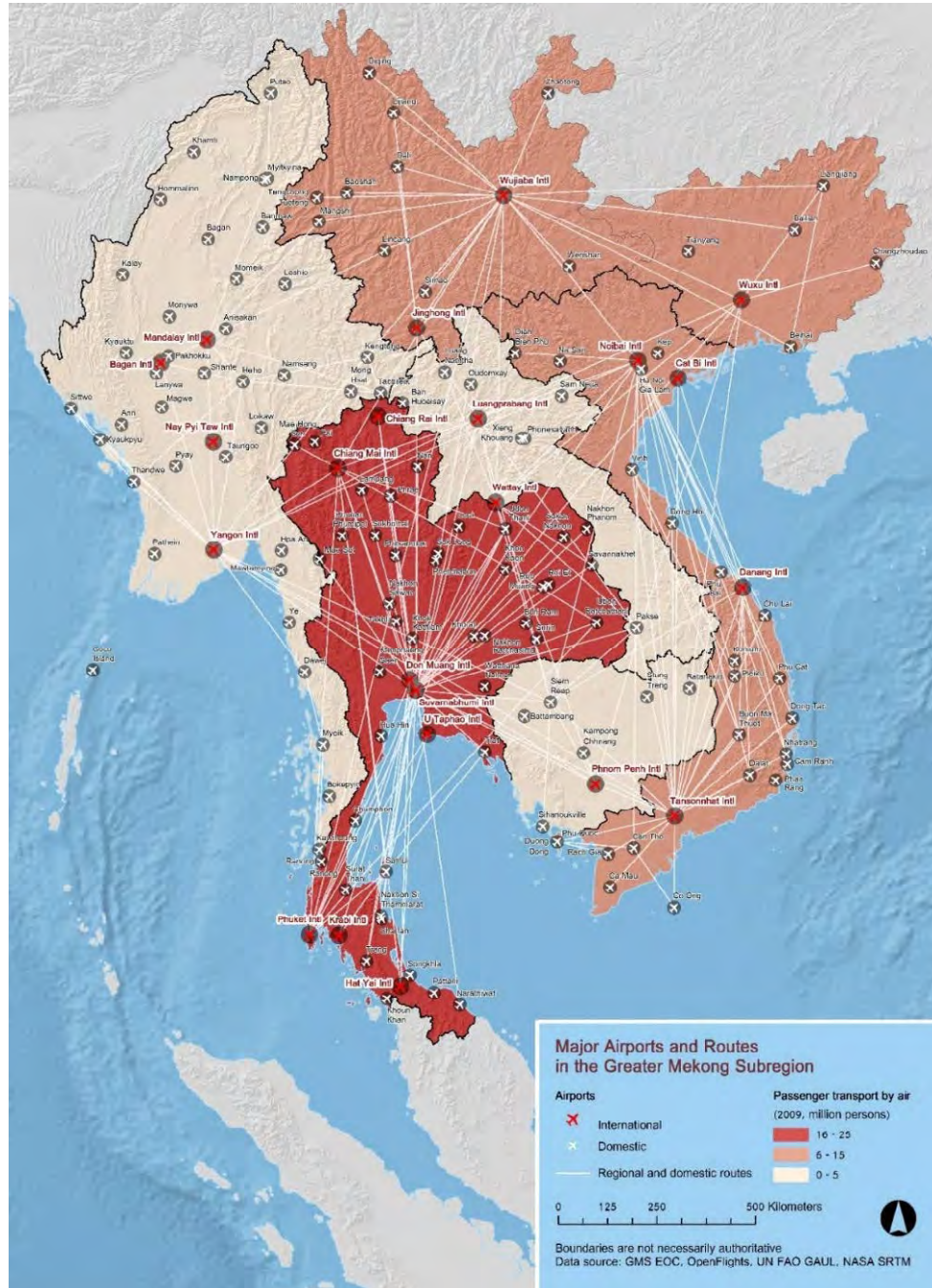
Source: Benchmark Survey for ASEAN Strategic Maritime Infrastructure Development in Asia Region (2010, JICA)

**Figure 2.1.10 Amount of Cargo Handled in ASEAN Major Port (2008)**

The total cargo volumes of the ASEAN region ports are as shown in Figure 2.1.10. The cargo volumes handled in Thailand (Laem Chabang) and Southern Vietnam (Ho Chi Minh) are larger than the volumes handled in northern and central Vietnam (Hai Phong, Danang etc.), Cambodia (Sihanoukville), and Myanmar (Yangon). The annual total cargo volume is about 54 million tons at Laem Chabang port and about 64 million tons at Ho Chi Minh (Saigon) port.

#### (4) Airport

Main airports in the GMS region are shown in Figure Figure 2.1.11. In the ASEAN region, the “open sky” policy has been progressing step by step since 1995, and the AEC blueprint (explained later) also aims to achieve a single aviation market<sup>3</sup>. The multilateral agreement has advanced, and flights between ASEAN countries are comparatively free. It is necessary to strengthen the single aviation market in the future.



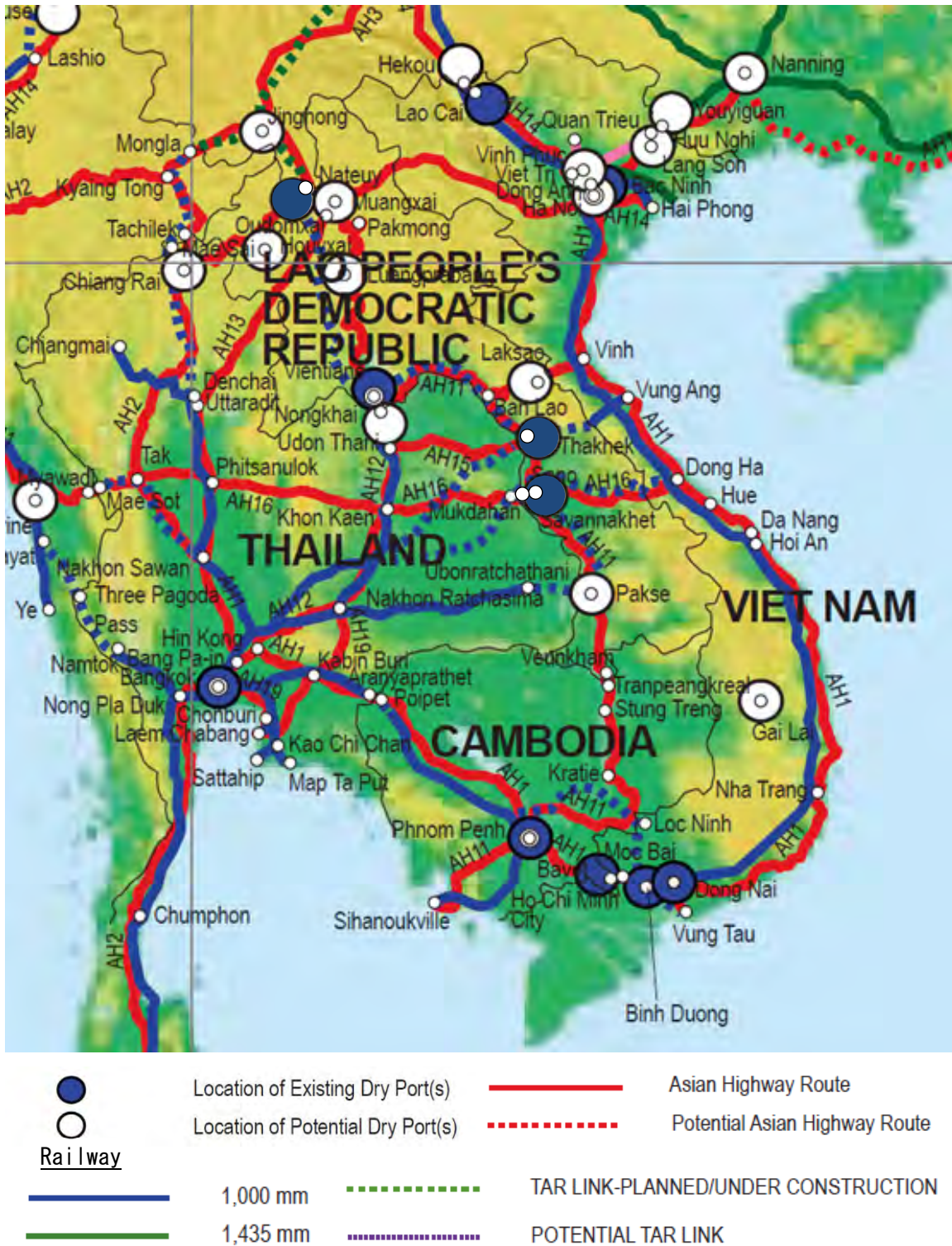
Source: GMS Portal (<http://portal.gms-eoc.org/>)

**Figure 2.1.11 Current Situation of Airport in GMS Region (as of April, 2016)**

<sup>3</sup> It is an approach to “open sky” in the ASEAN region, and it has been officially considered since 2004 in ASEAN. Although international air transport has traditionally been operated on the basis of restrictive systems based on bilateral agreements (designation of air lines, routes, transportation rights, fares, etc.). This is a system that the airline can decide each item freely by abolishing these restrictions partially or totally.

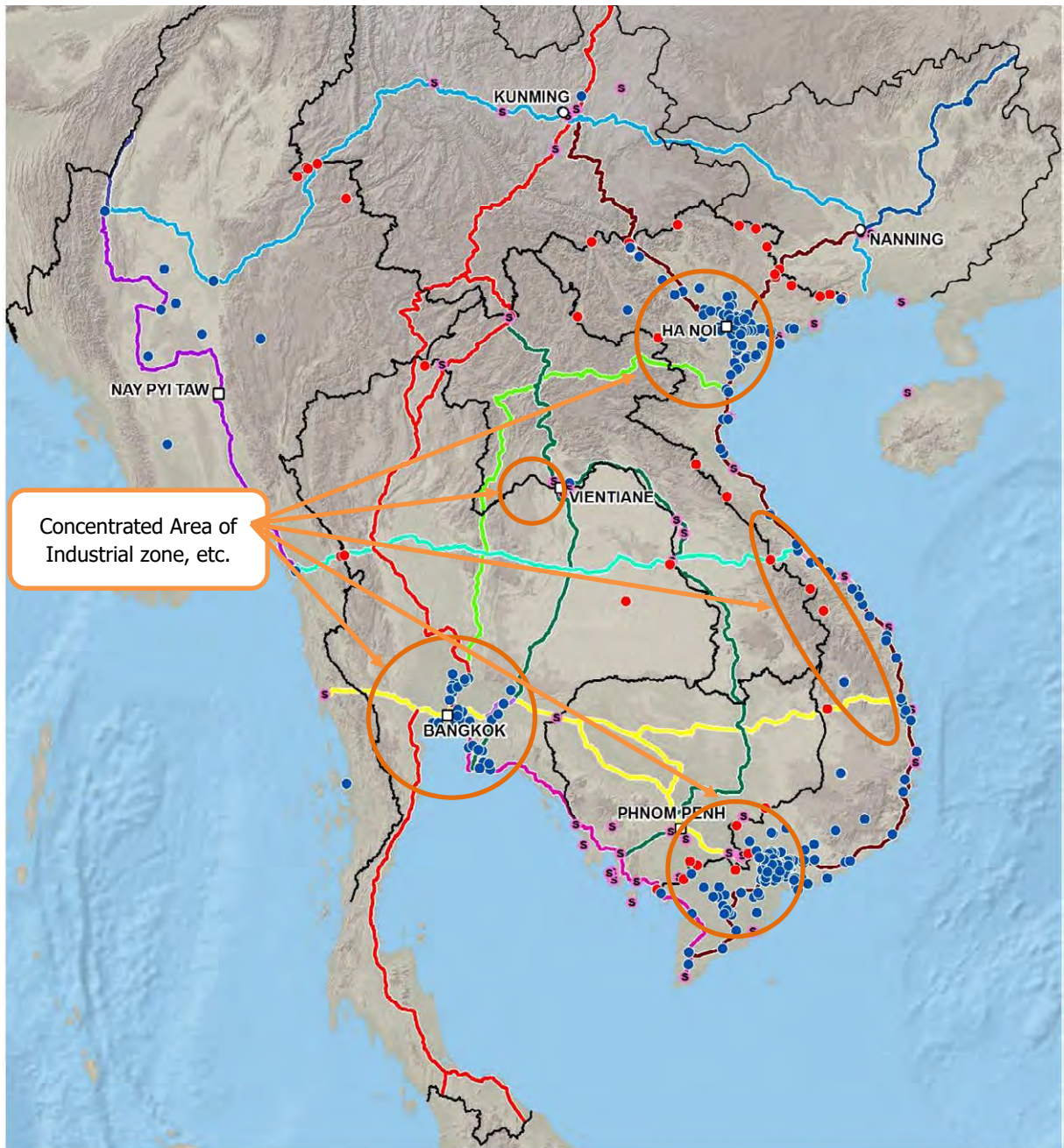
**(5) Industrial park, logistic park, etc.**

Figure 2.1.12 shows the Asian Highway Network, the Trans Asian Railway Network, and the location of the dry port as logistics-related infrastructure in Laos, Vietnam and Thailand, and Figure 2.1.13 shows the location of the SEZ.



Source: UNESCAP

**Figure 2.1.12 Main Road and Railway Network and Location of Dry Port in Laos, Vietnam, and Thailand**



Source: UNESCAP

**Figure 2.1.13 Location of SEZ in GMS Region**

National Roads No. 8, No. 9, No. 12, No. 13 in Laos are the main roads connecting Vietnam/Thailand and Laos, and Laos and Thailand have a railway between Vientiane and Bangkok. Although the road network has room for improvement in the pavement condition, etc., railway connecting Thailand, Laos and Vietnam is under planning as described in Section 2.2. The dry port, which is the relay point of land transportation, is located in the main city of each countries. SEZs are also located

in the main cities, and they are scattered about coastal cities such as Vinh and Da Nang in the Vietnam side. As shown in the above figure, facilities related to trade, investment and distribution such as SEZ and dry port are, in general, located along the GMS Economic Corridor; and the opening of the East-West Economic Corridor, for example, contributing to attracting companies to Seno SEZ in Savannakhet, has a high influence on improving connectivity in terms of road infrastructure development.

### 2.1.3 Development Plan of Target Area

#### (1) Related plan

The main upper level plans related to international corridor development and transportation development of six GMS regions (Thailand, Cambodia, Vietnam, Laos, Myanmar, and China) are shown in the table below.

**Table 2.1.6 The Outline and Goal of the Related Upper-level Plan**

Plan	Timing of Formulation	Target Period	Outline of Contents
ASEAN Economic Community (AEC) Blueprint 2015	Nov. 2007	2008-2015	<p>This plan was adopted at the ASEAN Summit. Goals and actions for the establishment of the ASEAN economic community (four pillar implementation plans) have been described.</p> <p>In land transportation, completion of Asian Highway and Singapore-Kunming Railway (SKRL) is prioritized. In maritime and air transport, adoption of general principles and framework of ASEAN single shipping market and development and implementation of ASEAN single aviation market is carried out.</p> <p><u>Four Pillar Implementation Plans:</u></p> <ul style="list-style-type: none"> <li>① Single Market and Production Base,</li> <li>② Competitive Economic Region,</li> <li>③ Equitable Economic Development,</li> <li>④ Integration into the Global Economy</li> </ul>
AEC Blueprint 2025	Nov. 2015	2016-2025	<p>One pillar was added to AEC Blueprint 2015 and its implementation plan was changed to five pillars (strategic goals). Action plan and implementation schedule are described in "Consolidated Strategic Action Plan".</p> <p><u>Five Strategic Goals</u></p> <ul style="list-style-type: none"> <li>A: A Highly Integrated and Cohesive Economy</li> <li>B: A Competitive, Innovative, and Dynamic ASEAN</li> <li>C: Enhanced Connectivity and Sectoral Cooperation</li> <li>D: A Resilient, Inclusive and People-Oriented, People-Centred ASEAN</li> <li>E: A Global ASEAN</li> </ul>
MASTER PLAN ON ASEAN CONNECTIVITY (MPAC) 2010	Oct. 2010	2011-2015	<p>This plan was adopted at the ASEAN Summit. For the establishment of a ASEAN community, specific strategies for strengthening connectivity and 15 priority projects are listed.</p>
MPAC 2025	Sep. 2016	2016-2025	<p>Following the MPAC 2010, this plan set five strategic goals and objectives and 15 initiatives (action plan). It also includes actions which is underway and undecided in MPAC 2010.</p>

Source: JICA Study Team

The top-level plan is the "ASEAN Economic Community (AEC) Blue Print", and it shows the goals and actions towards the establishment of the ASEAN Economic Community (AEC). The goals for the development of various infrastructure are listed in the plan. In addition, the AEC is founded in 2015,

and then "AEC Blueprint 2025" was formulated. Five strategic goals were set in this plan, and infrastructure network development, creation of single aviation market and single shipping market, transportation optimization by ASEAN Framework Agreement on the Facilitation of Goods in Transit (AFAFGIT) and other activities, and sustainable transportation were mentioned in the "strengthening strategic C: connectivity and cooperation by sector". The implementation plan is described in the "Consolidated Strategic Action Plan", which was formulated in February 2017, but it basically follows the content of the "Kuala Lumpur Strategic Transportation Plan".

In 2010, the "Master Plan on ASEAN Connectivity (MPAC)" was formulated, and concrete strategies for strengthening connectivity and 15 priority projects were listed for the establishment of the ASEAN community. Among the 15 priority projects, the project related to traffic and transportation, "Completion of the ASEAN Highway Network", "Singapore - Kunming Railway Construction", "Improvement of the Inland Waterway Network", "Improvement of the Maritime Transportation Network", and "Promotion of Multimodal and Economic Corridor maintenance ", were shown in the plan. "ASEAN Connectivity Master Plan 2025" was formulated in 2016, following the MPAC 2010, and it includes a new implementation plan. Regarding the contents of implementation concerning transportation, however, the continuous implementation of MPAC 2010 projects is described basically.

Following the above-mentioned upper level plan, the ASEAN Transport Strategic Plan has been formulated. After the formulation of "Brunei Action Plan", which is targeting 2011–2015, at the ASEAN Transport Ministers Meeting held in Malaysia in November 2015, "Kuala Lumpur Transport Strategic Plan", which is targeting 2016–2025, was approved. In the "Brunei Action Plan", establishment of open sky and ASEAN single aviation market (ASAM) in aviation field, formation of ASEAN single shipping market (ASSM) including the development of 47 designated ports in the maritime transport field, maintenance of route network such as development of RORO shipping route, strengthening of safety are stated as the main goals. The plan in particular recognizes challenges in the development of the road (ASEAN Highway Network: AHN) and railway (Singapore - Kunming rail link: SKRL). With regard to traffic facilitation, it is stated that it aims to implement multilateral agreement for facilitating the cross-border traffic and to develop the East-West economic corridor, etc. The "Kuala Lumpur Transport Strategic Plan", has evaluated "Brunei Action Plan", and formulated the strategic plan until 2025 shown in the table below. Basically, the projects in the " Brunei Action Plan" will be implemented on a continuous basis.

**Table 2.1.7 Outline of Two Transport Strategic Plans**

Plan	Timing of Formulation	Target Period	Outline of Contents
Brunei Action Plan (ASEAN Strategic Transport Plan)	Nov. 2010	2011-2015	This transport plan was established at the ASEAN Transport Ministers Meeting. Strategic goals and actions are described for the four fields of "Land Transport", "Air Transport", "Maritime Transport" and "Transport Facilitation" respectively.
Kuala Lumpur Transport Strategic Plan (ASEAN Transport Strategic Plan)	Nov. 2015	2016-2025	This transport plan was established at the ASEAN Transport Ministers Meeting. The evaluation of the "Brunei Action Plan" and the plan and implementation schedule for five fields including "Sustainable Traffic" up to 2025 are described.

Source: JICA Study Team



**Table 2.1.8 Strategic Goals of Kuala Lumpur Transport Strategic Plan**

Area	Strategic Goals
Air Transport	Strengthen the ASEAN Single Aviation Market for a more competitive and resilient ASEAN
Land Transport	Establish an efficient, safe and integrated regional land transport network within ASEAN and with the neighboring countries to support the development of trade and tourism
Maritime Transport	Establish an ASEAN Single Shipping Market and promote maritime safety, security and strategic economic corridors within ASEAN
Sustainable Transport	Formulate a regional policy framework to support sustainable transport which includes low carbon modes of transport, energy efficiency and user-friendly transport initiatives, integration of transport and land use planning
Transport Facilitation	Establish an integrated, efficient and globally competitive logistics and multimodal transportation system, for seamless movement of passengers by road vehicles and cargos within and beyond ASEAN

Source: Kuala Lumpur Transport Strategic Plan

## (2) Ongoing and planned projects

Table 2.1.9 and Table 2.1.10 show the ongoing and planned transport related projects in the GMS region.

According to the “GMS Program” as of March 2018, 68 projects relating to traffic and transport are ongoing (Grant: 7 projects, Loan: 61 projects), and the number of planned projects is 16 (all based on loan), excluding technical assistant projects.

### 2.1.4 Future Prospects

At the 21st GMS Transport Forum, preparation of the following documents was announced;

- (1) Mid-term Review of the GMS Strategic Framework
- (2) Ha Noi Action Plan 2018–2022
- (3) New Sector Strategies (TSS)

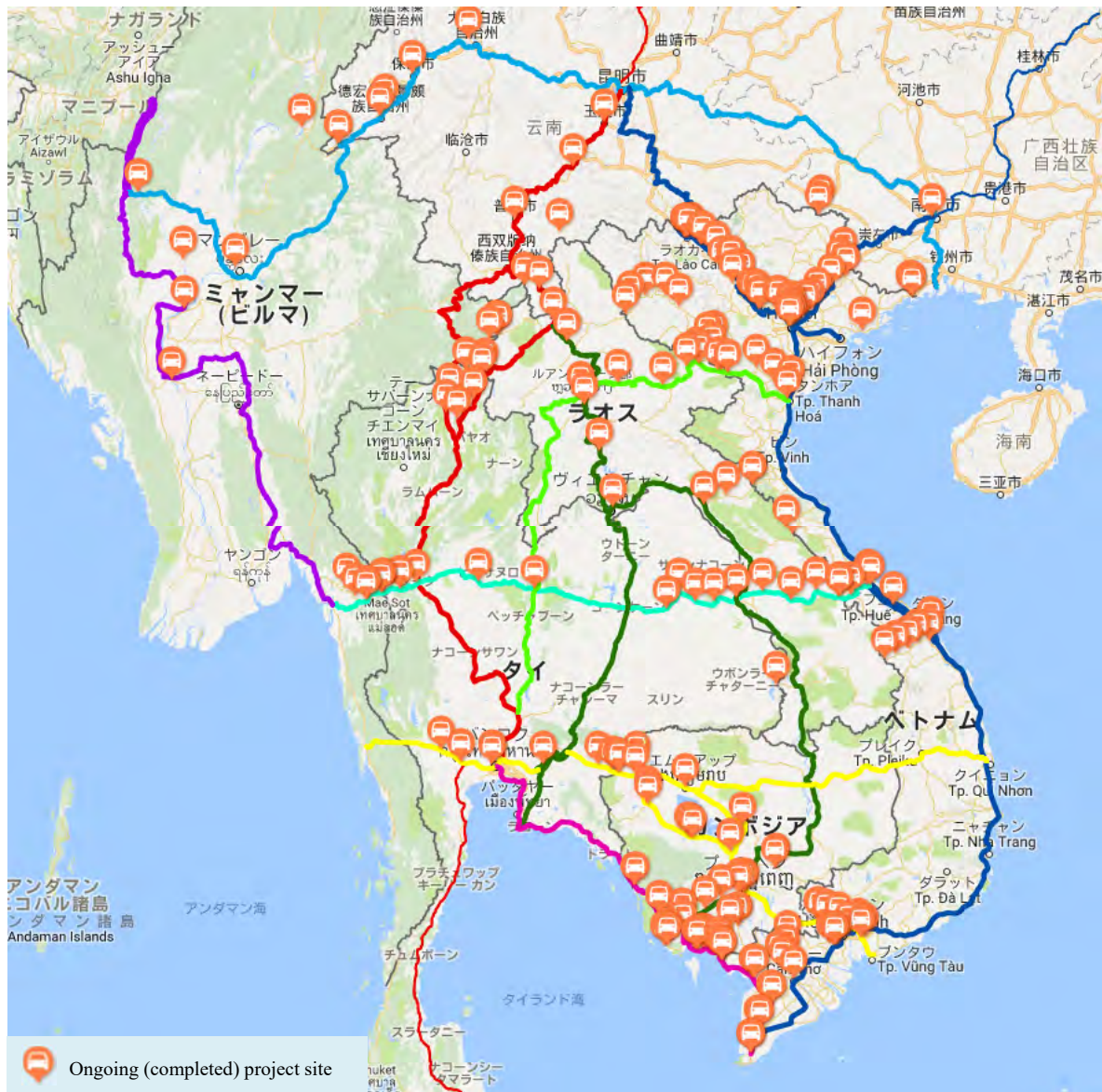
Although the progress of development regarding the establishment of physical connectivity in the transport sector is fine, there is some delay in transportation and trade facilitation, and there are some issues such as the weak linkage between regional investment strategies and sector strategies, etc. Therefore, the formulation of (1) is proceeded, because the mid-term review is necessary for further development of the GMS regional development. Furthermore, the formulation of the plan (2) as a 5-year plan aims at refining the strategic approach for the development of the GMS region and identifying keys to success and important focus. The contents of (1) are reflected into (2), and "The Hanoi Action Plan (HAP) 2018-2022" was adopted at the 6th GMS Summit which was held from March 29 to March 31, 2018. At the same time, "Regional Investment Framework (RIF) 2022" was adopted as a supplement to HAP, and 227 projects were identified as priority projects until 2022. Through these documents, further development of transportation sectors in the GMS region is expected.

In (3), "Transport Sector Strategy (TSS)" formulated in 2006 will be revised with the time span from 2018 to 2030, because the long-term goal has not been achieved, many changes have been made in the project environment, and the investment amount in the transport sector is the largest. Vision is set as "seamless, efficient, reliable, and sustainable GMS transport system", and it will promote strategically the completion of the economic corridor, improvement of connectivity of south and southeast Asia, promoting cross-border transport, popularizing intermodal links, and strengthening the logistics/traffic safety/road asset management. Further development of GMS region will be promoted based on the revised TSS. Priority projects in each transport sector are shown in Table 2.1.9.

**Table 2.1.9 Ongoing (Completed) Projects in GMS Region (As of October, 2018)**

Type	Status	Project Name	Country	Start	End	Total Cost (US\$'000)
Grant	Ongoing	GMS Southern Coastal Corridor	Viet Nam	2007	2015	25,500
Grant	Ongoing	CAM: Greater Mekong Subregion Southern Coastal Corridor Project (Cambodia/Vietnam)	Cambodia	2007	2014	8,000
Grant	Ongoing	CAM: Greater Mekong Subregion: Rehabilitation of the Railway in Cambodia Project	Cambodia	2009	2014	64,460
Grant	Ongoing	LAO: Second Northern GMS Transport Network Improvement Project	Lao PDR	2010	2016	20,000
Grant	Ongoing	GMS Corridor Towns Development Project (SF)	Viet Nam	2012	2019	1,000
Grant	Ongoing	Greater Mekong Subregion Southern Coastal Corridor Project - Additional Financing	Viet Nam	2013	2019	12,432
Grant	Ongoing	Central Mekong Delta Region Connectivity Project	Viet Nam	2013	2020	394,000
Loan	Ongoing	GMS: Phnom Penh-HCMC Road Improvement	Viet Nam	1998	2006	142,700
Loan	Ongoing	GMS: East-West Economic Corridor	Lao PDR	1999	2008	345,000
Loan	Ongoing	GMS: East-West Economic Corridor	Viet Nam	1999	2007	97,000
Loan	Ongoing	GMS Kunming-Haiphong Transport Corridor - Noi Bai-Lao Cai Highway Project	Viet Nam	2005	2010	8,000
Loan	Ongoing	GMS Rehabilitation of the Railway in Cambodia	Cambodia	2006	2016	42,000
Loan	Ongoing	GMS Rehabilitation of the Railway in Cambodia	Cambodia	2006	2016	31,000
Loan	Ongoing	GMS Kunming-Haiphong Transport Corridor: Yen Vien-Lao Cai Railway Upgrading Project (ADF)	Viet Nam	2006	2015	60,000
Loan	Ongoing	GMS Kunming-Haiphong Transport Corridor: Yen Vien-Lao Cai Railway Upgrading Project (ADF)	Viet Nam	2006	2015	60,000
Loan	Ongoing	GMS Southern Coastal Corridor (ADF)	Viet Nam	2007	2015	133,200
Loan	Ongoing	GMS Southern Coastal Corridor	Cambodia	2007	2014	60,700
Loan	Ongoing	GMS Kunming-Haiphong Transport Corridor - Noi Bai-Lao Cai Highway Project	Viet Nam	2007	2014	1,016
Loan	Ongoing	GMS Kunming-Haiphong Transport Corridor - Noi Bai-Lao Cai Highway Project	Viet Nam	2007	2014	200,000
Loan	Ongoing	Greater Mekong Subregion Ha Noi-Lang Son and Ben Luc-Long Thanh Expressways Technical Assistance Project	Viet Nam	2008	2016	30,800
Loan	Ongoing	Greater Mekong Subregion: Cambodia Northwest Provincial Road Improvement Project	Cambodia	2009	2014	47,890
Loan	Ongoing	Greater Mekong Subregion Highway Expansion Project	Thailand	2009	2014	179,400
Loan	Ongoing	Greater Mekong Subregion: Rehabilitation of the Railway in Cambodia Project	Cambodia	2009	2014	47,100
Loan	Ongoing	GMS: Southern Coastal Corridor (Supplementary) (ADF)	Viet Nam	2010	2015	125,000
Loan	Ongoing	LAO: Second Northern GMS Transport Network Improvement Project	Lao PDR	2010	2016	25,600
Loan	Ongoing	VIE: Second Northern GMS Transport Network Improvement	Viet Nam	2010	2016	97,400
Loan	Ongoing	Yunnan Integrated Road Network Development (OCR)	PRC	2010	2016	1,753,000
Loan	Ongoing	Greater Mekong Subregion Ben Luc-Long Thanh Expressway Project - Tranche 1	Viet Nam	2010	2019	627,700
Loan	Ongoing	GMS Corridor Towns Development Project (SF)	Viet Nam	2012	2019	146,190
Loan	Ongoing	Greater Mekong Subregion Southern Coastal Corridor Project - Additional Financing	Viet Nam	2013	2019	27,100
Loan	Ongoing	Central Mekong Delta Region Connectivity Project	Viet Nam	2013	2020	466,000
Loan	Ongoing	Greater Mekong Subregion Ben Luc-Long Thanh Expressway Project - Tranche 1	Viet Nam	2013	2019	117,750
Loan	Ongoing	Phnom Penh Sihanoukville Highway Corridor Improvements	Cambodia			1,000
Loan	Ongoing	Construction of Poipet (Cambodia) Klong Loek (Thailand) Railway Bridge	Cambodia	2014	2015	500
Loan	Ongoing	Dali Ruili Railway	PRC	2015	2022	4,500
Loan	Ongoing	Further Maintenance and Improvement of the Upper Mekong River Navigation Channel from the PRC (at Landmark 243) and Myanmar to Luang Prabang, in the Lao PDR	Regional	2016		370,000
Loan	Ongoing	Yuxi Mohan Railway	PRC	2015	2021	7,400
Loan	Ongoing	Vang Tao Border Crossing Point	Lao PDR	2016		15,000
Loan	F/S completed	Upgrading of NR8 East-West Transport Route; ASEAN Highway AH15 (Van Lao-Nan Phao)	Lao PDR			80000
Loan	Ongoing	Xiengkong River Port	Lao PDR			15000
Loan	Ongoing	Ban Mom River Port	Lao PDR			12,000
Loan	Ongoing	Nam Phao Border-Crossing Point (NR8)	Lao PDR			8,000
Loan	Ongoing	Na Phao Border-Crossing Point (NR12)	Lao PDR			10,000
Loan	Completed	Lao-Myanmar Friendship Bridge over the Mekong at Xianglok	Lao PDR	2012		30,000
Loan	Ongoing	Vientiane Boten Railway	Lao PDR	2015		7,200,000
Loan	Ongoing	Greater Mekong Subregion East-West Economic Corridor Eindu Kawkareik Road Improvement	Myanmar	2015	2020	120,000
Loan	Ongoing	Mae Sot Myawaddy Border Crossing and Infrastructure Improvements (with Thailand)	Myanmar	2014		30,000
Loan	Ongoing	Improvement of Inland Ports	Myanmar			60,000
Loan	Ongoing	Lao Myanmar Friendship Bridge over the Mekong River at Xiengkong Kainglap	Myanmar			30,000
Loan	Ongoing	Bang Yai Kanchanaburi Intercity Motorway (part of the Laem Chabang Bangkok Dawei (Myanmar) Corridor	Thailand	2016		2,000,000
Loan	Ongoing	Tak Mae Sot Highway Improvement	Thailand	2008		90,000
Loan	Ongoing	Kalasin Nakrai Kamcha I Highway Improvement	Thailand	2015		140,000
Loan	Ongoing	Chiang Rai Chiang Khong Highway Improvement	Thailand	2007		80,000
Loan	Ongoing	Mae Sot Myawaddy Border Crossing and Infrastructure Improvements (Thailand part)	Thailand	2009		116,000
Loan	Ongoing	Greater Mekong Subregion Ben Luc Long Thanh Expressway Project (Stage 2)	Viet Nam	2016	2020	591,520
Loan	Ongoing	Greater Mekong Subregion Ha Noi-Lang Son and Ben Luc-Long Thanh Expressways Technical Assistance Project	Viet Nam	2008	2016	30,800
Loan	Ongoing	Second Northern Greater Mekong Subregion Transport Network Improvement Project - Additional Financing	Viet Nam	2015	2019	71,130
Loan	Ongoing	National Highway 14D Improvement	Viet Nam			130,000
Loan	Ongoing	Northern East-West Corridor: Son La-Dien Bien-Tay Trang Border Gate (Viet Nam and the Lao PDR) section, to connect with Luang Namtha (Lao PDR) to the Friendship Bridge (Lao PDR-Myanmar) at Xiengkong-Kainglap	Viet Nam			-
Loan	Ongoing	GMS Kunming-Haiphong Transport Corridor Noi Bai-Lao Cai Highway (Additional Financing)	Viet Nam	2014	2016	152,000
Loan	Ongoing	GMS Kunming-Haiphong Transport Corridor Noi Bai-Lao Cai Highway (Additional Financing)	Viet Nam	2014	2016	16,090
Loan	Ongoing	GMS Kunming-Haiphong Transport Corridor Noi Bai-Lao Cai Highway (Additional Financing)	Viet Nam	2014	2016	13,910
Loan	Ongoing	Yunnan Pu'er Regional Integrated Road Network Development Project	PRC	2014	2021	589,530
Loan	Ongoing	Rural Roads Improvement II (additional financing)	Cambodia	2014	2020	74
Loan	Ongoing	Greater Mekong Subregion East-West Economic Corridor Eindu to Kawkareik Road Improvement Project	Myanmar	2015	2020	122
Loan	Ongoing	Second Northern Greater Mekong Subregion Transport Network Improvement Project - Additional Financing	Viet Nam	2015	2019	78
Loan	Ongoing	Greater Mekong Subregion Ben Luc-Long Thanh Expressway Project- Tranche 2 (parallel cofinancing)	Viet Nam	2016	2020	306

Source: GMS PROGRAM (<http://www.greatermekong.org/projects/>)



Source GMS PROGRAM (<http://www.greatermekong.org/projects/>)

**Figure 2.1.14 Ongoing (Completed) Projects in GMS Region (As of October, 2018)**

**Table 2.1.10 Planned Projects in GMS Region (As of October, 2018)**

Type	Status	Project Name	Country	Start	End	Total Cost (US\$'000)
Loan	Future	Sihanoukville Port Access Road Improvements	Cambodia			40,000
Loan	Future	GMS: Deepening Connectivity of Southern Economic Corridor Project (Redefined by Government as Second Provincial Road Improvement Project)	Cambodia	2017		200,000
Loan	Future	Link Road between NR-5 and NR-6 near Kampong Tralach North of Phnom Penh	Cambodia	2019		65,000
Loan	Preparing	Luang Namtha-Xiengkok-Lao-Myanmar Friendship Bridge: NR17	Lao PDR			150,000
Loan	Preparing	Mekong Bridge at Bungkan Paksan	Lao PDR			
Loan	Preparing	Thanaleng Border-Crossing Infrastructure Improvement	Lao PDR			25,000
Loan	Preparing	Lalay Border-Crossing Point (NR15)	Lao PDR			6,800
Loan	Future	Lomsak Phetchabun Highway Improvement	Thailand			120,000
Loan	Future	Mekong Bridge at Bungkan Paksan	Thailand			-
Loan	Future	Tha Laem Chabang Port Development, Phase 3 - Feasibility Study	Thailand	2025		5,000
Loan	Future	Single Rail Transfer Operator Development of Laem Chabang Port	Thailand	2018		90,000
Loan	Future	Second GMS Southern Coastal Corridor Project	Viet Nam	2016		254,000
Loan	Future	Upgrading NR13N and N13S (Portion through Phon Hong Vientiane Capital Ban Hai); ASEAN Highway AH11 (NR13S)	Lao PDR			320
Loan	Future	Hongsai (Xayaboury) Chomphet (Luang Prabang) Rehabilitation (120 km)	Lao PDR			90
Loan	Future	Upgrading of NR8 East West Transport Route; ASEAN Highway AH15 (Ban Lao-Nam Phao)	Lao PDR			80
Loan	Future	GMS: Deepening Connectivity of Southern Economic Corridor Project (Redefined by Government as Second Provincial Road Improvement Project II)				200
Loan	Future	Second GMS Northern Transport Network Improvement (Luang Prabang Thanh Hoa) (additional financing)	Viet Nam			145,000

Source: GMS PROGRAM (<http://www.greatermekong.org/projects/>)



Source: GMS PROGRAM (<http://www.greatermekong.org/projects/>)

Figure 2.1.15 Planned Projects in GMS Region (As of October, 2018)

Table 2.1.11 Outline of Regional Investment Framework 2022

Sector	Number of Projects			Cost Estimates (\$ million)		
	Investment	TA	Total	Investment	TA	Total
Transport	85	12	97	55,753.0	10.4	55,763.4
Energy	11	8	19	2,230.1	14.5	2,244.6
Agriculture	9	10	19	1,695.2	95.8	1,791.0
Environment	3	4	7	560.0	13.3	573.3
Health and Other HRD	4	7	11	702.2	21.5	723.7
Urban Development	7	6	13	1,147.1	9.7	1,156.8
Others/BEZ	6	6	12	2,084.9	8.0	2,092.9
Tourism	12	17	29	1,430.0	83.2	1,513.2
TTF	3	9	12	91.3	16.6	107.9
ICT	3	5	8	28.0	22.3	50.3
<b>Total</b>	<b>143</b>	<b>84</b>	<b>227</b>	<b>65,721.8</b>	<b>295.3</b>	<b>66,017.1</b>

BEZ = border economic zone, HRD = human resource development, ICT = information and communication technology, TA = technical assistance, TTF = transport and trade facilitation.  
Source: GMS Secretariat calculations.

Source: Overview of Regional Investment Framework 2022

**Table 2.1.12 Priority Projects in Each Transport Sector in Revised Transport Sector Strategy**

Sector	Description
Roads	<ul style="list-style-type: none"> <li>◆ Upgrading the sections in each transport sector in revised Transport Sector Strategy of SEC in Cambodia</li> <li>◆ Upgrading the new routes in EWEC and NSEC in Myanmar and Lao PDR</li> <li>◆ Improving links between secondary roads and the main corridor routes</li> <li>◆ Establishing effective approaches to road asset management and financing</li> </ul>
Rail	<ul style="list-style-type: none"> <li>◆ Sustaining the operation of the Greater Mekong Railway Association (GMRA)</li> <li>◆ Completing the missing railway links to interconnect the subregion</li> <li>◆ Upgrading and expanding the capacity of existing railway lines</li> <li>◆ Upgrading systems for communications, signaling and train control</li> </ul>
Ports and Inland Waterways	<ul style="list-style-type: none"> <li>◆ Developing and/or increasing the capacity of major deep-sea ports</li> <li>◆ Promoting the use of coastal shipping and inland waterways for domestic and international trade</li> <li>◆ Improving landside seaport access</li> <li>◆ Improving port policies and regulations</li> <li>◆ Streamlining terminal and port operations</li> </ul>
Air Transport	<ul style="list-style-type: none"> <li>◆ Developing and/or Improving secondary airports</li> </ul>
Urban Transport	<ul style="list-style-type: none"> <li>◆ Constructing circumferential and bypass roads around major urban centers along the corridors</li> <li>◆ Adopting mechanisms for coordinating transport programs and projects with the development plans of major cities and towns along the economic corridors</li> </ul>
Transport Facilitation	<ul style="list-style-type: none"> <li>◆ Facilitating extension of traffic and transport rights along the GMS economic corridors</li> <li>◆ Upgrading border crossing facilities</li> <li>◆ Improving border management</li> <li>◆ Enhancing institutional mechanisms for implementing transport facilitation measures</li> <li>◆ Strengthening the interface between transport facilitation and trade facilitation initiatives</li> <li>◆ Conducting capacity building programs to raise awareness, knowledge and skills of central, local and border officials in transport and trade facilitation</li> </ul>
Logistics	<ul style="list-style-type: none"> <li>◆ Improving road-rail-port connectivity</li> <li>◆ Establishing inland dry ports with road and rail interface</li> <li>◆ Establishing direct feeder service between ports and ICDs, and integrating ICDs into the rail network</li> <li>◆ Encouraging investment in logistics hubs, ICDs, inland dry ports and cold storage facilities</li> </ul>

Source: Prepared by JST based on the materials of 21st GMS Transport Forum

As mentioned above, from around 2010, progress evaluation and review of the development of the road transport infrastructure of GMS started to be conducted. The transportation infrastructure both roads and railways, in Laos is insufficient, and the lack of road traffic infrastructure is particularly a challenge for Laos, which is landlocked, for connectivity with neighboring countries. Designation of additional economic corridors, development of Asian/ASEAN highway/ railroad/etc. are expected to proceed with the revision of related material, and the promotion of the strengthening cooperation among GMS related countries in terms of infrastructure. In Laos, it is necessary to strengthen the connectivity with Thailand and Vietnam in neighboring countries in terms of transportation and logistics. For linking Laos and Vietnam, the extension of the route connecting Laos and Vietnam to the east and west is especially important, because the major roads (three routes (National Road No.8, No.9, and No.12)) and railway are limited. Through strengthening the connection between the two countries, it is conceivable that this will lead to strengthening connectivity with GMS countries including Thailand, Myanmar.

At the 6th GMS Summit, each country consulted on the above-mentioned related matters, and "Leveraging 25 Years of Cooperation for a Sustainable, Integrated and Prosperous GMS" was announced as a joint declaration. Based on the past development in GMS and the economic growth, the countries are aiming at further strengthening and growing connectivity among GMS countries. In the future, they will proceed with maintenance based on HAP and RIF.

## 2.2 Current Status and Future Development of Main Logistics Infrastructure between Vientiane and Hanoi

### 2.2.1 The Policies of Laos and Vietnamese Government and Development Status and Future Plan of Logistics Infrastructure

#### (1) Priority policies

The main policies of the government of Laos and Vietnam concerning the logistics infrastructure development are as follows.

##### 1) Laos

###### A : 8th Five Year National Socio- Economic Development Plan (2016–2020)

The government of Laos has formulated Five Year National Socio-Economic Development Plan VIII (2016–2020) in 2016. Infrastructure developments in this plan are listed below:

- Upgrading roads that connect to the neighboring countries, such as the Greater Mekong Subregion (GMS) Corridor, Asian Highway, East-West Corridor and North-South Economic Corridor, and upgrading roads in accordance with the strategic plan on logistics to support the transportation of vehicles with 11 tons of cargo to underpin the shift to industrialization and modernization;
- Constructing the Vientiane–Boten Railway Project and conducting survey and designing Savanh–Lao bao and Vientiane Capital–Thakhek–Namphao, in order to connect to Muya and other destinations;
- Creating comprehensive logistics systems by focusing on four areas: Natoei–Luangnamtha, Seno– Savannakhet, Tha Nalang–Vientiane and Vangtao–Phonthong Champasack;
- Surveying and designing new international airports in Vientiane Capital, Sayabouly and Champasack (Champasack Airport is expected to serve three million passengers per annum in Champasack, Saravane and Sekong provinces).

###### B : Five Year Development Plan (2016–2020)

According to the "Data Collection Survey on Transport Sector the Lao People's Democratic Republic (2016, JICA)", MPWT has formulated the "Five Year Development Plan of Public Works and Transport Sector (2016–2020)". "Goal" and "Target and Achievement" are mentioned as follows.

##### Goal:

- ① To integrate among land transportation, aviation, and water transport and to support macro economy by enhancing domestic production competitiveness and export linking with central area, rural area, and neighboring countries effectively and safely;
- ② To implement equitable infrastructure development in urban and rural areas, and to eliminate inequality; to improve living environment and to create the foundation for domestic economy; to focus on the development plan of the big villages and to help to change big “villages” into a small “town” in rural areas;
- ③ To enhance the capacity of the transport sector and to enable it to be competitive with the international market.

##### Target and Achievement:

- ① Maintenance for constantly usable infrastructure
- ② Implementation of incomplete projects
- ③ Construction and improvement of transport infrastructure
  - Construction and improvement of roads and bridges
  - Construction and improvement of domestic water transport facilities

- Construction and improvement of aviation facilities
- Construction and improvement of railway facilities
- Construction of transportation facilities and road safety
- Construction and improvement of city facilities and water supply facilities
- Transportation system development and transportation services
- Capacity development of public works and transport sectors

#### C : Other collected documents

According to the collected documents from MPWT, the policy and strategy on the connectivity of Laos are described below. These documents describe the development plan for each sector, such as road sector, railroad sector, but details will be described in detail separately.

#### Main Policies:

Develop and improve 4 modes of transport/multi-model transport, namely roads, rails, air transports and inland waterways through the realization of transforming the Laos from landlocked to land-linked country in the Greater Mekong Sub-region and in the mainland of ASEAN.

#### Strategies:

- Providing sufficient and reliable transport infrastructure and facilities, particularly on transit transport routes,
- Facilitating cross border transport of goods and people between and among neighboring countries.

## **2) Vietnam**

#### A : Socio-Economic Development Strategy

The government of Vietnam has formulated the “Vietnam’s Socio-Economic Development Strategy for the Period of 2011–2020” in 2010. The strategy aimed at achieving modern industrialization by laying the foundation for an advanced industrialized country by 2020. For achieving this goal, (1) construction of a socialist-oriented market economy system, (2) development of human resources, and (3) development of infrastructure (infrastructure for transport and urban) will be breakthroughs. Accelerating the development of infrastructure systems and the development of new cities and new rural areas are described. It also includes the following points:

- Concentration of efforts on construction and investment of urban infrastructure in North-South expressway and high-speed railway, international seaport and airport, and Hanoi and Ho Chi Minh City;
- Formation of the North-South traffic route and the East-West economic corridor step by step, and ensuring cooperation of various modes of transportation;
- Construction of trans-border roads meeting international technical standards;
- Realization of the cooperation within the infrastructure system to form North-South economic axis, East-West economic corridor, and the Asian economic corridor; creation of services and industrial product groups, and connection of central cities along the economic corridor; formation of a large-scale economic development cooperation base at the border gate in the economic corridor.

#### B : The 5-Year Socio-Economic Development Plan

In April 2016, Resolution on the 5 Year Socio-Economic Development Plan of 2016-2020 has been formulated. Overall goals are the maintenance of macroeconomic stability, the acceleration of policy implementation based on the three breakthroughs described above, and the creation of a foundation for changing into modern industrialized country at an early stage. The importance of the development of transportation infrastructure and urban infrastructure is described, and the following ones are listed as the main infrastructure development project:

- Continue development of roads, high-speed rail, and North-South railways,
- Update existing railway system, inland water transport, coastal water transport network,
- Priority Capital investment of transportation infrastructure project into low income areas,
- Improvement of traffic congestion in Hanoi City and Ho Chi Minh City,
- Restructuring of toll gates,
- Completion of development of Long Thanh International Airport.

#### C : Master Plan on Development of Vietnam’s Expressway Network

In January 2016, the “Master Plan on Development of Vietnam’s Expressway Network” with a target year of 2020 was approved by the decision of the Prime Minister Office. It aims to expand the logistics network by connecting border areas and harbor bases from major cities of the country as starting point. The development plan is as follows:

- Development of 2 routes of North-South Expressway (about 3,083 km);
- Development of 14 routes connecting Hanoi capital and neighboring provinces, highway development with a total length of 1,368 km in the northern area;
- Development of 3 routes with a total length of 264 km in the central part;
- Development of 7 routes with a total length of 983 km in the southern part;
- Development of a ring road in Hanoi and Ho Chi Minh City, with a total length of 712 km.

#### D : Other Collected Documents

According to the documents collected from the Ministry of Finance of Vietnam, the following points are shown as a part of efforts for the development of the transportation infrastructure in Vietnam by 2020:

- Development of harmonious modes of transportation: decrease of the share of motorcycle and automobile, increase of the share of railway/maritime traffic and inland water transport, and concentration on major transportation corridors;
- Development of a modern and harmonious transportation infrastructure system;
- Strengthening efficiency, effectiveness and competitiveness of transport related companies;
- Reform of transparent policy reform, and development of clear legal framework;
- Utilization of new and modern technology in road maintenance and traffic management.

It is noted that this documents contain development plans for each transportation sector, such as roads, railways sectors, but details will be described separately.

Connectivity in logistics and transportation with neighboring countries is important for Laos as a landlocked country, and improvement of access with neighboring countries, and development and improvement of access roads and railway are major projects. In Vietnam, while conscious of cooperation between the northern and southern area in the country, the development of an economic base near the border based on the economic corridor has been listed. Regarding strengthening of the connectivity, Laos and Vietnam are mentioned in their socioeconomic development plan, which is the upper level plan of both countries, and it is assumed that enhancing connectivity is important for both countries.

## **(2) Road**

The road development status and road development plans of the government of Laos and Vietnam are as follows.

### **1) Laos**

The Ministry of Public Works and Transport (MPWT) is in charge of construction and maintenance of roads and bridges in Laos. And the Public Transportation Research Institute (PTRI) manages road



condition data, the Department of Roads (DOR) forms management programs, and the Department of Public Works and Transport (DPWT) conducts actual works for development and maintenance. However, all road development projects in DPWT (including maintenance and management) are entrusted to private construction companies and government corporations. Road development projects are not directly managed by DPWT. The current status of road development in Laos is shown in Table 2.2.1 and Table 2.2.2.

**Table 2.2.1 Road Classification, Length, Pavement Ratio**

Class	Administration	Road Length (km)	Pavement Ratio (%)
National Road	MPWT	7,235	61.2
State Road	Province	7,923	8.3
Other Road	District	24,389	4.0

Source: Project Finding Survey on Road Project for ASEAN International Corridor (2016, MLIT)

**Table 2.2.2 The Length by Pavement Type**

Class	Length (km)	AC	Co	Simple Pavement	Clashed Stone	Mud
National Road	7,235	539	2.0	3,890	2,192	611
State Road	7,923	—	—	658	4,164	3,102
Other Road	24,389	31	—	69	7,518	15,886

Source: Project Finding Survey on Road Project for ASEAN International Corridor (2016, MLIT)

The ongoing and planned road projects are listed below, but the completion and opening year of some of the projects are not decided because of financial shortages:

Road: 12 projects (two are ongoing, others require financing, and all are road improvement projects)

- [R1] [Ongoing] Hongsa-Chomphet-Luangbrabang
- [R2] Luangnamtha-xiengkong-Lao-Myanmar bridge (NR17)
- [R3] Luangprabang-Dienbienphu
- [R4] Luangprabang-Xumnuca
- [R5] [Ongoing] Vangvieng-Vientiane Cap (NR13N) & Vientiane Cap-Thabok (NR13S)
- [R6] NR1E
- [R7] NR1F
- [R8] NR1G
- [R9] NR16B
- [R10] Pakse-Mouangkong-Cambodia border (NR14A)
- [R11] Phia phi-Attapue (NR18A)
- [R12] Thakhek-Ngommalad-Boulapha-Naphao (NR12)

Bridge: 3 projects (one is project and two require financing)

- [B1] Mekong Bridge at Konteun
- [B2] [Ongoing] Mekong Bridge at Pac Xan-Bungkane (Priority Project)  
※5th Thai-Lao Friendship Bridge
- [B3] Mekong Bridge at Saravane-Ubol (Priority Project)

Expressway: 4 projects

- [E1] NR 3 Expressway, 160 km (F/S stage)
- [E2] NR 13 N Expressway, 420km (Completion of F/S between Vientiane - Vang Vieng)
- [E3] 13 S Expressway, 560km (Will start F/S within 2018)
- [E4] Hanoi-Vientiane Expressway, 725km (Completion of pre-F/S)

Figure 2.2.1 shows the road network situation including the planned roads in Laos.

Regarding the progress of the North-South expressway in Laos ([E2] and [E3] above), Vientiane - Vang Vieng route is about to be developed on a BOT basis with investment from China. It was agreed in November 2017 that the project will be proceed with 95% investment covered by China side and the reaming 5% by Laos government. The project is expected to take three years to complete. After development of this section, Vang Vieng - Luang Prabang route and Luang Prabang - Boten route will be developed, but the timing of construction of these sections is undecided. In October 2014, MPWT conducted discussion on the adopting PPP to develop NR.13, with a business case based on toll collection. Actual operation is unknown at this moment, but the North-South expressway of Laos is expected to operate under BOT concession contract. Since the expected North-South expressway route is between Vientiane and Boten (at Chinese border), it is necessary to develop the East-West direction in order to strengthen the connectivity between neighboring countries and Laos.

As for the Vientiane-Pakse expressway ([E3] in the previous page), four companies (two from China and two from Laos) were selected for conducting the F/S survey in the end of February 2018. The F/S will start within 2018 and it will be completed in about one year. After approval of MPWT, a BOT contract will be concluded and construction will start. However, the specific construction schedule, including the starting time, is unknown as of August 2018. The target section of the F/S survey with their respective selected companies are listed below:

Section 1: Pac Xan (Vientiane-Hanoi intersection) – Thakhaek (Road No. 12 Intersection) (164km)

Contractor: China Yunnan Sunny Road and Bridge Company

Section 2: Thakhaek (Road No. 12 Intersection) – Savannakhet (Road No. 9 Intersection) (117km)

Contractor: Douangchaleun Development Construction Group

Section 3: Savannakhet (Road No. 9 Intersection) – Salavanh (Road No. 18 Intersection) (128km)

Contractor: Phousy Construction and Development Public Company

Section 4: Salavanh (Road No. 18 Intersection) – Pakse (82km)

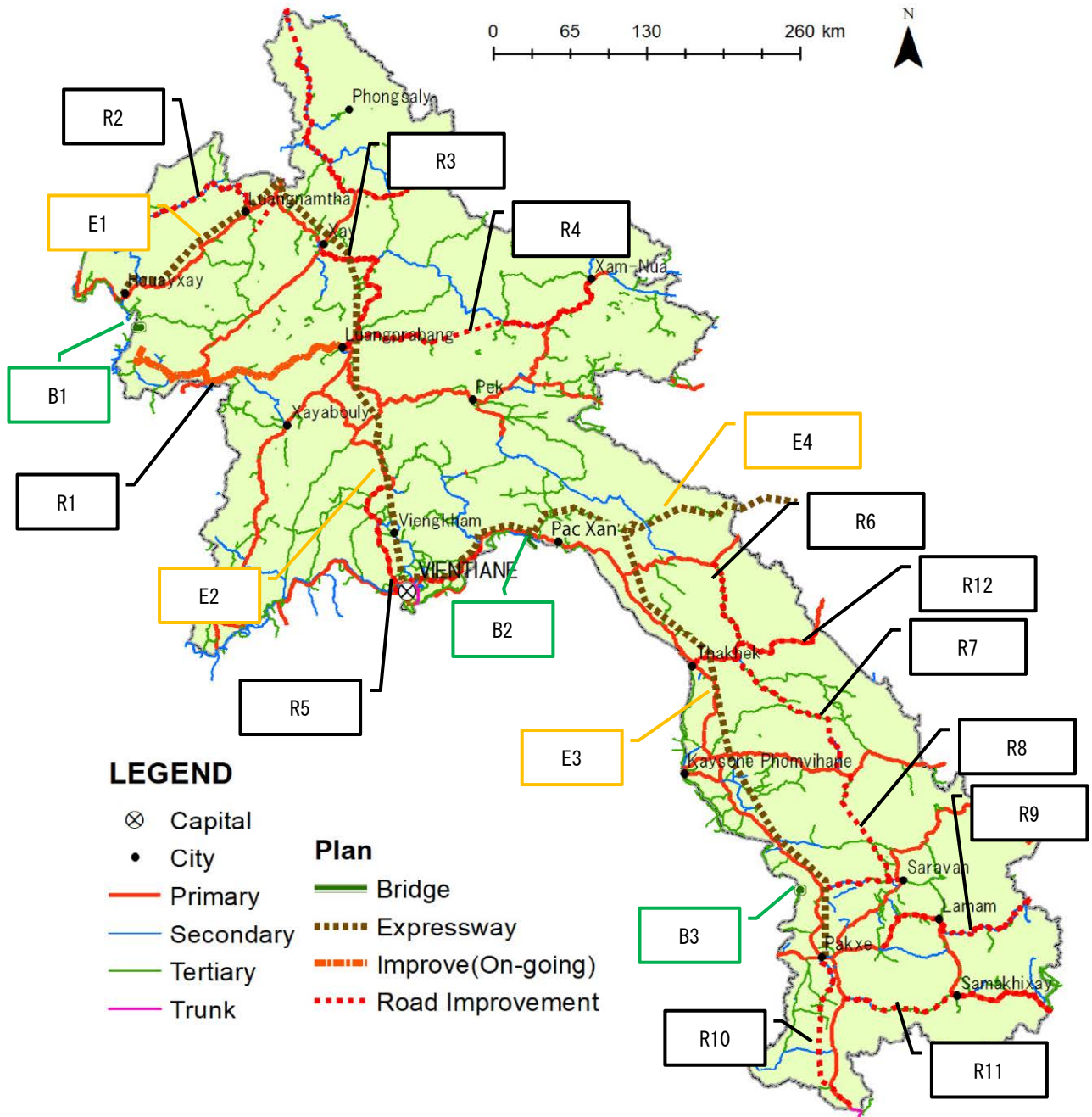
Contractor: China Road and Bridge Corporation

As mentioned above, surveys and development of North-South corridors centering on Vientiane has been promoted, especially with high involvement of China. On the eastern side starting from Vientiane, the expressway has been planned. The Hanoi-Vientiane expressway and Vientiane-Pakse expressway plans overlapped in the section between Vientiane and Pac Xan. However, since the section between Vientiane and Pac Xan is not included in the F/S of Vientiane-Pakse expressway, it is assumed that the route alignment of Hanoi-Vientiane expressway is given priority in the present situation. The route alignment of the Vientiane-Pakse expressway will be decided based on the F/S result.

In addition to these expressways, Thailand's NEDA has been preparing for financial assistance to the development of the 5th Thai-Lao Friendship Bridge ([B2] on the previous page) and for implementation of F/S and D/D on the upgrading project of NR 12 ([R12] on the previous page). In particular, since the 5<sup>th</sup> Thai-Lao Friendship Bridge project is designed to enhance connectivity of Thailand, Laos and Vietnam, it is imperative for the Hanoi-Vientiane expressway to coordinate well with this project.

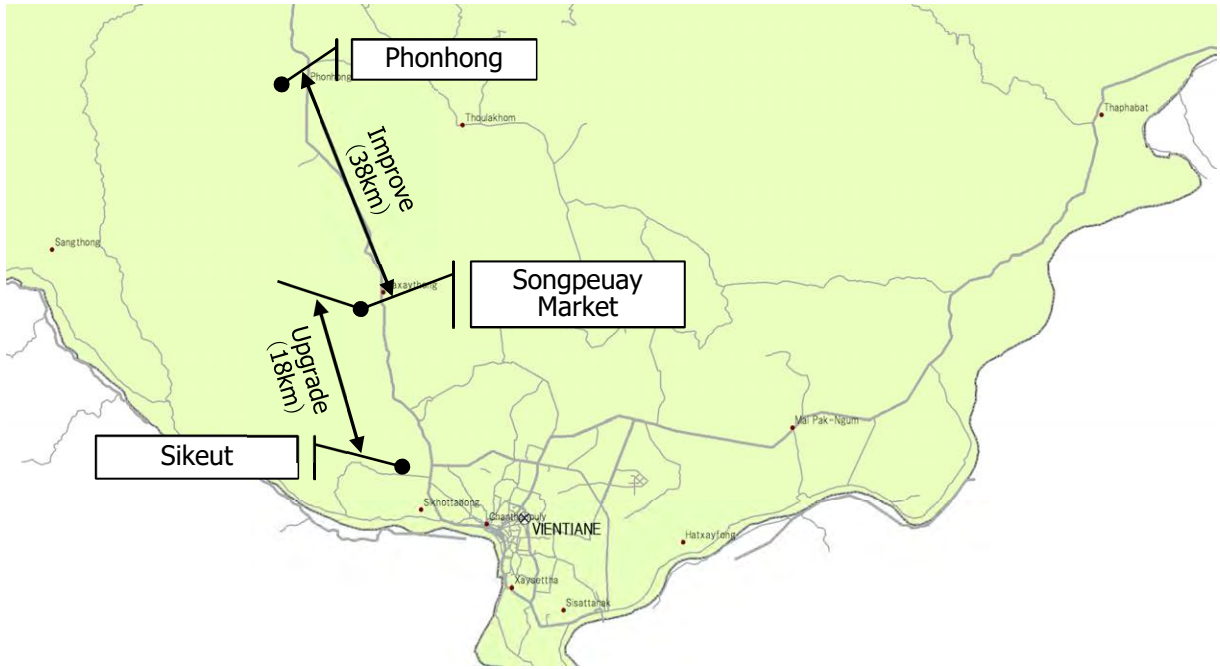
Laos has requested the Asian Infrastructure Investment Bank (AIIB) support (co-financing with the World Bank) for a project of the improvement of NR. 13, and the outline has been announced on the AIIB website. This project purpose is the improvement of maintenance and safety, as well as disaster prevention of NR No.13; and it consists of three components: (1) Road Improvement and Maintenance, (2) Supervision and Capacity Building, and (3) Project Management. The section between Sikeut and Songpeuay Market (18 km) is for road widening (from 2 lanes to 4 lanes), and the section between Songpeuay Market and Phonhong (38 km) for road improvement (Figure 2.2.2). Land expropriation for this project will be also conducted, and the result of environmental impact assessment of this project was announced on the MPWT website in February 2018. AIIB and the World Bank are financing USD 40 million each, the Nordic Development Fund is financing 9.5 million USD, and the hare of Laos is

USD 38.5 million. MPWT will be in charge of this project. The contract type is Output- and Performance-based Road Contract (OPBR), and ASEAN Standard is applied for road design. The AIIB Board will evaluate the necessity of the project in September 2018.



Source: JICA Study Team

**Figure 2.2.1 Road Network in Laos (Current and Future)**



Source: JICA Study Team

**Figure 2.2.2 Target Routes of National Road 13 Improvement and Maintenance Project**

## 2) Vietnam

The Ministry of Transport (MOT) is in charge of the road transport sector, and the Directorate for Roads (DOR), Vietnam Expressway Corporation, among others, develop or maintain road infrastructure. The current status of road improvement in Vietnam is shown in Table 2.2.3 and Table 2.2.4.

**Table 2.2.3 Road Classification, Length, Pavement Ratio**

Class	Administration	Road Length (km)	Pavement Ratio (%)
Expressway	MOT	—	
National road	DOR	15,360	61.7
Provincial road	Province	17,450	22.7
District road	Province	36,90	9.8
Urban road	People's committee	3,211	100.0
Commune road		132,055	2.2

Source: Project Finding Survey on Road Project for ASEAN International Corridor (2016, MLIT)

**Table 2.2.4 The Length by Pavement Type**

Class	Length (km)	AC	Co	Simple Pavement	Clashed Stone	Mud
National road	15,360	75	4,228	5,177	4,755	995
Provincial road	17,450	12	387	3,561	8,605	4,885
District road	36,950		53	3,558	17,932	15,362
Urban road	3,211		1,246	1,965		
Commune road	132,055			2,922	52,446	76,687

Source: Project Finding Survey on Road Project for ASEAN International Corridor (2016, MLIT)

According to the data collected from the Ministry of Finance and the Master Plan for Highway Network Development, Vietnam plans to construct about 6,400 km by the year 2020, mainly the North-South expressway. The standardization of national roads and improvement of the roads linking with GMS countries such as Laos, Cambodia, China, and ASEAN countries is also implemented.



Source: Ministry of Transport of Vietnam

**Figure 2.2.3 Future Expressway Network in Vietnam**

Although not confirmed in the above plan, both Laos and Vietnam side identified the Hanoi-Vientiane expressway as the highest priority project in their countries at the 21st GMS Ministerial Meeting held in July 2017.

### (3) Railway

The development status and future plans for the railway infrastructure of the government of Laos and Vietnam are as follows.

#### 1) Laos

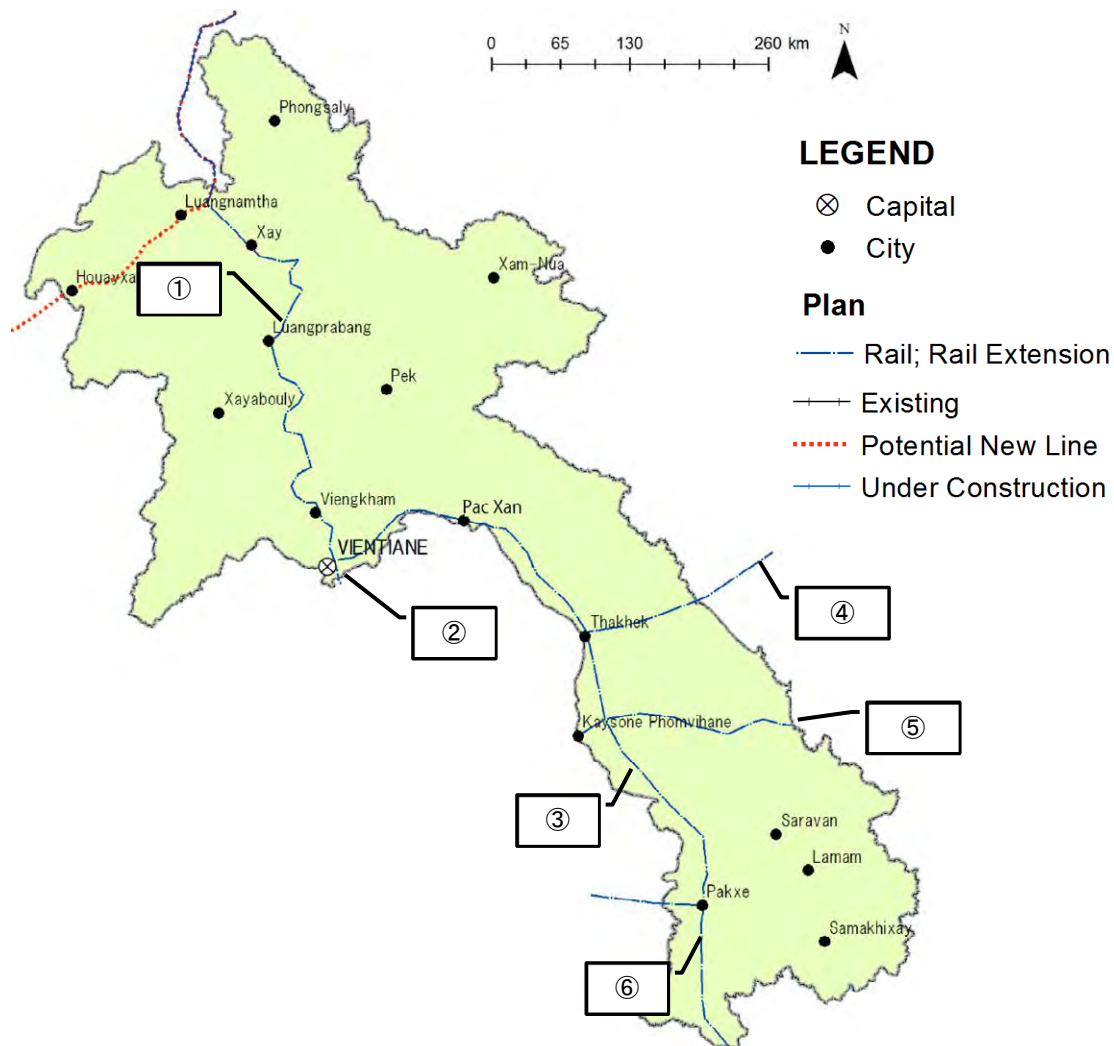
Laos has now only a 3.5 km railway connecting Nongkhai in Thailand and Thanalaeng in Laos. According to the interview with railway department of MPWT, the railway is service currently limited to only passengers (3,000 to 4,000 people/month). Starting freight transport from 2018 was under discussion because the demand for gasoline from Thailand is high. Regarding cargo, container yards and customs facilities have already been built and they have been operating since March 2017.

Meanwhile, the following six projects have been planned as a railway development plans related to Laos (some of those projects are being developed):

- ① Vientiane-Boten (Vientiane-Kumming) Railway Project, 414 km, (financing: 30% by Laos and 70% by China; progress: 10% (currently under construction))
- ② Thanalaeng-Nongkhai Railway Extension Project, 7.5 km (extending to Vientiane Station (Kamsabat Village), project schedule of commencement is in May 2018 and currently procuring consultants)
- ③ Thakhek-Savannakhet - Pakse - Vangtau (Lao-Thai border) Railway Project, 345 km (Pre-F/S has been completed by Korea. The F/S is under consideration, and currently no sources of funding.)

- ④ Vientiane-Thakaek-Mugia Vietnam border (Vientiane-Vung Ang), 455 km (F/S was completed by KOICA in November 2017. However, it is said that there is no intention of the Korean side to pursue the project, and situation is under the consideration of donors.)
- ⑤ Savannakhet-Lao Bao Railway Project, 220 Km (F/S completed, 50 years concession contract with a Malaysian company in 2012)
- ⑥ Pakse-Veunkham (Lao-Cambodia border), 150 km (under planning of pre-F/S, and no discussion on border connection with Cambodia has been implemented).

Figure 2.2.4 shows the railway network in Laos including planned railways. The alignments of the projects from ① to ⑥ outlined above are the same as those of the highway development plan in Laos, and it is assumed that some of the demand for passenger and logistics will shift to railway by implementing these railway projects.



Source: JICA Study Team

**Figure 2.2.4 Railway Network in Laos (Present and Future)**

## 2) Vietnam

The railway in Vietnam is currently operated by the state-owned railway, and the North-South railway between Hanoi City and Ho Chi Minh City is the main route. The railway network of Vietnam is shown in Figure 2.2.5. Frequency of operation is 14–22 per day (one way), of which cargo accounts for 10–12 per day (one way). According to VITRANSS 2, details of the extension of the North-South railway are shown in Table 2.2.5.

**Table 2.2.5 Basic Information of North-South Railway**

Section	Hanoi - Vinh	Vinh - Danang	Danang – Nha Trang	Nha Trang - HCMC
Track	Meter gauge (Single Track)			
Length (km)	319.0	472.4	523.5	411.3
Rail Crossing (No.)	294	272	269	238
Bridge	No.	127	270	487
	Length (m)	3,390	11,298	14,588
				5,667

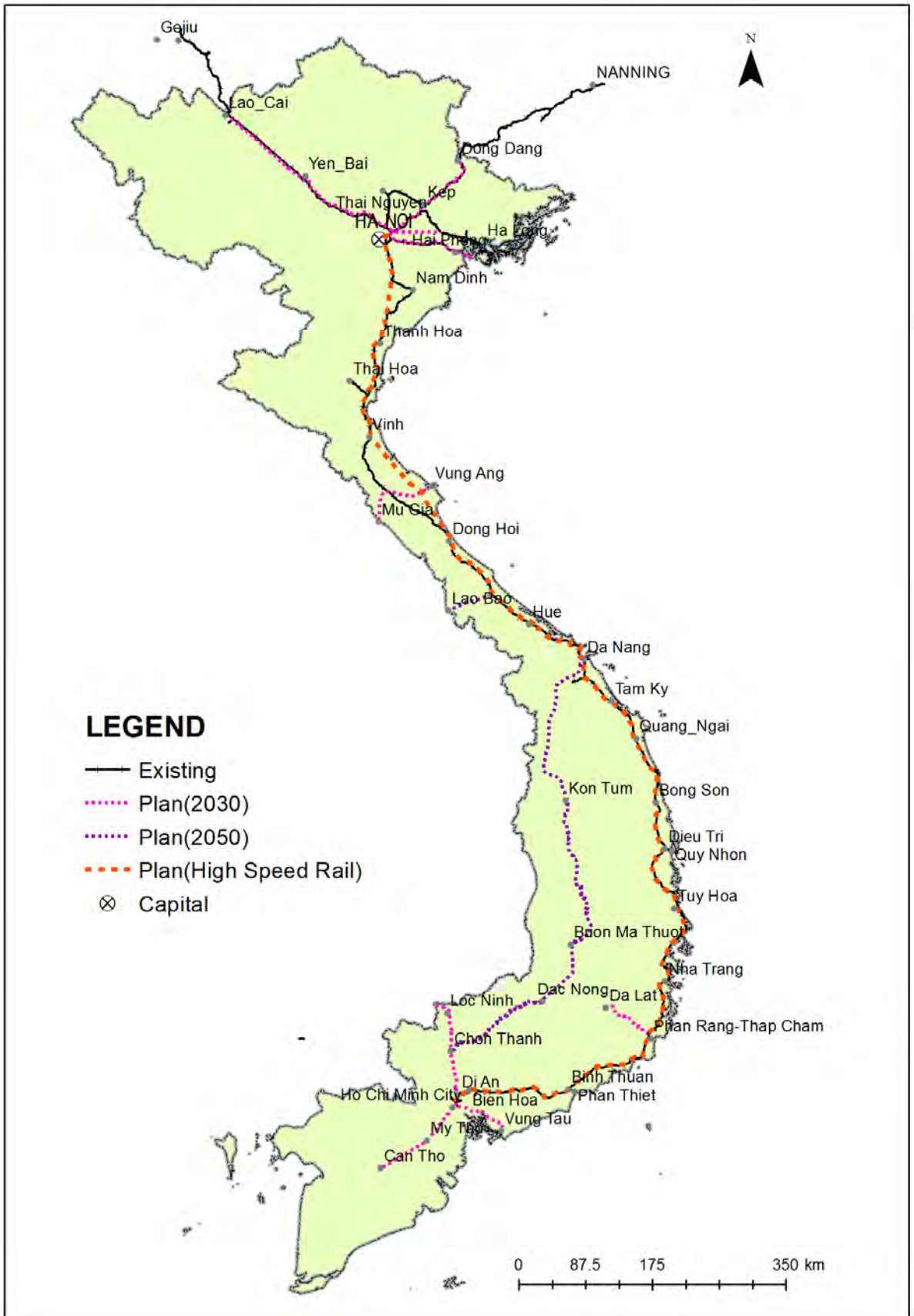
Source: VITRANSS2

Railway plan in Vietnam focuses on improving and modernizing the North-South railway (passenger: 80-90 km / h; cargo: 50-60 km / h). It is planned to conduct an investment plan survey in the following section from the viewpoint that proper investment plan is necessary for the improvement of the North-South high-speed railway while renovating and improving existing railway lines toward 2030. The target sections for this survey are;

- Lao Cai - Hanoi - Hai Phong
- Hanoi - Dong Dang
- Bien Hoa - Vung Tau
- Ho Chi Mihn - Can Tho
- Hai Phong - Lach Huyen Port Connection Railway
- North-South Axis
- Vung Ang – Mugia

The Government of Vietnam is also planning to consider routes connecting major harbors and logistics parks. In the 5th working group of TAR (Trans-Asian Railway) Network (June 2017), as a vision of 2050, modernization of the existing railroad network commensurate with passenger and freight demand, development of railway network and TAR network in the Central Highlands, development of railway network connecting logistics parks and important ports are listed. With the railway development plan in Laos, the Vietnamese plan is expected to enhance the connectivity of the railway network between the two countries. Meanwhile, the two countries are expected to negotiate on the operation railroad crossing the border and reach agreement on smooth cross-border services.

In addition to the above, major urban railway development projects, e.g. railway project of Hanoi, have been implemented.



Source: Prepared by JST based on the materials of GMS Portal and 5th working group of TAR Network

**Figure 2.2.5 Railway Network (Present and Future)**



#### (4) Port

The development status and future plans for port infrastructure of the government of Laos and Vietnam are as follows.

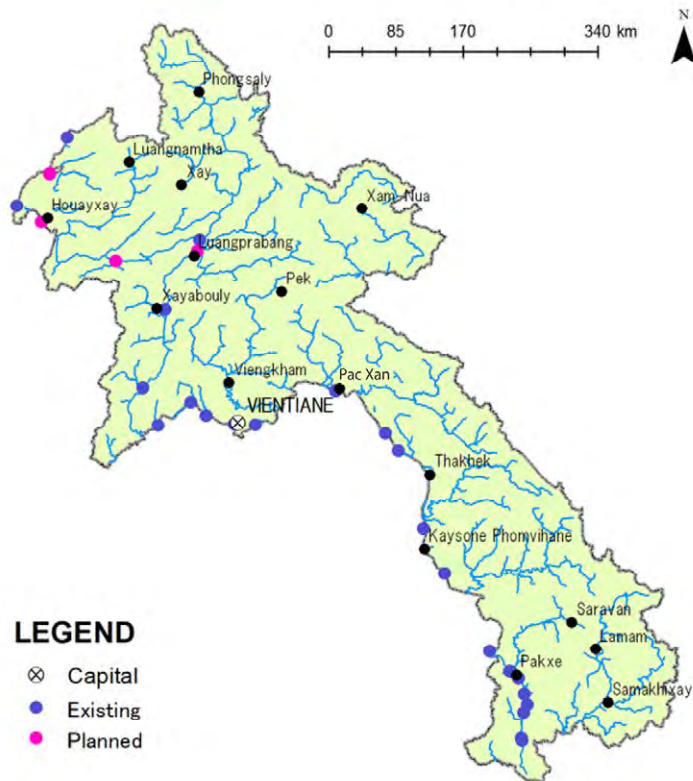
##### 1) Laos

According to the data collected from the MPWT Water Transport Bureau, the length of inland waterway in Laos is 333 km and there are 27 river ports. Although the demand of water transportation has decreased since the northern line of NR13 was completed, it is still important in the passenger and cargo transportation between Luang Prabang-Huayxay and Huayxay- Guan Lei (China). Waterway is now being recognized once again, because road transportation is facing maintenance and rehabilitation issues given the pace of deterioration of the road, besides traffic accidents. In the current situation, it is possible to operate shipping of 300 tons between China and Bokeo, 300 tons between Bokeo and Luang Prabang (in dry season) and 450 tons (in rainy season), 300–500 tons between Luang Prabang and Vientiane, 500–1,000 tons between Vientiane and Savannakhet. For example, as much as 100,000 tons of wood are exported per a month from Laos to Oji Paper Corporation in Japan (50,000 tons of woods are exported twice a month).



Source: Provided Document from MPWT Water Transport Bureau

**Figure 2.2.6 Situation of River Port in Laos**



Source: Prepared by JST based on the documents from MPWT Water Transport Bureau

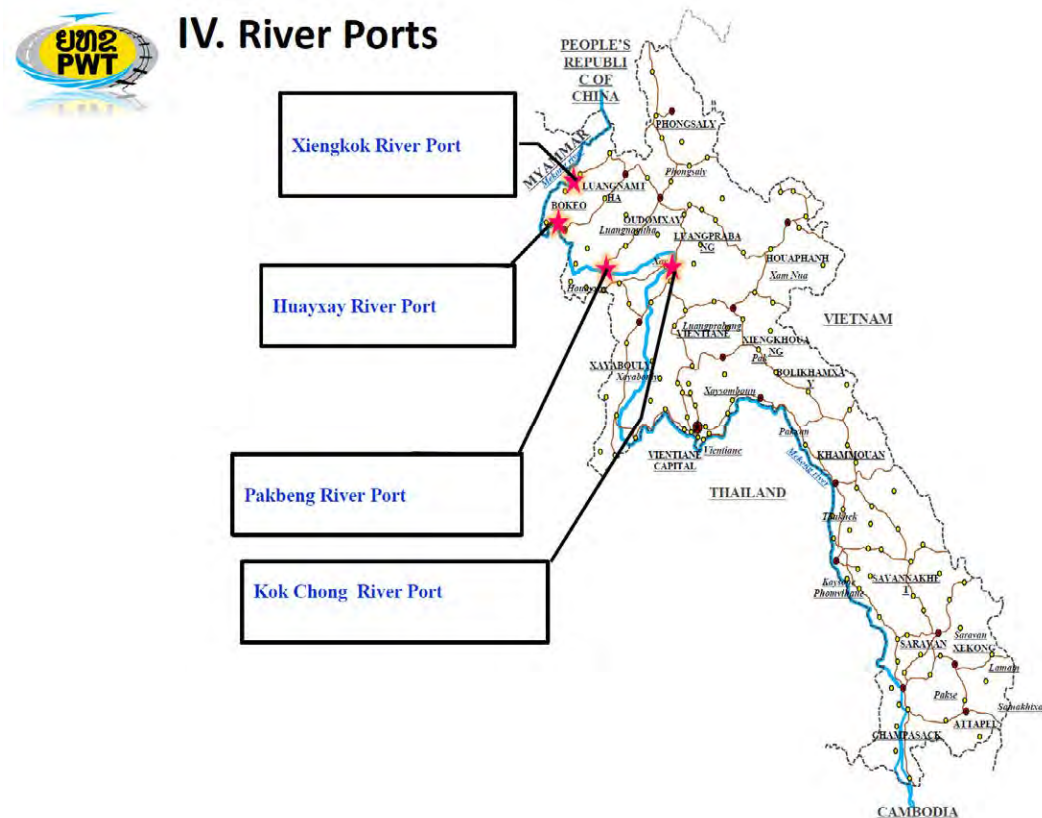
**Figure 2.2.7 Location of River Port in Laos**

Four river ports are planned to be developed in the future: (1) Xiengkok Port, (2) Pakbeng Port, (3) Luang Prabang port (Kok Chong), and (4) Houayxai Port. Although details of ④ are unknown, but in ① –③ are planned to serve both for passengers and cargos. Facilities and buildings will be developed followed proper standard, and inspection and communication facilities and equipment will also be introduced. Other water transportation services for the region will be provided.



Source: Provided Document from MPWT Water Transport Bureau

**Figure 2.2.8 Development Plan of Xiengkok port, Pakbeng port, and Luang Prabang Port**



Source: Provided Document from MPWT Water Transport Bureau

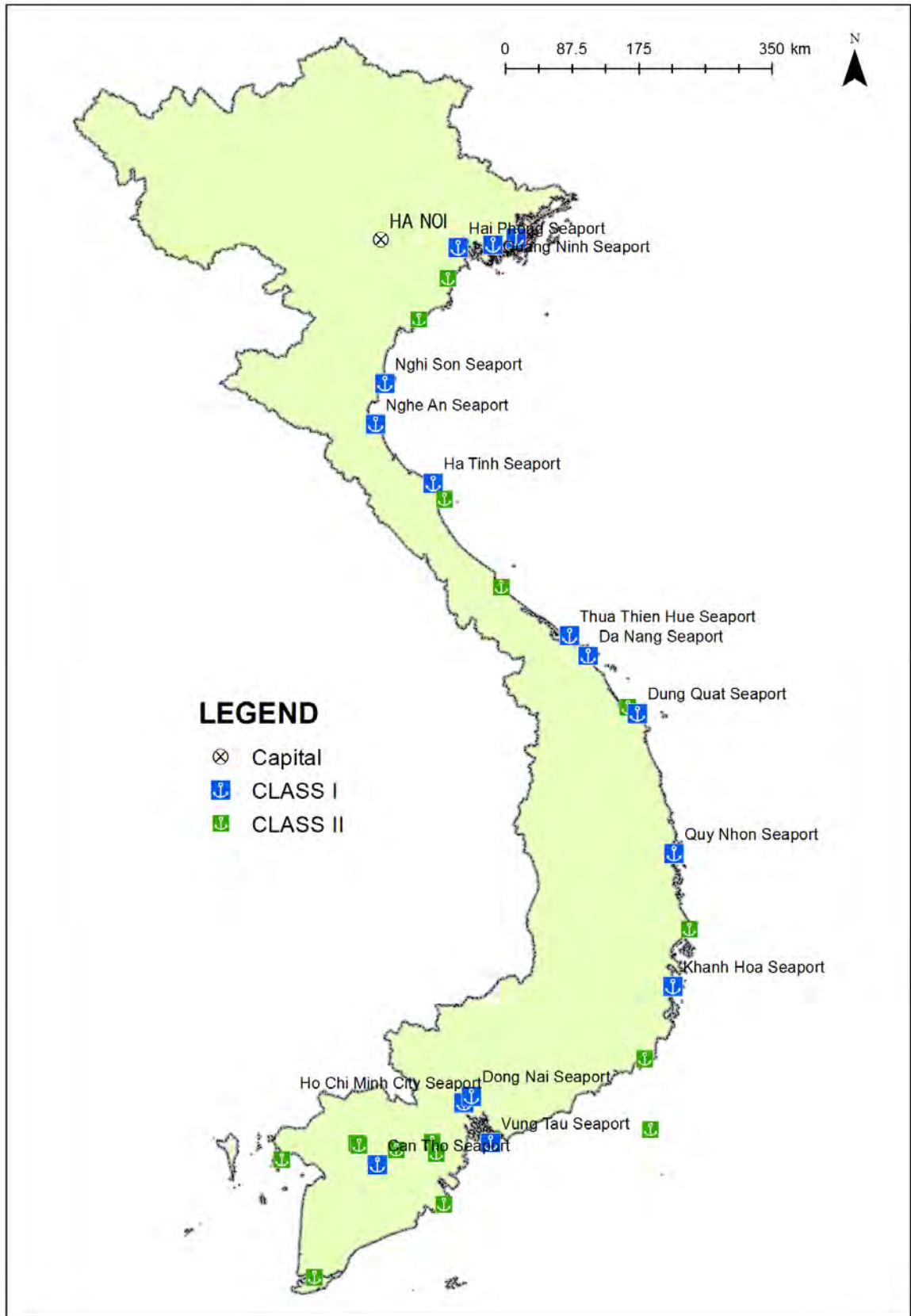
**Figure 2.2.9 Location of New River Port in Laos**

Since Laos is an inland country, the country depends on other countries for its imports and exports, and land transportation accounts for 90% of the imports and exports. Laos used mainly the routes from Thailand or Vietnam (Vung Ang port) to access the ports for importing and exporting, but both routes require clearance procedures. Although inland waterway is an important mode of transportation and trade, there are some issues of restrictions on transportation such as low tide and waterfall. Under such circumstances, the National Economic Development Plan and the GMS Program put high priority to road improvement projects and simplification of customs clearance.

## 2) Vietnam

According to the Vietnam Maritime Administration (VINAMARINE), there are a total of 228 ports in Vietnam, and 31 of them are CLASS I and CLASS II ports. The location of major ports are shown in Figure 2.2.10. CLASS I is defined as “large-scale port that contributes to socio-economic development of the country and region”, and CLASS II is defined as "mid-sized port that contributes to regional and regional socioeconomic development" in "VIETNAM MARITIME CODE".

According to the data collected from the Ministry of Finance of Vietnam, the development of the Lach Huyen port (capacity up to 100,000 DWT) in the northern part of Vietnam, upgrade of the port facility in the central part of Vietnam (Nghì Son, Cua Lo, Vuing Ang, Danang, Dung Quat, Quy Nhon), the development of international passenger terminals (Hue, Danang, Nha Trang), and the attracting of overseas investment in Van Phong Port, the development of Cai Mep-Thi Vai port (capacity up to 100,000 DWT) and improvement based on the master plan in the southern part of Vietnam are listed. Regarding the river ports, improvement of important routes (Red River, Thai Binh river) and development and improvement of ports (Ninh Phuc, Da Phic, Viet Tri, Hoa Binh, Phu Dong Container Port) in northern Vietnam, improvement of important riverways in central Vietnam, the development of important routes (Ho Chi Minh to Cuu Long Delta, Tien River, Hau River), new ports, containers and passenger terminals in the south Vietnam are listed.



Source: Prepared by JST based on the GMS Portal and VINAMARINE Website

**Figure 2.2.10 Location of Seaport in Vietnam (as of April, 2016)**

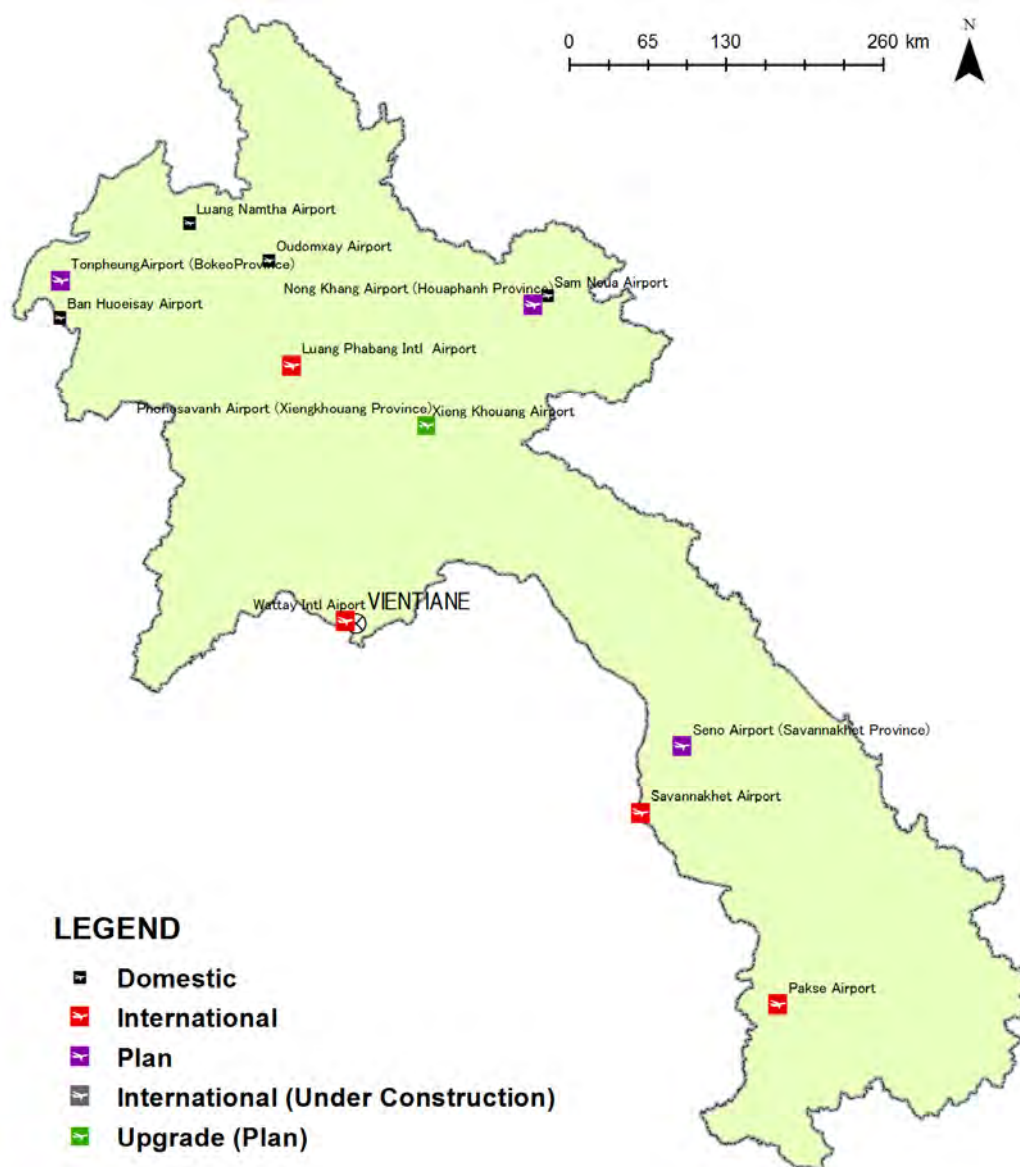
## (1) Airport

The development status and future plans for the airport infrastructure of the government of Laos and Vietnam are as follows.

### 1) Laos

Currently, there are nine airports in Laos. Four of them are international airports, and they are located in Vientiane, Luang Prabang, Savannakhet and Pakse. According to the Department of Transport, MPWT, there are 12 routes in Laos and 350 to 400 flights/day.

As for the future plan, there are four expansion or improvement plans other than the Wattay International Airport which is currently under expansion (Tonpheung Airport Development, Nong Khang Airport Development, Seno Airport Development (Seeking fund for construction), upgrading Phonesavanh Airport (Seeking fund for construction)). However, due to lack of funds for development, the timing of project implementation is unknown. Figure 2.2.11 shows the location of the airports including the planned ones.



Source: Prepared by JST based on the GMS Portal and material provided by MPWT

**Figure 2.2.11 Location of Airport in Laos (Present and Future)**

## 2) Vietnam

There are 23 airports in Vietnam, and 11 of them are international airports.

**Table 2.2.6 Main Airport in Vietnam**

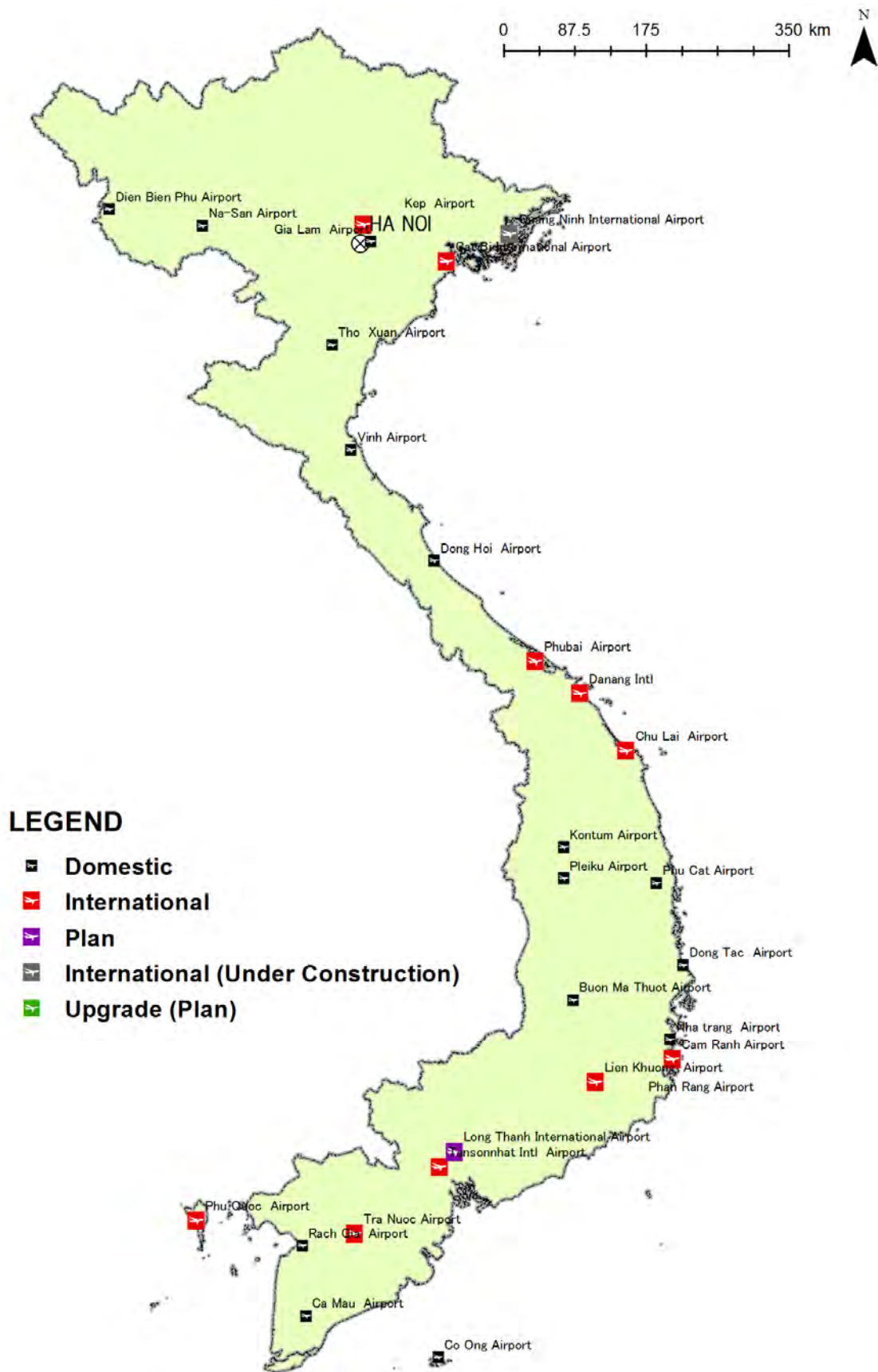
International Airport	Domestic Airport
Can Tho	Buon Ma Thuot
Chu Lai	Ca Mau
Lien Khuong (Da Lat)	Co Ong (Con Dao)
Da Nang	Dien Bien Phu
Cat Bi (Haiphong)	Dong Hoi
Noi Bai (Hanoi)	Pleiku
Tan Son Nhat (Ho Chi Minh City)	Phu Cat (Qui Nhon)
Phu Bai (Hue)	Rach Gia
Cam Ranh (NhaTrang)	Na san (Son La)*
Phu Quoc	Dong Tac (Tuy Hoa)
Vinh	Vung Tau
	Tho Xuan (Sao Vang)

\*: Currently, it is not used, and it is under planning of re-maintenance

Source: Prepared by JST based on the collected document

Regarding airport-related development, improving the navigation route and the operation of existing airports in Hanoi and Ho Chi Minh, the possibility of improving the Noi Bai and Cat Bi international airports and the possibility of developing the Quang Ninh Airport in the northern Vietnam, improvement of Da Nang International Airport and Cam Ran Airport and improvement of operation related to international transportation of Lien Khuong Airport in central Vietnam, improvement of operation of Tan Son Nhat International Airport and improvement of Long Thanh International Airport in the southern Vietnam are listed.

The situation of airport development in Vietnam including the ones mentioned above is shown in Figure 2.2.12.



Source: Prepared by JST based on the GMS Portal and collected Documents

**Figure 2.2.12 Location of Airports in Vietnam (Present and Future)**

**2.2.2 Information Collection of Reginal Railway Development Plan**

**(1) Plan overview and development schedule**

The regional railway plan in Laos and Vietnam includes Vientiane-Boten railway and Vientiane-Vung Ang railway. In addition to this, there are railway plans of Thanalaeng-Nongkhai (9 km), Savannakhet-Lao Bao (220 km), Pakse-Ubon (120 km), but these are under discussion, under F/S stage, or seeking donor. The above rough positional relationship is described in "2.2.1 (3) Railway".

**1) Vientiane-Boten railway**

The Vientiane-Kunming Railway is designated in the Trans-Asian Railway Network of UNESCAP. A Chinese consultancy conducted the F/S of the Vientiane-Boten railway, which is the section on the Laos side, and it was completed in July 2016. A concession contract was concluded in December 2016, and it will be implemented by joint investment (Laos 30% of the investment, and China 70%). Construction started in December 2017, and Table 2.2.87 shows the outline of this route. The route alignment proposed in the F/S report is shown in Figure 2.2.13.

**Table 2.2.7 Outline of Vientiane-Boten Railway**

Classification	Level I	Length of main line	427.201 km
Track	Single	Operation length	420.874 km
Operation Speed	Passenger : 160–200 km/h Freight : 120 km/h	No. of Bridges	170
Standard	Standard Guege (1,435mm)	No. of Tunnels	72
No. of Station	33	Length of Bridge and Tunnel	252.071 km
		Ratio of Bridge and Tunnel	59.01%

Source: New Boten–Vientiane Railway Feasibility Study General Report (2016)



Source: Prepared by JST based on the “New Boten–Vientiane Railway Feasibility Study General Report (2016) ”

**Figure 2.2.13 Proposed Route**



In the F/S report, initial (2025), short-term (2030), and long-term (2040) stages were set, and the demand and necessary number of vehicles on this line were estimated after conducting the demand forecast of passenger and freight in each period.

**Table 2.2.8 Result of Demand Forecast of Freight**

(Unit:10<sup>4</sup> ton)

Section	Preliminary Stage (2025)		Short Term (2030)		Long Term (2040)	
	Freight flow density		Freight flow density		Freight flow density	
	Up	Down	Up	Down	Up	Down
Boten ~ Muang Xai	560	360	965	580	1450	820
Muan Xai ~ Luang Prabang	557	352	938	570	1382	805
Luang Prabang ~ Vang Viang	547	394	905	615	1285	1050
Vang Viang ~ Vientiane	539	437	875	638	1240	995
Vientiane ~ Border of Laos and Thailand	410	268	595	481	1056	825

Source: New Boten–Vientiane Railway Feasibility Study General Report (2016)

**Table 2.2.9 Passing Traffic Volume of Vientiane - Boten and Necessary Number of Vehicles**

Section	Preliminary Stage (2025)		Short Term (2030)		Long Term (2040)	
	Passenger Flow Density (10 <sup>4</sup> persons/year)	Passenger Train (pair/day)	Passenger Flow Density (10 <sup>4</sup> persons/year)	Passenger Train (pair/day)	Passenger Flow Density (10 <sup>4</sup> persons/year)	Passenger Train (pair/day)
Boten ~ Muang Xai	59	2	125	5	195	8
Muan Xai ~ Luang Prabang	60	2	128	5	204	8
Luang Prabang ~ Vang Viang	85	3	177	7	248	10
Vang Viang ~ Vientiane	87	3	182	7	254	10
Vientiane ~ Border of Laos and Thailand	132	4	197	7	322	12

Source: New Boten–Vientiane Railway Feasibility Study General Report (2016)

Based on the toll revenues and operating costs of passenger and freight transport services, financial analysis was conducted for a calculation period of 55 years. The results are shown in Table 2.2.10. The IRR is as low as 3.93%, and the collection period requires 35 years. The F/S report has concluded that the financial feasibility is poor because the analysis suggest that the project shows a deficit after six years from the start of operation.

**Table 2.2.10 Result of Financial Analysis in F/S report**

Item	Unit	Index
Interest Rate	%	3%
IRR of project investment (after tax)	%	3.93%
Payback period of project investment (after tax)	Year	29.39
IRR of capital fund	%	4.38%
Repayment period of capital fund (including construction period)	Year	34.63
Loss year (excluding construction period)	Year	6
Total loss	100 mil RMB	39.7
Maximum financing gap at operation period	100 mil RMB	159.9
Total payback period of loan (including construction period)	Year	30
Cumulative after-tax profit at operation period	100 mil RMB	677.0

\*: RMB = Renminbi

Source: New Boten–Vientiane Railway Feasibility Study General Report (2016)

On the other hand, according to the results of the economic analysis, the EIRR is 24.57%, which is economically feasible. Moreover, the sensitivity analysis shows EIRR of more than 20% in all cases confirm the benefits.

**Table 2.2.11 Result of Economic Analysis in F/S report**

EIRR	Increase and decrease (%)				
	-20	-10	0	10	20
Change factors					
Traffic volume	22.35	22.58	24.57	26.37	25.51
Investment for civil works	25.37	25.38	24.57	23.79	24.17

Source: New Boten–Vientiane Railway Feasibility Study General Report (2016)

The F/S report shows that this railway project has financial problems, but economically feasible and demand is also high. Therefore, they conclude that it is desirable to develop this railway, which also contributes to the future growth in ASEAN region.

## 2) Vientiane-Vung Ang Railway

Vientiane-Vung Ang railway constitutes part of Singapore-Kunming rail line (SKRL) proposed at the ASEAN Summit. On this line, a F/S survey was conducted by KOICA from 2015 to 2017.



Source: Feasibility Study for the Railway Link from Vientiane in the Lao PDR to Vung Ang in Vietnam Final Report (draft)

**Figure 2.2.14 Route Map (Left: SKRL, Right: Target Route of F/S)**

In the F/S study, based on route alignment and topographical conditions, three applicable technical standards were examined, and then optimum route with its proper standard was selected. Alternative (3) is the economically feasible, but considering the fact that the traveling speed and the number of passengers decrease, the F/S concluded that alternative (2) is the best route.

Regarding the construction section, two scenarios were considered: Vientiane-Vung Ang as a Scenario 1, and Thakhek-Vung Ang as a Scenario 2. In the case of Scenario 1, the total number of stations are 44.

**Table 2.2.12 Examined Three Technical Standards**

Classification		Alternative 1 (Electric Railroad)	Alternative 2 (Electric Railroad)	Alternative 3 (Not Electric Railroad)
Maximum speed (when it is inevitable)		200km/h (150km/h)	150km/h (120km/h)	120km/h (80km/h)
Gauge		Standard Gauge (1,435mm)	Standard Gauge (1,435mm)	Standard Gauge (1,435mm)
Ballast		Ballasted track	Ballasted track	Ballasted track
Minimum curve radius		2,000m (1,200m) When it is inevitable :400m	1,200m (800m) When it is inevitable :400m	800m (400m)
Slope	Main Line	10% less than When it is inevitable :15% less than	12.5% less than When it is inevitable :15% less than	15% less than When it is inevitable :25% less than
	Station	1.5% less than	1.5% less than	1.5% less than
Vertical curve		14,000m	8,000m	5,000m
Formation level width		Entire width : Over 8.5m	Entire width : Over 8.0m	Entire width : Over 7.0m

Source: Material of F/S Workshop



Classification		Alternative 1 V=200km/h (150km/h)			Alternative 2 V=150km/h (120km/h)			Alternative 3 V=120km/h (80km/h)		
		Laos	Vietnam	Total	Laos	Vietnam	Total	Laos	Vietnam	Total
Structures	Earthwork	402.15km (95.69%)	47.46km (49.27%)	449.61km (87.03%)	441.42km (97.66%)	58.15km (5.66%)	499.57km (90.05%)	442.60km (98.32%)	72.66km (66.25%)	515.25km (92.04%)
	Bridge	4.31km (1.03%)	6.91km (7.17%)	11.22km (2.17%)	8.50km (1.88%)	6.96km (6.77%)	15.46km (2.79%)	5.43km (1.21%)	7.76km (7.07%)	13.18km (2.36%)
	Tunnel	13.82km (3.29%)	41.96km (43.56%)	55.78km (10.80%)	2.07km (0.46%)	37.63km (36.63%)	39.70km (7.16%)	2.14km (0.48%)	29.26km (26.67%)	31.40km (5.60%)
Total		420.28km (81.35%)	96.33km (18.65%)	516.61km	451.98km (81.48%)	102.74km (18.52%)	554.72km (+38.11km)	450.16km (80.41%)	109.67km (19.59%)	559.83km (+43.22km)



Classification		Alternative 1 V=200km/h (150km/h)			Alternative 2 V=150km/h (120km/h)			Alternative 3 V=120km/h (80km/h)		
		Laos	Vietnam	Total	Laos	Vietnam	Total	Laos	Vietnam	Total
Structures	Earthwork	104.42km (88.13%)	47.46km (49.27%)	151.88km (70.70%)	132.49km (95.19%)	58.15km (56.60%)	190.64km (78.80%)	135.40km (97.44%)	72.66km (66.25%)	208.06km (83.68%)
	Bridge	1.54km (1.30%)	6.91km (7.17%)	8.45km (3.93%)	5.83km (4.19%)	6.96km (6.77%)	12.79km (5.28%)	2.69km (1.94%)	7.76km (7.07%)	10.45km (4.20%)
	Tunnel	12.52km (10.57%)	41.96km (43.56%)	54.48km (25.36%)	0.87km (0.63%)	37.63km (36.63%)	38.50km (15.91%)	0.86km (0.62%)	29.26km (26.67%)	30.12km (12.11%)
Total		118.48km (55.16%)	96.33km (44.84%)	214.81km	139.17km (57.53%)	102.74km (42.47%)	241.92km (+27.11km)	138.96km (55.89%)	109.67km (44.11%)	248.63km (+33.82km)

Source: Material of F/S Workshop

**Figure 2.2.15 Construction Section (Upper: Scenario 1, Under: Scenario 2)**

In the F/S, no definite conclusion is drawn as to the best scenario. The report presents Scenario 1 as a basic scenario and Scenario 2 as an alternative which should be considered depending on budgetary situation. In Scenario 1, a total construction cost of 5,062 million USD is required.

**Table 2.2.13 Total Construction Cost by each Scenarios**

Scenario 1			(unit : 1,000,000 USD)						
Classification	Alternative 1 V=200km/h (150km/h)			Alternative 2 V=150km/h (120km/h)			Alternative 3 V=120km/h (80km/h)		
	Laos	Vietnam	Total	Laos	Vietnam	Total	Laos	Vietnam	Total
① Construction	2,500	1,124	3,624	2,423	1,110	3,533	1,986	1,022	3,008
② Incidental cost	295	138	433	285	136	421	251	125	376
③ Rolling stock	279	64	343	259	59	318	203	47	250
④ VAT(①+②)x10%	280	126	406	270	125	395	223	115	338
⑤ Contingency allowance	280	126	406	270	125	395	223	115	338
Summary of Total Project Cost	3,634	1,578	5,212	3,507	1,555	5,062	2,886	1,424	4,310

Scenario 2			(unit : 1,000,000 USD)						
Classification	Alternative 1 V=200km/h (150km/h)			Alternative 2 V=150km/h (120km/h)			Alternative 3 V=120km/h (80km/h)		
	Laos	Vietnam	Total	Laos	Vietnam	Total	Laos	Vietnam	Total
① Construction	907	1,124	2,031	908	1,110	2,018	781	1,022	1,803
② Incidental cost	112	138	250	112	136	248	98	125	223
③ Rolling stock	88	64	152	63	59	122	70	47	117
④ VAT(①+②)x10%	102	126	228	102	125	227	88	115	203
⑤ Contingency allowance	102	126	228	102	125	227	88	115	203
Summary of Total Project Cost	1,311	1,578	2,889	1,287	1,555	2,842	1,125	1,424	2,549

Source: Material of F/S Workshop

The passenger and freight traffic demand of the Scenario 1 and Scenario 2 from 2025 to 2045 was forecast. The forecast shows high grow rates of the traffic from 2025 to 2045; in Scenario 1, the passenger traffic increased by 1.6 times and the freight doubled, and in Scenario 2 the passenger traffic increased by 1.8 times and freight by 1.9 times.

**Table 2.2.14 Result of Passenger and Freight Demand Forecast by Scenario**

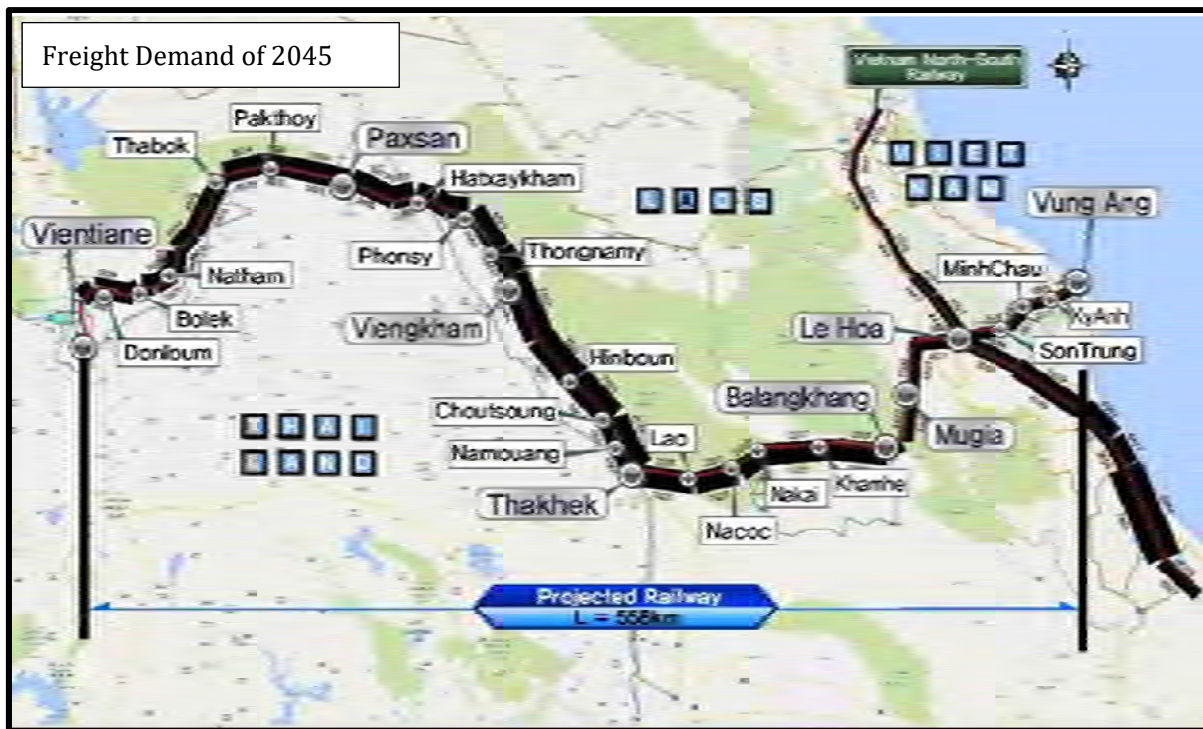
Scenario 1						
Classification	Passenger(persons/day)			Freight (Tons/day)		
	2025	2035	2045	2025	2035	2045
Normal Growth (A)	15,150	18,623	21,914	15,963	23,482	30,596
High Economic Growth (B)	18,095	23,028	29,808	30,395	46,227	63,186
Variation (B-A) (Variation rate of change)	2,945 (19.4%)	4,405 (23.7%)	7,894 (36.0%)	14,432 (90.4%)	22,745 (110.6%)	32,590 (106.5%)

Scenario 2						
Classification	Passenger(persons/day)			Freight (Tons/day)		
	2025	2035	2045	2025	2035	2045
Normal Growth (A)	6,182	7,429	8,812	9,587	14,944	19,679
High Economic Growth (B)	6,303	8,428	11,036	22,016	31,467	42,603
Variation (B-A) (Variation rate of change)	121 (1.9%)	949 (25.2%)	2,224 (25.2%)	12,429 (129.6%)	16,523 (110.6%)	22,924 (116.5%)

Source: Material of F/S Workshop

According to the F/S report, the Vientiane-Vieng Kham section has high passenger demand, and Vieng Kham-Thakhek section has high freight demand. There is a certain level of freight demand continuing through Vientiane to Vung Ang port. This goes true for Thakhek-Vung Ang section, although passenger demand for the same section is relatively low.



Source: Feasibility Study for the Railway Link from Vientiane in the Lao PDR to Vung Ang in Vietnam Final Report (draft)

**Figure 2.2.16 Traffic Assignment of Passenger and Freight Demand between Vientiane and Vung Ang**

Port

The economic analysis based on the demand forecast result show that NPV, B/C and EIRR barely exceed the criteria in the high growth case of Scenario 2, and Scenario 1 is not economically feasible.

**Table 2.2.15 Result of Economic Analysis**

(unit : million USD)						
Classification		D/C Cost	D/C Benefit	NPV	IRR	B/C
Scenario 1	Normal Growth	2,303	1,037	-1,266	5.2%	0.45
	High Growth	2,358	1,615	-742	8.6%	0.69
Scenario 2	Normal Growth	1,289	879	-402	8.5%	0.69
	High Growth	1,306	1,353	462	12.3%	1.04

Source: Material of F/S Workshop

In the financial analysis, the PIRR of Scenario 1 is 3.0% to 6.0% and the repayment period is 23 years to 35 years, and the PIRR of Scenario 2 is 0.3% to 5.3% and the repayment period is 25 years to 49 years. Both scenarios have low profitability, and F/S concluded that an approach such as ODA or subsidies is necessary because it is difficult only to rely on private capital arrangements such as BOT.

**Table 2.2.16 Result of Financial Analysis**

	Scenario 1		Scenario 2	
	Normal growth	High growth	Normal growth	High growth
P-IRR (pre-tax)	3.00%	6.11%	0.34%	5.33%
P-IRR (after-tax)	2.68%	5.52%	0.18%	4.83%
ROE	2.27%	6.38%	N/A	5.35%
Payback period (years)	35.0	23.0	49.0	25.0
Number of cash shortfalls	31	◇	45	◇
Max. cash shortfall (mil. USD)	(2,078)	◇	(3,273)	◇

Source: Material of F/S Workshop

## (2) Socio-economic effect of railway construction for community

In the above two railway construction plans, although the passenger and freight traffic demand is forecast to be high, their profitability is low and not attractive to the private sector. On the other hand, both plans show a certain socioeconomic effect of the railway construction.

In the report of New Vientiane-Boten railway, the expenses of passenger and freight transportation by different modes (after the railway construction) were compared, and it was found that the railway transportation would be low compared with those of land, water, and air transportation as shown in Table 2.2.17.

**Table 2.2.17 Comparison of Transportation Cost between Vientiane-Boten**

Transport mode	Passenger transport cost		Freight transportation cost	
	Unit Price (RMB/person · km)	Total Price (RMB/person)	Unit Price (RMB/ton · km)	Total Price (RMB/ton)
Railway (415km)	0.30	125	0.50	207
Existing Highway (731km)	0.20~0.30	146~219	0.80~1.20	585~877
Transportation on Mekong River (Jinghong to Vientiane about 1,000km)	-	-	0.4~0.5	400~500
Aviation (Jinghong to Vientiane about 483km)	1.0~1.5	483~724	2.0~4.0	966~1,932

\*: RMB = Renminbi

Source: New Boten – Vientiane Railway Feasibility Study General Report (2016)

The railway construction will reduce the vehicle operating cost and the travel time cost (Table 2.2.18) by the traffic shifting from the road. In the F/S report of the Vientiane-Vung Ang Railway, these saving benefits were estimated as well as the reduction of traffic accident expenses and emission gas of CO2.

**Table 2.2.18 Result of Benefit of Reduction of Travel Time**

Classification		(unit : thousand USD)						
		Without project		With project		VOTS		
		Road	Rail	Road	Rail	Road	Rail	Total
Normal	2025	539,119	0	352,217	33,310	186,902	-33,310	153,591
Economic	2035	686,144	0	450,788	41,089	235,356	-41,089	194,267
Growth	2045	859,232	0	567,512	50,690	291,720	-50,690	241,030
High	2025	608,103	0	361,839	40,639	246,264	-40,639	205,625
Economic	2035	834,992	0	500,621	55,782	334,371	-55,782	278,589
Growth	2045	1,151,211	0	698,703	73,274	452,508	-73,274	379,233

Source: Feasibility Study for the Railway Link from Vientiane in the Lao PDR to Vung Ang in Vietnam, Final Report (draft)

UNESCAP and the GMS meeting also pointed out the necessity of railway construction for the area concerned. Figure 2.2.17 shows the missing link of the railway in the GMS region, and ADB and GMS countries designate these nine routes as priority railway projects (Route 5 and Route 6 are Vientiane-Boten railway and the Vientiane-Vung Ang railway, respectively). The construction of these missing links of the railway network in the GMS will strengthen the connectivity of Laos and neighboring countries.



Source: Connecting the Railways of the Greater Mekong Subregion, Technical Assistant Report (2016, ADB)

**Figure 2.2.17 Priority Railway Link in GMS Region**

Also, since the Hanoi-Vientiane expressway runs in parallel with the Vientiane-Vung Ang railway, it is expected that there will be a certain level of competition for passengers and logistics demand between the two modes. If one of them is developed earlier than the other, the schedule of the latter project is inevitably affected due to demand competition or financial availability. However, because of the differences of transport property between road (expressway) and railway, it is not difficult for both to be fully utilized at the same time. On the contrary, it is possible that the development of both transport modes strengthens the level of regional transport services and then region-wide development is promoted, leading to the demand increase for both transport modes. Also, the coordination between logistics hubs along the expressway/railway (e.g. Vientiane, Thakhek and Pakse, etc.) and the transport facilities are necessary for establishing a more efficient logistics system.



## 2.2.3 Current Status and Issues of Major Ports (Vung Ang Port, Nghi Son Port, Cua Lo Port)

### (1) Current status of each port

According to the interviews and information collected, the current status of major port in Vietnam having high relevance to Laos, Vung Ang port, Nghi Son port, and Cua Lo Port, are summarized as follows.



Source: JICA Study Team

Figure 2.2.18 Location of Vung Ang Port, Nghi Son Port, Cua Lo Port

#### 1) Vung Ang Port

Vung Ang Port is a deep-sea port in the central part of Vietnam which opened in 2001, and it was developed by joint investment with the Vietnamese side share of 80% and Lao side share of the remaining 20% (total approximately 1 billion yen). From 2010, a joint stock company is operating, and port facilities are also operated jointly by both countries. According to an interview with the MPWT Water Transport Bureau, the share of the Laos side will be increased to 47% at the latest by 2019.

The main exports items from Vung Ang are mainly iron ore, potassium, and woods, and imports are mechanical equipment, construction materials (iron etc.), coal, and fuel. The main export destinations are Australia, China and Japan, and imports are almost all from China. Vung Ang Port plays an important role as an international port. Regarding the share of goods to/from Vietnam and Laos, Lao side accounts for 25% for both exports and imports (and Vietnam the remaining 75%). According to an interview with the Viet-Lao Joint-Stock Company which is operating the Vung Ang Port, the amount of cargo handled had been low until 2010, but increased since then, and currently they cannot deal with demand. Customs clearance service is provided at Vung Ang Port, but only for entering Vietnam. There is an intention to establish customs service for entering Laos in the future depending on the demand. There is no facility for scanning, and import and export goods are checked manually.

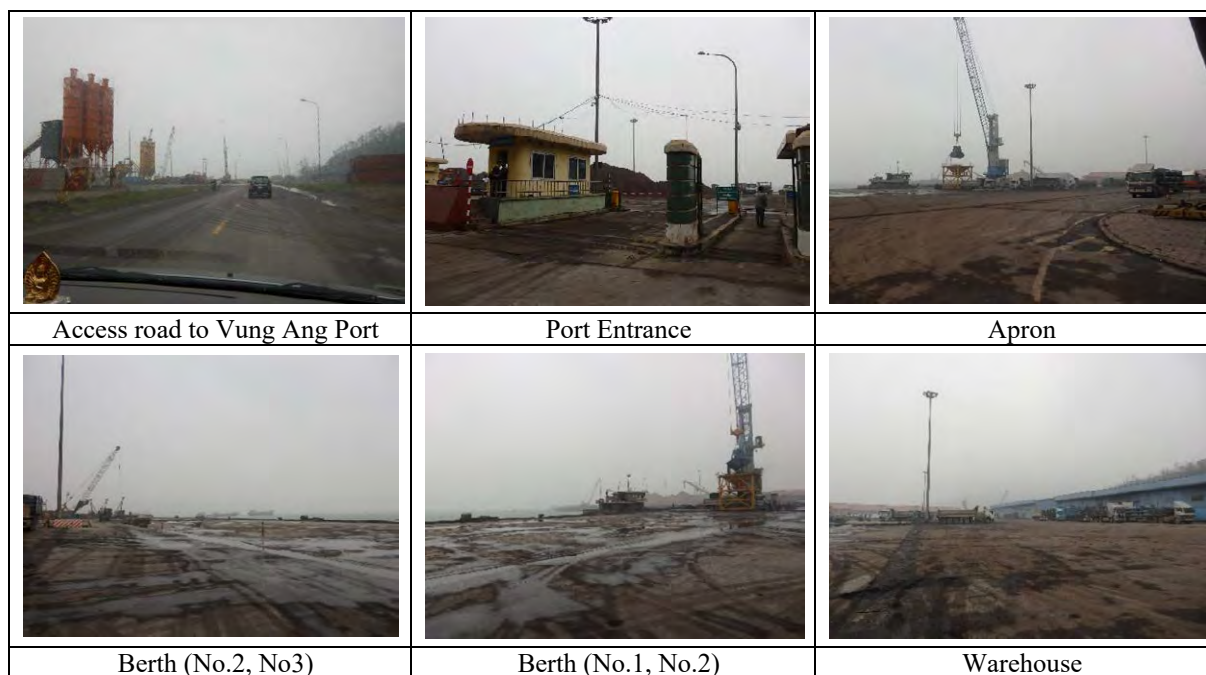
According to the information collected during field survey, the access route at Vung Ang Port is 2 km, the width is 150 m (350 m including ship repair spaces). There are two berths at the Vung Ang Port. Currently, two additional berths are under construction, and one berth is at the stage of application for construction. The outline of the existing berths is shown in Table 2.2.19.

Table 2.2.19 Outline of Berth at Vung Ang Port

	Berth No.1	Berth No.2	Berth No.3
Length	185.5 m	270 m	225 m
Tide	Diurnal Tide	Diurnal Tide	Diurnal Tide
Deterrence	2.0 m	2.0 m	2.0 m
Breakwater	-	260 m	370 m
Height from water	+ 4.5 m	+ 4.5 m	+ 4.5 m
Depth	- 11 m	- 13 m	- 14 m
Vessel accepted	30,000 DWT	45,000 DWT	45,000 DWT
(Woodchip Vessel)	45,000 DWT	55,000 DWT	-
Capacity	460,000 tons/year	860,000 tons/year	1,500,000 tons/year

\*: DWT = Deadweight tonnage

Source: Brochure of Joint Stock Company of Vung Ang Port



Source: JICA Study Team

**Figure 2.2.19 Vung Ang Port**

## 2) Nghi Son Port

Nghi Son Port was completed in 2000 and is a deep-sea port which started operation in 2009. It is a complex port with a total area of 922 ha (438 ha on the ground, 484 ha on the sea) including Petrochemical Products Exporting Port and Port dedicated to Thermal Power Plant. There are 30 berths, and amount of cargo handled is 10 million ton per year. Table 2.2.20 shows the breakdown of port facilities of Nghi Son Port.

**Table 2.2.20 Outline of Nghi Son Port**

	Port Complex	Petrochemical Products Exporting Port	Dedicated Port and Port Complex	Port dedicated to Thermal Power Plant	Port Complex and Container Terminal	Gasoline, Oil and LPG Importing Port
Total Area	12 ha	33 ha	71 ha	16 ha	93 ha	48 ha
Wharfs	3 units	6 units	8 units	5 units	6 units	2 units
Wharf length	555 m	-	2,000 m	560 m	1,500 m	-
Depth	8.5 m	-	-	-	-	-
Vessel accepted	30,000 DWT	30,000 DWT	30,000 DWT	30,000 DWT	50,000 DWT	50,000 DWT
Warehouse	2,880 m <sup>2</sup>	-	-	-	-	-
Container terminal	10,000m <sup>2</sup>	-	-	-	-	-

Source: Study on the Vessel Navigation and Security Management Network Reinforcement Project in the Socialist Republic of Vietnam (2012, METI)

## 3) Cua Lo Port

Cua Lo Port started operations in 2003 and currently has four berths. The access route is 4 km and the depth is 6.8 m. The handling capacity is 3 million tons per year, and the current berth was planned to accommodate 15,000 to 25,000 DWT, but the size of vessels that can enter the port is limited to 7,000 to 10,000 DWT because of shallow water depth. Outline of each berth is shown in Table 2.2.21.

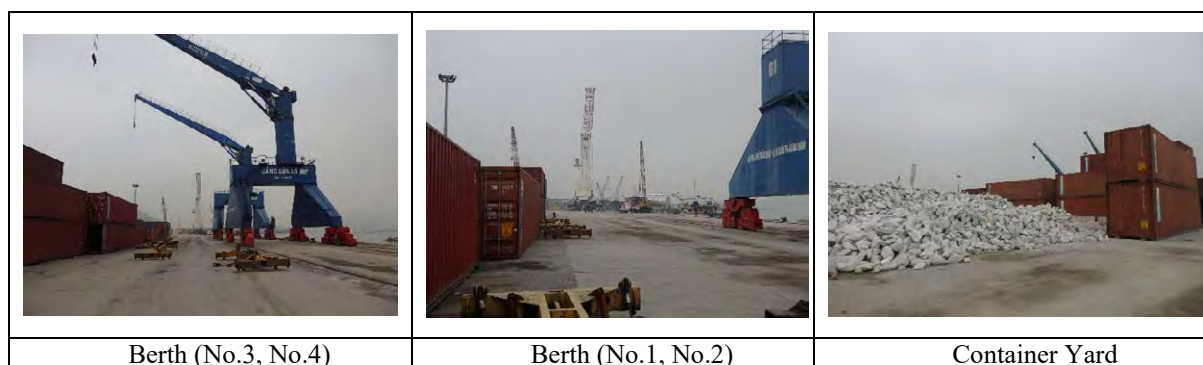
According to an interview with the operating company of the Cua Lo Port, the annual amount of cargo handled was 3,215 tons in 2015, it remained the same in 2016, and currently the demand is over

the capacity of the port. In the past, goods from Laos contained a lot of woods, but recently the handling volume is decreasing. Currently Cua Lo Port handles a lot of potassium (used for agricultural fertilizer), 100,000 tons annually. There are 2 to 3 companies (located at Khammouane and near Khammouane) that produce potassium in Laos, and the potassium is exported to China via the Cua Lo Port. China is investor of these companies. Almost all goods from Laos come from the Cau Treo border (Nam Phao border). Goods that Laos imports are mainly coal from India and machinery equipment from China, but the current handling volume is small.

**Table 2.2.21 Outline of Berth at Cua Lo Port**

	Berth No.1	Berth No.2	Berth No.3	Berth No.4
Length	160 m	160 m	175 m	175 m
Depth	- 7.0 m	- 7.0 m	- 7.0 m	- 7.5 m
Vessel accepted	15,000 DWT	15,000 DWT	25,000 DWT	25,000 DWT

Source: Prepared by JST based on the existing documents



Source: JICA Study Team

**Figure 2.2.20 Cua Lo Port**

## (2) Future Plan and Potential

As described in 2.2.1, Vietnam has a development plan up to 2020 with "Vietnam Port System Master Plan" approved in 2001. Under this master plan, it is stated that Vung Ang port will be developed to accommodate 50,000 DWT of vessel and to trade 15 million tons of cargo. For Nghi Son port and Cua Lo port, it is planned to accommodate 50,000 DWT and 30,000 DWT of vessels, and to trade 44 million and 9.5 tons of cargo, respectively.

However, in consideration of future demand growth and connectivity of logistics with neighboring countries, notification of updating this development plan (Decision 2368 / QJJ-BGTVT) was issued in 2016. The revised development plan of each port is as shown below. Future demand of freight is shown in Table 2.2.22. They all seem to have high potential as major logistics port as their demand have significantly increased and they have possess high potential.

- Vung Ang Port:
  - Cargo handling capacity: 82 million tons by 2020, 138.2 million tons by 2030
  - Accommodating Vessel capacity: 50,000 DWT. Ships for thermal power generation are 120,000 DWT.
  - Priority Project: Extension of Breakwater
- Nghi Son Port: [cargo handling capacity] 38.7 million tons by 2020, 65.6 million tons by 2030
  - [Accommodating Vessel capacity] 30,000 to 50,000 DWT
  - [Priority project] Maintenance of ship station of terminals No. 4 and No. 5
- Cua Lo Port: [cargo handling capacity] 20 million tons by 2020, 34.2 million tons by 2030

[Accommodating Vessel capacity] No. 2 to No. 4 of Nam Cua Lo terminals are developed to allow 20,000 DWTs to enter the port. Bac Cua Lo terminal is 10,000 ~ 70,000 DWT. However, basically goals of both terminals is 30,000 to 50,000 DWT.

[Priority Business] Improvement of Terminal

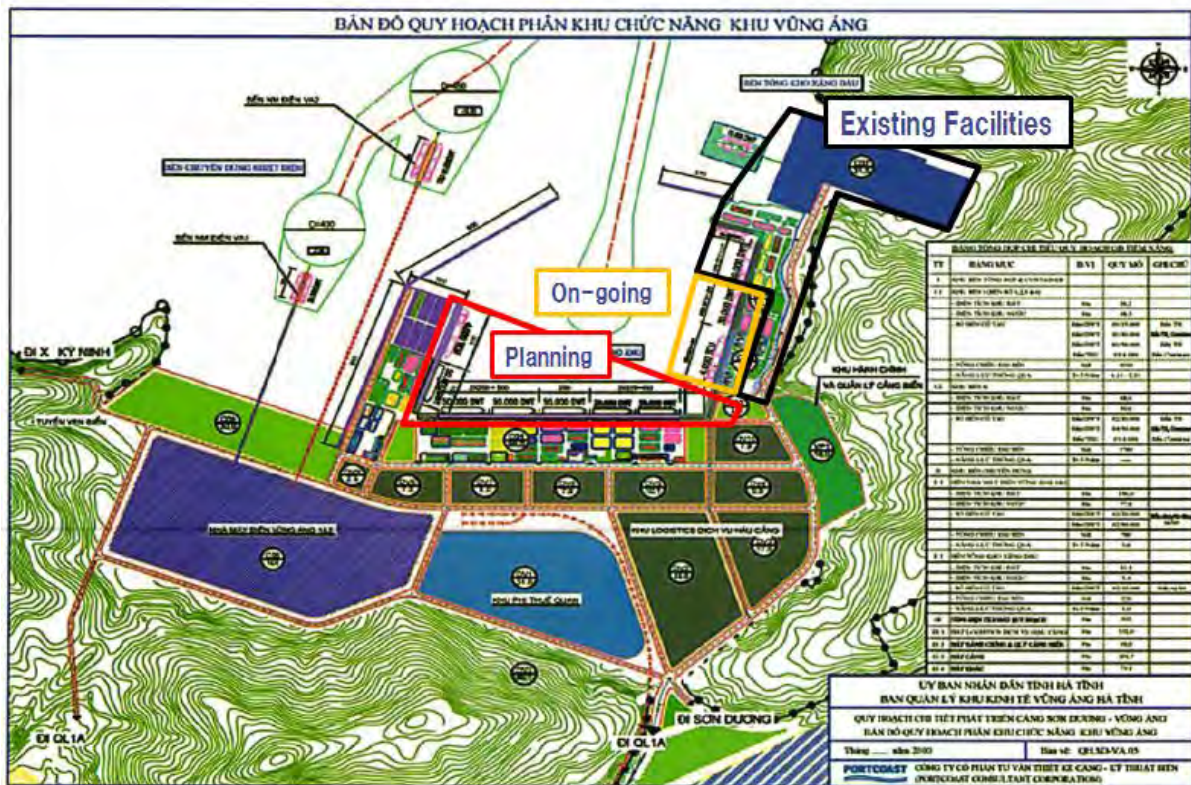
**Table 2.2.22 Future Demand of Goods (Unit: million tons)**

	Name of seaport	Forecast to 2020					Forecast to 2030				
		Special goods	General goods	Container	Transshipment goods	Total	Special goods	General goods	Container	Transshipment goods	Total
	<b>GROUP 2</b>	<b>120,7</b>	<b>13,85</b>	<b>6,15</b>	<b>-</b>	<b>140,7</b>	<b>193,8</b>	<b>28,2</b>	<b>16,0</b>	<b>-</b>	<b>238</b>
<b>I</b>	<b><i>Nghi Son port (Class I)</i></b>	<b>33,7</b>	<b>3,5</b>	<b>1,0</b>	<b>0,5</b>	<b>38,7</b>	<b>55,6</b>	<b>6,75</b>	<b>2,25</b>	<b>1,0</b>	<b>65,6</b>
1	Nghi Son South seaport	12,45	3,0	1,0		16,45	19,60	5,75	2,25	-	27,60
2	Nghi Son South seaport	21,5	-	-	-	21,5	36,50	-	-	-	36,50
3	Le Mon, Quang Chau seaport	0,25	0,5	-	-	0,75	0,5	1,0	-	-	1,5
<b>II</b>	<b><i>Nghe An port (Class I)</i></b>	<b>13,5</b>	<b>3,98</b>	<b>2,03</b>	<b>0,5</b>	<b>20,00</b>	<b>18,0</b>	<b>10,0</b>	<b>5,0</b>	<b>1,2</b>	<b>34,20</b>
1	Cua Lo South seaport	-	3,48	2,03	-	5,5	-	10,0	5,0	-	15,0
2	Bac Cua Lo South seaport	6,25	-	-	-	6,25	8,0	-	-	-	8,0
3	Dong Hoi seaport	7,50	-	-	-	7,50	11,20	-	-	-	11,20
4	Ben Thuy, Cua Hoi seaport	0,25	0,5	-	-	0,75	-	-	-	-	-
<b>III</b>	<b><i>Ha Tinh Seaport (Class I)</i></b>	<b>72,0</b>	<b>6,38</b>	<b>3,13</b>	<b>0,5</b>	<b>82,0</b>	<b>117,0</b>	<b>11,45</b>	<b>8,75</b>	<b>1,0</b>	<b>138,20</b>
1	Vung Ang seaport	9,5	5,88	3,13	-	18,5	10,0	10,95	8,75	-	29,7
2	Son Duong seaport	63	-	-	-	63	108,0	-	-	-	108
3	Xuan Hai seaport	-	0,5	-	-	0,5	-	0,5	-	-	0,5

Source: Decision 2368/QĐ-BGTVT

### 1) Vung Ang Port

As shown in Figure 2.2.21, the Vung Ang Port plans to construct 12 berths by 2030. As mentioned above, berth No. 1 and berth No. 2 are existing (in the black frame in the figure below), berth No. 3 and berth No. 4 are under construction (yellow frame in the figure below), berth No. 5 is at the stage of application for construction, berth No. 6 to berth No. 12 (red frame in the figure below) are undecided. According to the future plan, berth No. 3 and berth No. 4 will be able to handle 30,000 to 40,000 DWT, and the berth No. 5 to berth No. 12 will be able to handle 40,000 to 50,000 DWT. Some yards will be added, and the port is expected to have high processing capacity after the completion of the construction.



Source: Brochure of Joint Stock Company of Vung Ang Port

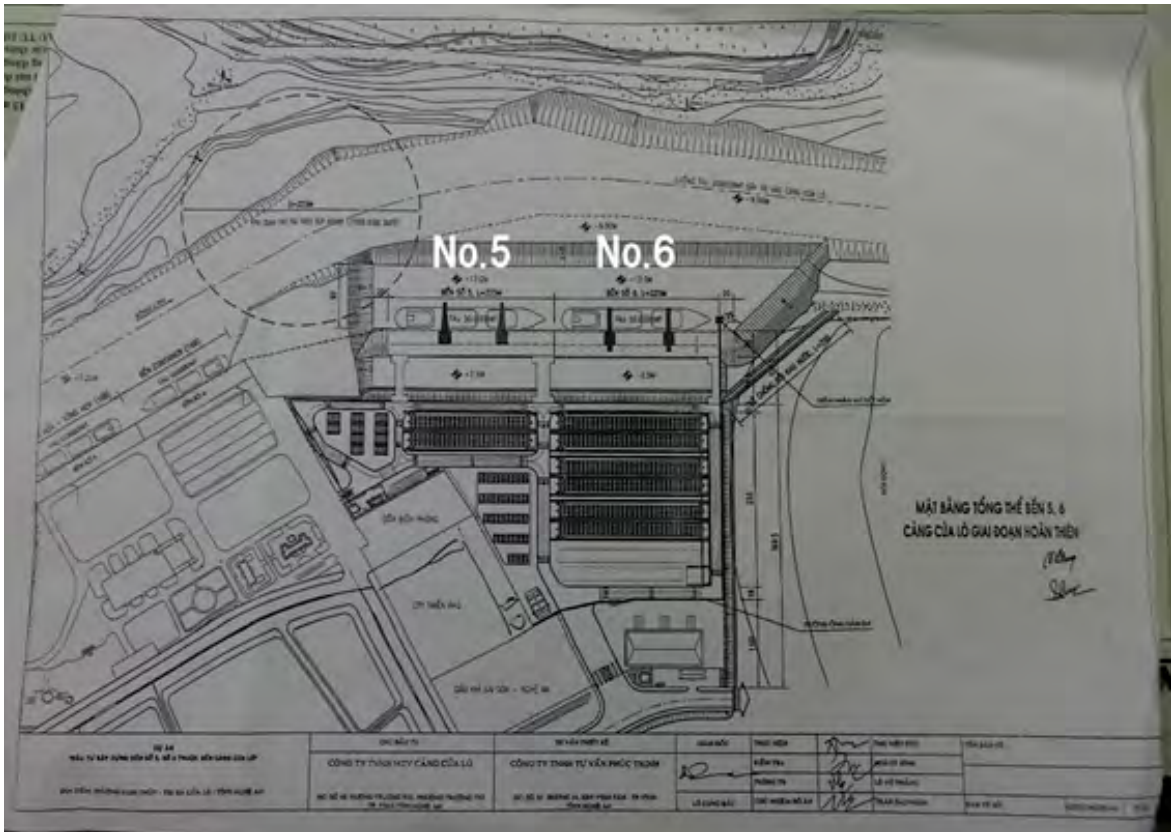
Figure 2.2.21 Future Plan of Vung Ang Port

2) Nghi Son Port

As for the Nghi Son Port, detailed information could not be obtained because it was not possible to collect materials and conduct interviews. According to the available information, however, the access route improvement project is planned to be implemented through PPP with a total cost of 12 million USD, of which 20% (about 2 million USD) is to be borne by enterprises and investors.

3) Cua Lo Port

Cua Lo Port is constructing its fifth berth, and it will completed in 2018. In addition, the sixth berth is planned to be constructed. This is expected to increase the amount of cargo handled by the Cua Lo Port.



Source: Document provided from Cua Lo port Operation Company

**Figure 2.2.22 Development Plan of Cua Lo Port**

**(3) Challenges for enhancing connectivity**

Based on interview surveys, features of import/export of Laos through Vietnam ports are summarized as follows.

- Export
  - Export of iron ore, potassium and wood to Australia, China and Japan (From Laos to Vung Aung port through NR 12)
  - Export of potassium to China (From Laos to Cua Lo port through NR 8)
- Import
  - Import of machinery and construction materials from China (From Vung Ang port to Laos through NR 12)
  - Import of oil (From Nghi Son port to Laos through NR 8)

According to the interview survey, it is difficult to predict the future trend of cargo handled because it varies greatly depending on each year. However, as already mentioned, there are plans of future expansion for each port, and the cargo volume each port will handle is predicted to increase. It is also expected that different port is selected according to situations of development of railways and access road.

In Vietnam, the declaration notice (Decision 2368 / QD-BGTVT) mentions enhancement of connectivity between the East-West Economic Corridor and each port, particularly Highway 217, Highway 7, Highway 8, and Highway 12A are regarded as important.

Further, if customs procedures are improved and become smoother, the coordination between these ports and North-east regions of Thailand may be probable in the future, from geological point of view.

In order to promote efficiency of broad-based logistics system, development of road and railway infrastructure connecting these ports are essential.

### 2.2.4 Current Situation and Issues on Each Corridor Routes

#### (1) Thanh Thuy/Nam On border gate

The Thanh Thuy/Nam On border gate is about 300 km east of Vientiane, 50 km west from Vinh, and 700 m above the sea level.



Source: JICA Study Team

**Figure 2.2.23 Location of Thanh Thuy/Nam On Border Gate**

Roads around the border gate are not paved, and it is difficult for the vehicles to use them, especially on the Lao side. Therefore, it is necessary to improve the roads so that vehicle can use them easily and safely. On the Vietnamese side, roads are paved, but there is safety risk due to the influence of fog.



Source: JICA Study Team



Source: Ha Noi-Vientiane Expressway Project Pre-feasibility study report

**Figure 2.2.24 Thanh Thuy/Nam On Border Gate and its Environ**

**(2) National Road No. 8 Route (Vientiane - National Road 8 - Nam Phao /Cau Treu border gate - Vinh - Hanoi)**

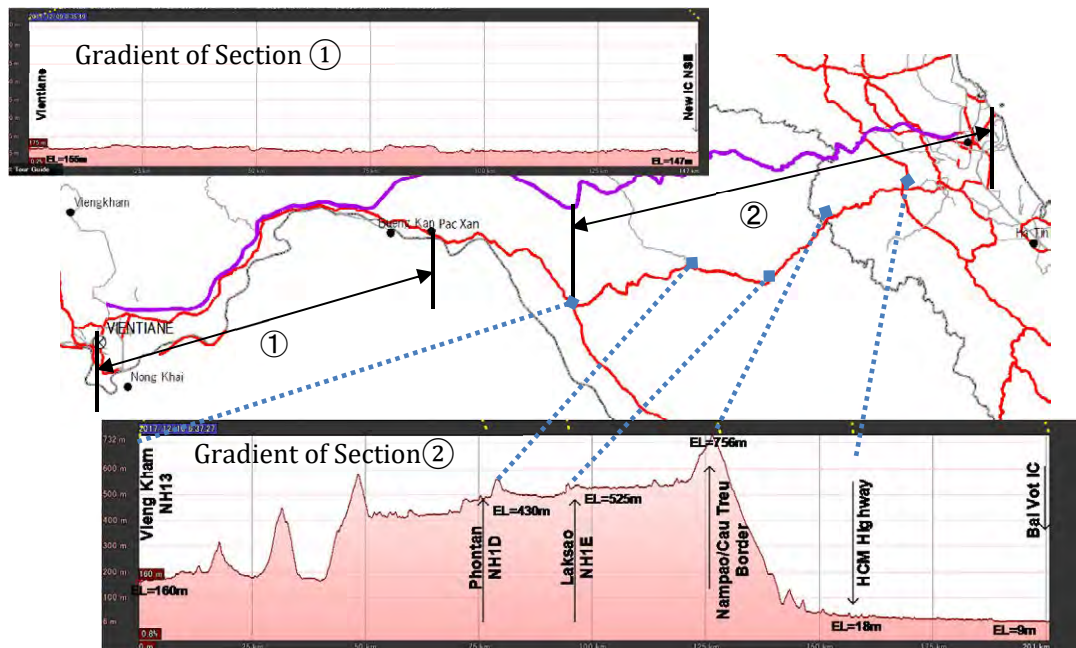
JST conducted travel survey of National Road No. 8 (from Vientiane to Vinh). The distance from Vientiane to the intersection between National Road No. 13 and National Road No. 8 is approximately 238 km, and the road surface is roughly flat with a few sloped. The road has 4 lanes on each side in Vientiane, but 2 lanes outside the city. Many vehicles run with high speed on National Road No.13. They overtake frequently, and there are many traffic accidents because they jump over to the opposite lane for overtaking. The distance from National Road No. 8 to the Laos-Vietnamese border is approximately 121 km, and the road of this section has two lanes. There are some steep sloped sections in the mountains area. Large logistics vehicles use the road and pavement of many sections has been damaged.



Source: JICA Study Team

**Figure 2.2.25 Road No. 8 Route (Red Line)**

The road from the border to the Vinh, approximately 92 km, is paved and has two lanes. The pavement is in a goof condition, but 20 km from the border has a sharp gradient because of steep mountains. The number of lanes becomes four from the 52 km point from the border, and the running performance improves. It is about 286 km from the Vinh to Hanoi via the National Road No. 1 or National Road No. 15. The National Road No. 1 has four lanes, but its route passes through the city area, and the traffic volume is also high; therefore, the speed performance is not so good. On the other hand, the National Road No. 15 has two lanes, but the traffic volume is low and the speed performance is good. Therefore, it is assumed that the use of National Road No. 15 is effective for improving the lead time of logistics. The highway is open from Ninh Binh to Hanoi, and there is no problem about the speed performance.



Source: JICA Study Team

**Figure 2.2.26 Gradient of Road No. 8 Route**



		
Center Area of Vientiane (Road No. 13)	Outside of Vientiane Capital (Road No. 13)	Road No. 13 (Near the intersection of Road No.8)
		
Road No. 8, Mountain Area	Road No. 8 (Near Laksao)	Road No. 8 (Near Border)
		
Road No. 8A (Near Border)	Road No. 8A	Road No. 8A (Near Vinh)

Source: JICA Study Team

**Figure 2.2.27 Road Condition of National Road No. 8 Route**

### **(3) National Road No. 12 Route (Bangkok ~ Nakhon Phanom/Thakhek Border Gate - National Road No. 12 - Na Phao/Cha Lo Border Gate - Vinh - Hanoi)**

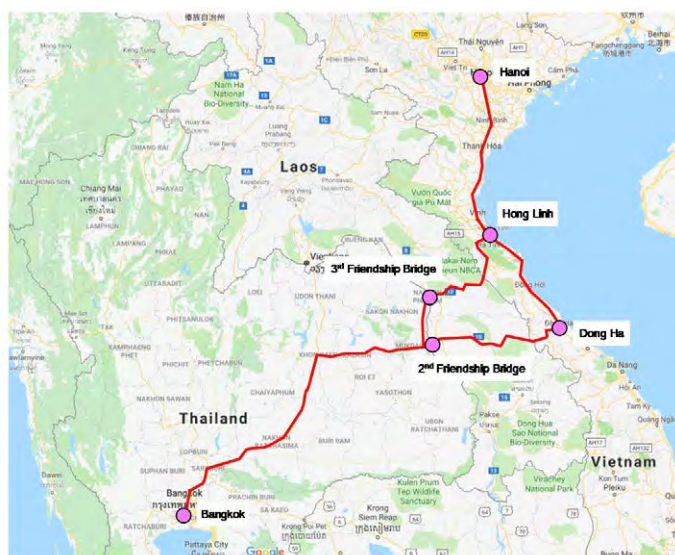
On National Road No. 12 Route, travel surveys had been conducted in "Survey on Trilateral Transport (Bangkok-Hanoi) on Route via 3rd Mekong Friendship Bridge (2012, JETRO)". The actual situation of physical infrastructures such as roads, facilities and traffic conditions and non-physical infrastructures such as customs clearance procedures, etc. were surveyed.

According to the result of the survey, the distance between Bangkok and Hanoi was 1,429 km, and the total required time was 38.5 hours. But the customs clearance time required 5.9 hours and the transshipment time required 1.5 hours, and it takes significant time to cross the border. Regarding the road condition, the Thailand side was in a good condition and there was no particular problem. In Laos, the pavement situation of the National Road No. 12 was good and stable speed could be secured except at the vicinity of the villages. On the Vietnam side, National Road No. 15 was in a good condition, but the pavement condition of National Road No. 8 was poor, and the National Road No. 1 was dangerous because of speeding, reckless overtaking and high traffic volume.

The JETRO survey also compared the route which passes through the 2nd Friendship Bridge, - National Road No. 9 - Dong Ha – Hanoi with the route which passes through the 3rd Friendship Bridge and National Road No. 12. Although travel of the latter is faster by 2 hours approximately, it took

more than 4 hours to clear customs clearance and transshipment work. The report indicates that due to these issues, the route passing the 3rd Friendship Bridge becomes slower as a whole.

The biggest challenge is that transit clearance at Laos is not permitted, and this has a negative effect on the lead time. The lead time is similarly affected by the insufficient development of payment system for transit taxes and customs facilities, etc. In the future, if lead time and cost could be reduced further by extending the customs service time, implementing one stop customs clearance service, and improving logistics infrastructure which can run at night, etc., the land transportation share may increase.



Source : Prepared by JICA Study Team based on JETRO's study report on logistics and customs in ASEAN-Mekong region (2013)

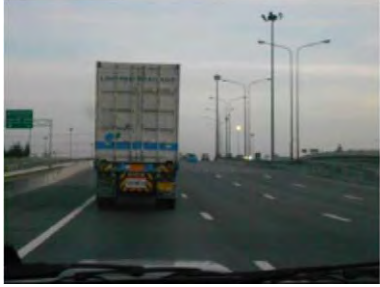











**Figure 2.2.28 Routes of Bangkok to Hanoi**

As for the NR 12, F/S and D/D for improvement of road between Thakhek and Naphao (147 km) and related facilities (lights and border control facilities) are planned by the NEDO of Thailand.

**Table 2.2.23 Comparison of Travel Time from Bangkok to Hanoi**

	National Road No.9 route (The 2 <sup>nd</sup> Mekong bridge route)	National Road No.12 route (The 3 <sup>rd</sup> Mekong bridge route)
From Bangkok to Mukdahan	643km	643km
From Mukdahan to Hong Linh	595km ※ Through Mukdahan, Savannakhet, Densavan, Lao Bao, Dong Ha	449km ※ Through Nakhon Phanom, Thakhek, Naphao, Cha Lo
From Hong Linh to Hanoi	337km	337km
Total length (km)	1,575km	1,429km
Actual travel time	32.8 hours	31.1 hours
Required time for customs clearance	2.6 hours	5.9 hours
Transshipment time	0.5 hours	1.5 hours
Total required time	35.9 hours	38.5 hours

Source: JETRO, 2012

		
Highway toward outside of Bangkok	Road No. 2 (Thailand)	3rd Friendship Bridge
		
Thakhek (Laos)	Bridge on Road No. 12	Near Border Gate (Laos)
		
Custom Facility at Cha Lo Boder	Road No. 12 (Vietnam)	Road No. 8
		
Road No. 1	Toll Gate on Road No. 1	Road of northern side of Pháp Vân

Source: Survey on Trilateral Transport (Bangkok - Hanoi) on Route via 3rd Mekong Friendship Bridge (2012, JETRO)

**Figure 2.2.29 Road Condition of National Road No. 12 Route**

**(4) Mekong region East-West economic corridor (Yangon - National Road No. 9 - Da Nang Port)**

The East-West economic corridor has been opened between Vietnam, Laos and Thailand, and improvement of road at Myanmar side is expected. This corridor consists of routes of about 1,470 km connecting Da Nang, Dong Ha, Lao Bao, Densavan, Savannakhet, Mukdahan, Khon Kaen, Tak, Myawaddy, Hpa An, and Yangon. In terms of road infrastructure, paved roads with 2 to 4 lanes have been developed in Thailand, and there are few issues concerning the speed performance. But the road in Vietnam has issues of traffic congestion on National Road No. 1, and section close to the border

with Laos has only one lane on each side. There road section on Laos side has some problems; the pavement of National Road No. 9 is bad, and there are some speed performance issues. On the Myanmar side, road conditions have been improved due to the bypass between Myawaddy and Kawkareik, which was regarded as the most difficult section. There were some logistics problems such as transshipment, because of the weight limit (up to 25 tons) on the 1st Friendship Bridge at the border between Thailand and Myanmar. However, these problems are expected to be addressed by the improvement of the road infrastructure, such as the development of the 2nd Friendship Bridge which is underway and scheduled to be completed in 2019. Regarding the non-structural measures, on the East-West Economic Corridor, a bilateral agreement has been signed between Thailand and Vietnam to allow mutual passage. However, there are some restrictions; i.e. mutual passage is only allowed for permitted vehicles (300 cars/day) and for traffic between Khon Kaen-Da Nang. If vehicles are not permitted, people need to change the vehicle at Laos border. There is no such bilateral agreement between Thailand and Myanmar, and more time is required for customs clearance and transshipment.



Source: JICA Study Team

**Figure 2.2.30 East-West Economic Corridor Route**

In 2013, JETRO conducted travel surveys on the roads linking Bangkok, Myanmar, Yangon. The survey found that the road between Myawaddy and Hpa An which was in a serious condition as the biggest problem. In addition to this, the issue of institutionalization, such as restriction of foreign entry and mutual use of trucks, were also problems. Meanwhile, the maritime transportation, which is the main means of transport among Thailand, Bangkok, Myanmar and Yangon, has a lead time of 21 days, whereas the lead time has been shortened to three days on land transportation. The land transportation has overwhelming merits in reducing the lead time if the road condition and system could be improved.

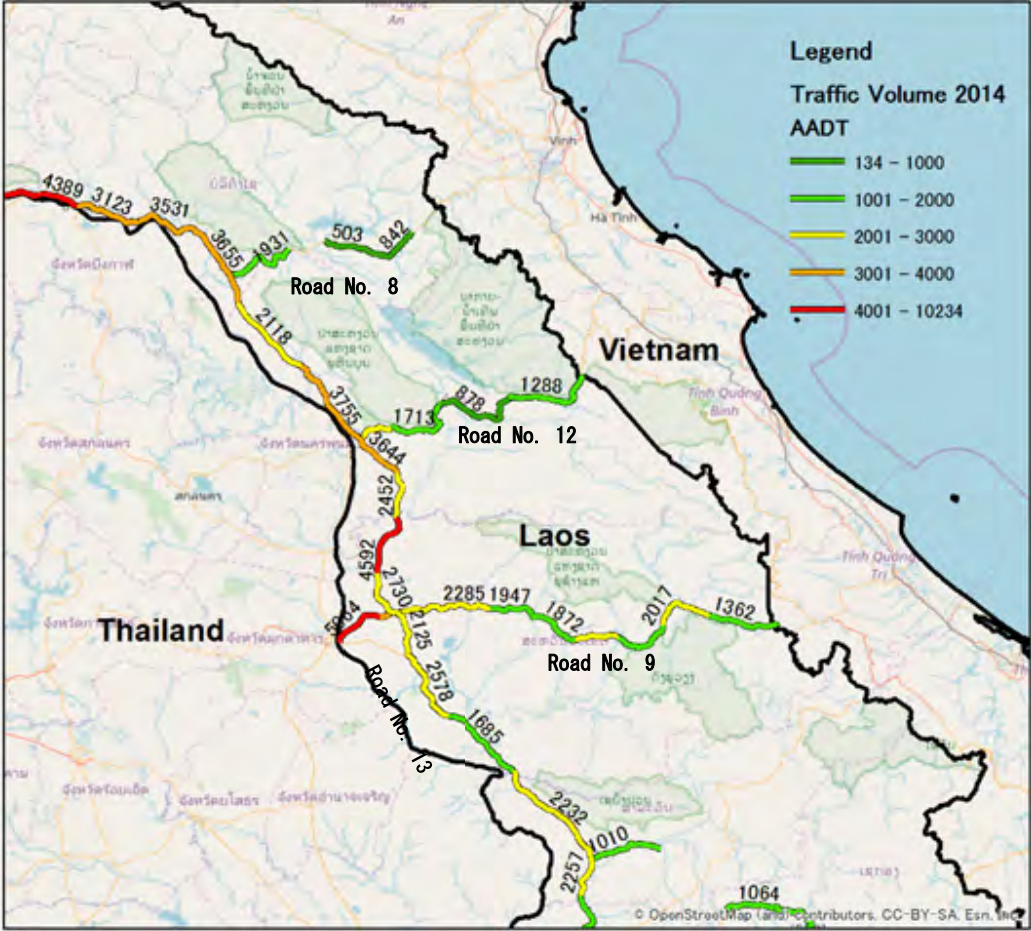


Source: Survey of Land Transportation between Yangon-Bangkok via Western side route of East-West Economic Corridor, Institute for International Trade and Investment Website (Photo of\*)

**Figure 2.2.31 Road Condition of Running Route**

**(5) Comparison of Road No. 8, No. 9, No. 12 Routes**

Regarding the traffic volume of Road No. 8, No. 9 and No. 12 in Laos, the Public Works and Transport Research Institute (PTRI) of Lao PDR regularly counts the traffic volume throughout Laos, and record it using a Road Management System (RMS). Figure 2.2.32 shows the average annual daily traffic (AADT) of Road No. 8, No. 9 and No. 12. It is noted that the traffic volume of Road No. 9 is relatively higher than those of the other two roads.



Source: Prepared by JST based on the collected data from PTRI

**Figure 2.2.32 Traffic Volume of East-West Direction Road (Road No.8, No. 9 No. 12)**

Regarding the road condition in Laos, National Road No. 12 is in a good condition, but National Road No. 8 and No. 9 have pavement problems. National Road No. 12 is expected to further improve by NEDA's road improvement project. Meanwhile, as for National Road No. 9, mutual passage and single stop (Dansavan-Lao Bao border) are implemented in customs clearance procedures with Thailand and Vietnam. Thus there is merit in terms of lead time. In the future, the National Road No. 9 continues to be utilized not only as a trade route through Da Nang Port in central Vietnam but also as expected traffic route between Thailand and Myanmar. National Road No. 8 is part of the shortest route between Vietnam and Vientiane, and its importance could increase with the future development of Vung Ang Port and Cua Lo port. If road pavement is improved continuously and custom system is also improved, it has a high potential as a logistics route linking Laos.

**Table 2.2.24 Comparison of Road No. 8, No. 9, and No. 12**

	Road No. 8 Route	Road No. 9 Route	Road No. 12 Route
Route	Vientiane - National Route 8 - Nam Phao /Cau Treo border gate - Vinh - Hanoi	Bangkok - Nakhon Phanom/Thakhek Border Gate - National Road No. 12 - Na Phao/Cha Lo Border Gate - Vinh - Hanoi	Yangon - National Road No. 9 - Da Nang Port
Length	737 km	1,429km	1,470 km
Travel Time	14.7 hours (Calculation by 50km/h)	31.1 hours (excluding customs clearance and transshipment)	29.4 hours (Calculation by 50km/h)
Traffic Volume	1,931 vol/day	2,285 vol/day	1,713 vol/day
Pavement Condition	Damaged	Relatively good	Damaged
Others	The altitude is high near the border, and there is a section where it is difficult to drive a large car.	It takes time to clear customs	It doesn't takes much time for customs clearance between Laos - Vietnam/Thailand due to bilateral agreement.

Source: JICA Study Team

## (6) Conclusion

Roads designated as economic corridors in Laos are National Road No. 8, No. 9, No. 12, and No. 13, and the development of major national roads in Laos is considered to contribute to the investment and distribution. However, National Road No. 9 and National Road No. 12, which are linking the east and west of southern Laos, function as a logistics route mainly between Thailand and Vietnam, and it is possible that the direct benefits to Laos as well as to the Vientiane capital is limited. In order to strengthen the connectivity between Laos and neighboring countries and the GMS region, it is important to improve National Road No. 8 and National Road No. 13. Currently, four logistic parks (dry ports) are developed at Vientiane, Savannakhet, Thakhek and Boten in Laos, and there are plans to develop in Vientiane (Expansion), Laksao and Pakse. These ports are located along National Road No. 13 and No. 8, and the development of these roads will improve trade, investment in Laos. The development of the Hanoi-Vientiane expressway and Vientiane-Vung Ang railway will be closely related to these logistics parks, and the synergistic effect of increasing demand is expected. Regarding logistics between Laos and other countries, these expressways, railways, and ports in Vietnam such as Vung Ang Port will be utilized, and the connectivity with neighboring countries will be improved. For Hanoi, it is assumed that the highway and the National Road No. 8 are used for saving lead time.

Regarding the logistics linking Thailand and Vietnam, JETRO conducted travel survey on the roads between Bangkok and Hanoi, "The latest logistics and customs clearance situation in the ASEAN and Mekong region (2013, JETRO)", and compared using the National Road No. 9 and National Road No. 1. The merits and demerits of Road No. 9 and Road No. 12 are described in Section "2.2.4 (3)". The JETRO study found that the cost of the land transport between Vietnam and Thailand is high, and maritime transport which connects Laem Chabang port and Hai Phong port is the fastest route. However, it is said in the study report that the lead time of land transportation is shorter, and the use of land transportation is increasing. As a conclusion, it is assumed that the connectivity among Laos, Vietnam and Thailand will be strengthened by the road and railway development, and by reducing institutional barriers such as those related to customs clearance and mutual passage in the future.

## 2.3 Current Status and Issues in Enhancing Connectivity from Soft Component Point of View

### 2.3.1 Cross-Border Transport Agreement

## (1) Current situation and future plans of CBTA in GMS

The Greater Mekong Subregion (GMS) compiled the Cross-Border Transport Agreement (CBTA) with support from the Asian Development Bank (ADB). GMS countries have ratified all main agreements, annexes and protocols by 2015. CBTA consolidates regulations related to the facilitation of cross-border transport in a single document. It regulates the cross-border movement of people (visa facilitation), traffic rights, exemption of physical customs inspection, deposit, escort, quarantine, commercial traffic rights, road and bridge design standards, and the development of transport infrastructure including road signs and signals. CBTA is composed of the following two components:

- a) Regulations with regard to single-window inspection,
- b) Regulations with regard to cross-border transport of goods and people.

The overall structure of CBTA is shown in Table 2.3.1. It consists of a main agreement of 10 parts, 17 annexes, and 3 protocols. Each annex consists of articles detailing the conditions. The annexes and the protocols have the same effect as the main agreement.

**Table 2.3.1 The Overall Structure of CBTA**

Category	Part No.	Main Agreement	Annex No.	Annex
Driver	2	<ul style="list-style-type: none"> <li>• Facilitation of Border Crossing Formalities (Single-window, Single-stop)</li> <li>• Cross-Border Transport of People</li> <li>• Requirements for the Admittance of Road Vehicles (Driving licenses)</li> </ul>	5	<ul style="list-style-type: none"> <li>• Cross-Border Movement of People</li> <li>• Criteria for Driving Licenses</li> </ul>
	3		16	
	5			
Goods	2	<ul style="list-style-type: none"> <li>• Facilitation of Border Crossing Formalities (Single-window, Single-stop)</li> <li>• Cross-Border Transport of Goods (transit traffic, Phytosanitary and Veterinary Inspection, Transport of Particular Categories of Goods)</li> <li>• Requirements for the Admittance of Road Vehicles (Temporary Importation of Motor Vehicles)</li> </ul>	1	<ul style="list-style-type: none"> <li>• Carriage of Dangerous Goods</li> <li>• Carriage of Perishable Goods</li> <li>• Facilitation of Frontier Crossing Formalities</li> <li>• Transit and Inland Customs Clearance Regime</li> <li>• Temporary Importation of Motor Vehicles</li> <li>• Container Customs Regime</li> <li>• Commodity Classification System</li> </ul>
	4		3	
			4	
	5		6	
			8	
	14			
	15			
Vehicle	5	<ul style="list-style-type: none"> <li>• Requirements for the Admittance of Road Vehicles (Admittance of Road Vehicles in Other Contracting Parties, Registration, Technical Requirements, Technical Inspection Certificates, Liability Insurance)</li> </ul>	2	<ul style="list-style-type: none"> <li>• Registration of Vehicles in International Traffic</li> </ul>
Transport Operator	6	<ul style="list-style-type: none"> <li>• Exchange of Commercial Traffic Rights (Traffic rights, Licensing of the Transport Operator, Market Access, Pricing)</li> </ul>	9	<ul style="list-style-type: none"> <li>• Criteria for Licensing of Transport Operators for Cross-Border Transport Operations</li> <li>• Conditions of Transport</li> <li>• Multimodal Carrier Liability Regime</li> <li>• Criteria for Licensing of Multimodal Transport Operators for Cross-Border Transport Operations</li> </ul>
			10	
			13a	
			13b	
Roads and Transport	5	<ul style="list-style-type: none"> <li>• Requirements for the Admittance of Road Vehicles (Road Traffic Regulations and Signage)</li> <li>• Infrastructure (Road Signs and Signals)</li> </ul>	7	<ul style="list-style-type: none"> <li>• Road Traffic Regulation and Signage</li> <li>• Criteria for Driving Licenses</li> </ul>
	7		16	
Roads	7	<ul style="list-style-type: none"> <li>• Infrastructure (Road and Bridge Design Standards, Road Signs and Signals, Border Crossing Facilities)</li> </ul>	11	<ul style="list-style-type: none"> <li>• Road and Bridge Design and Construction Standards and Specifications</li> <li>• Border Crossing and Transit Facilities and Services</li> </ul>
			12	

Source: Japan International Freight Forwarders Association Inc., Commentary on GMS/CBTA

CBTA has been ratified by all GMS countries. However, the operation methods are still being negotiated among ADB and GMS countries. CBTA has not reached the implementation phase as of February 2018<sup>4</sup>. Many bilateral and trilateral memorandum of understanding (MOU) on the cross-border movement of road vehicles have been signed in the GMS. MOU is being applied sequentially, ahead of the implementation of CBTA. The MOU signed by Lao People’s Democratic Republic (Lao PDR) is shown in Table 2.3.2. Cross-border movement of road vehicles are permitted between Lao PDR and three countries in the GMS excluding Myanmar and China. Driving permits, licenses and passports are required<sup>5</sup> when the vehicles are passing the border.

**Table 2.3.2 List of MOU on Cross-Border Transportation Signed by Lao PDR**

Countries	Number of License Issuance
Lao PDR, Thailand	No Restrictions
Lao PDR, China	20,000 Trucks, 17,500 Buses
Lao PDR, Vietnam	No Restriction
Lao PDR, Thailand, Vietnam	300 vehicles
Lao PDR, Vietnam, Cambodia	150 vehicles

Source: Prepared by Study Team based on MPWT Website (<https://www.mpwt.gov.la/en/news-en/ministry-news-en?start=4>, <https://www.mpwt.gov.la/en/news-en/provinces-news-en/377-mou-on-land-transport-news-en>)

It is confirmed that the cross-border movement of road vehicles is permitted between Lao PDR, Thailand and Vietnam<sup>6</sup>. However, several regulations are attached, specifically the following: (a) vehicles must only pass the route permitted in the MOU, and (b) Information on transport services must be declared in advance. For example, for the cross-border movement of road vehicles between Thailand and Lao PDR, drivers of Thai nationality and those driving trucks registered in Thailand must declare the goods and the route in Lao PDR prior to entering the country. They are not permitted to provide any other transport services. However, as of February 2018, they are permitted to declare additionally<sup>7</sup>.

Adjustment with domestic legislation in each GMS countries for the implementation of CBTA took a long period. Therefore, CBTA became obsolete before it was even implemented. For that reason, ADB and GSM countries are preparing an updated version of CBTA (CBTA2.0) with the support from AusAid. The targeted year for the implementation of CBTA 2.0 is set as 2019. Furthermore, ADB and GSM countries are planning for the Early Harvest measure, which is expected to have immediate effect. The Early Harvest measure allows GMS countries excluding Myanmar cross-border movement of up to 500 vehicles per country by carrying the Temporary Admission Document (TAD)<sup>8</sup>. Myanmar is expected to join from 2019<sup>9</sup>.

**(2) Current status and issues in customs clearance, immigration control, and animal and plant quarantine (CIQ)**

The current status and issues in customs clearance, immigration control, and animal and plant quarantine (CIQ) identified through interviews with the Ministry of Public Works and Transport and freight forwarders as well as the collection and analysis of documents and information materials are summarized below. The interview with forwarders conducted in the field survey showed that they had complaints mostly as to the way customs clearance is currently run, but they had hardly any problem with quarantine and immigration control.

<sup>4</sup> Meeting with the Ministry of Public Works and Transport, Department of Transport of Lao PDR, February 2018. ADB aims to begin the implementation of CBTA by April 2018.

<sup>5</sup> Meeting with the Ministry of Public Works and Transport, Department of Transport of Lao PDR, February 2018.

<sup>6</sup> Meeting with Japanese logistics company, February 2018

<sup>7</sup> Meeting with Japanese logistics company, February 2018

<sup>8</sup> TAD is valid for 12 months, and is not permitted to be shared among operators and vehicles. There is no limit on the number of cross-border passage during the permitted period for vehicles carrying TAD. However, vehicles are not permitted to stay in the destination country for more than 30 days, as the entrance of the vehicle is admitted as “temporary importation”.

<sup>9</sup> JETRO (2017/09/26) ”New Measures for the Mekong Region Cross-Border Transport Under Way”



**Table 2.3.3 Issues and Tasks for Customs Clearance, Immigration Control, and Animal and Plant Quarantine (CIQ) in Laos**

Issues	Tasks
<Customs Clearance>	
* Required procedures and documents differ from an official to another.	- Improve and spread manuals on customs procedures, etc. and educate and train customs officials for better practice.
* Customs clearance takes much time (compared with Thailand, etc.).	
* When the person in charge is absent from work, sometimes there is no one who replaces them and the processes stall. Sometimes there is no one to handles affairs even during business hours.	
* They often demand to pay charges other than regular charges. If asked to hurry up, demand higher charges.	
<Immigration control>	
Interviews with the Ministry of Public Works and Transport and customs forwarders as well as study of relevant documents and materials have revealed no major problems in particular concerning immigration control.	---
<Animal and plant quarantine>	
* The European Union (EU) has imposed a ban on imports of certain Lao agricultural products due to problems of insect contamination, etc.	- Coordinate with export promotion, Confirm applicable international standards and certification systems, and confirm inspection items, and settlement of inspection agencies in charge
* For inspections to be done for the issuance of quarantine certificates, number of inspection agencies, inspection facilities and devices, and officials capable of handling such devices, etc. are all insufficient.	- Enhance the inspection system by increasing the number of inspection agencies and staffs; Develop human resources and assign budgets
* Reagents for the inspections are not enough due to budgetary deficit	

Source: Interviews with the Ministry of Public Works and Transport and customs forwarders as well as collection and analysis of relevant documents and materials

Table 2.3.4 summarizes the problems pointed out in the information gathering and checking survey (actual running survey) on the enhancement of connectivity in Myanmar conducted by JICA (in September 2017) as well as how such problems in the present survey and tasks should be tackled. The report of the actual running survey, which was conducted on the East-West Corridor route and the Southern Corridor route in GMS as well as on the Hanoi-Vientiane route (NR 8/NR 12 routes), broadly discusses the problems of connectivity in terms of not only physical infrastructures but also of non-physical systems, procedures, and practice, but Table 2.3.4 deals only with the problems of CIQ on NR 8 on the Hanoi-Vientiane route. Furthermore, it seems that the actual running survey report does not discuss much problems and tasks related to logistics and quarantine as discussed in detail in Chapter 11 of the present survey report. As shown in the table below, despite minor differences between the problems pointed out by the actual running survey team and how those issues are found this time, the proposals made by the actual running survey team and what this study finds as the tasks ahead are basically the same.

**Table 2.3.4 Problems, Recognition and Tasks ahead to be Tackled**

Problems pointed out by the actual running survey team	How we find the current situation	Tasks ahead for improvement
The Lao side checkpoint on the Nam Phao-Cau Treo border (facility for customs clearance) is located in the town of Laksao, about 35 km	* Given the terrain of the border, it would be difficult to build a facility near the	- To handle the increasing volume of customs clearance, it is necessary to secure sufficient

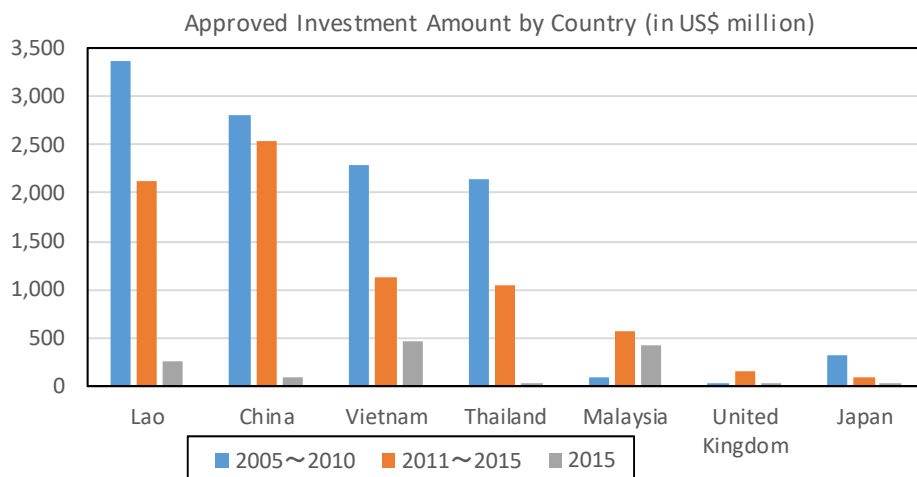
Problems pointed out by the actual running survey team	How we find the current situation	Tasks ahead for improvement
away from the border, which requires people to carry out immigration control, animal and plant quarantine, and customs clearance procedures separately at different places and causes great inefficiency.	border capable of handling the increasing volume of customs procedures. * According to the Ministry of Finance, the reason why customs clearance is taking much time is that they don't have much space to inspect cargo in the existing facility and do that in the tight parking lot for trucks, which hampers the smooth flow of trucks. They are currently planning to get a terrain about 15 km from the border and open there a new facility for customs clearance.	space and sufficient number of employees. - With the construction of the expressway, the volume of customs clearance at this border will increase drastically. A drastic measure should be taken to face the situation.
※ At the checkpoint on the Lao side, the digitization of CIQ procedures has not been done properly. ※ Currently it is customs employees, not customs forwarders, who input data into an electronic data management system (ASYCUDA).	* The checkpoint in Laksao has an office in the facility, with a couple of PCs, especially for carriers and forwarders to prepare documents. * Customs clearance procedures have not been fully digitized yet and still require some paper documents.	Enhance education and guidance of customs employees, carriers, forwarders, and registered customs specialists on digitization and handling of customs data, while spreading and promoting further digitization in coordination with the Ministry of Commerce and Industry and the Ministry of Agriculture and Forestry.
Differently from Thailand and Vietnam, the declarant filing a (preliminary) export/import declaration is not offered the option to select the examination method (selecting green, yellow, or red channel).	* As we checked and found in this survey, eleven customs offices that have already introduced ASYCUDA perform risk management of cargoes at the time of declaration and the declarant is offered the option to select an examination type. * In the interviews conducted with logistics companies, etc., we didn't hear any complaints in particular about the selection of examination method. * In Laksao, we saw a line of trucks waiting for X-ray inspection (physical inspection on many trucks).	- As the Lao customs spreads and deepens the digitization of customs information in tandem with the Ministry of Commerce and Industry and the Ministry of Agriculture and Forestry, we expect them to tackle the next task of the single window system. - It is necessary to educate and train customs employees so they learn to properly select examination methods.

Source: Compiled by the survey team from the information provided by the Information Gathering/Checking Survey (Actual running survey) Report on the Enhancement of connectivity in Myanmar (September 2017)

## 2.3.2 Promotion of Trade, Investment, and Logistics in Laos and Thailand

### (1) Current status and trends of foreign investment in Laos

Figure 2.3.1 shows the evolution of investment amounts approved in Laos (direct investment) in recent years. The total amount of investment approved in Laos (including investments by Lao public and private sectors) in recent years has been quite on the decrease: USD 12.5 billion (USD 2.1 billion per year) in the years 2005–2010, USD 8.6 billion in the years 2011–2015 (USD 1.7 billion per year), and USD 1.3 billion in 2015. In terms of amounts approved of foreign indirect investment in Laos, China, Vietnam, and Thailand occupy the top three places in the period between 2005-2010 and between 2011-2015. Especially China has invested a large amount of money, exceeding the amount approved of investment by Laos itself for the years between 2011 and 2015, and more than double of the amount invested by Vietnam and Thailand in the same period. The approved amount of investment from Japan was USD 0.3 billion between 2005 and 2015 (the fourth largest foreign investment, USD 50 million per year on average), but dropped to USD 300,000 in 2015.

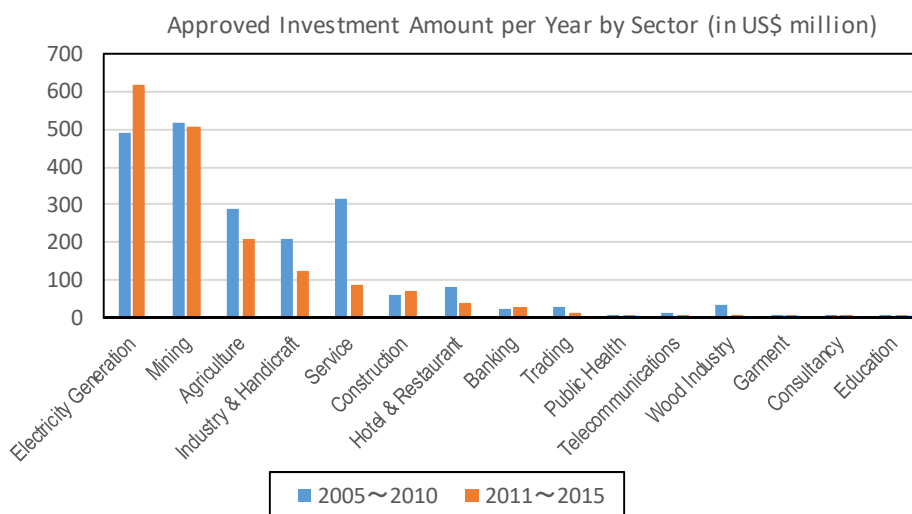


Source: Investment Promotion Department, Ministry of Planning and Investment, Lao PDR

**Figure 2.3.1 Evolution of Amounts of Investment Approved in Laos**

Figure 2.3.2 shows the approved amount of investment per year by sector for two periods, 2005–2010 and 2011–2015. Two sectors, power generation and mining, show definitely largest approval amounts of investment suggesting a high potentiality of development in both sectors, followed by agriculture, manufacture and handicrafts, services, construction, hotels and restaurants, finance, etc. that show larger amounts. In terms of approved amount of investment per year during the two periods, 2005–2010 and 2011–2015, power generation received more investment between 2011 and 2015 while investment in mining reduced in the same period. Among the other sectors, construction and finance received a little more investment between 2011 and 2015, while manufacture and handicrafts, services, and hotels and restaurants received less investment in the same period.

With the construction of the Hanoi-Vientiane expressway, foreign investments is to be attracted for the agricultural sector, which still shows a high potential despite recent decrease in the amount of approved investment, and the food processing industry, which processes the agricultural products, as well as for the export of the processed products, and thereby increase the volume of freight transport on the expressway. In addition, the number of passengers using the expressway may increase by attracting investment in the development of the tourism industry and building the tourism areas along road. Promoting the manufacturing industry which enjoys enough supply of electricity from the power generation industry (which has always supplied and, and will in the future), active investment, and attracting investment for that purpose will be another measure that will contribute to increasing the freight transport using the expressway.



Source: Investment Promotion Department, Ministry of Planning and Investment, Lao PDR

**Figure 2.3.2 Approved Amount of Investment in Laos per year by Sector**

## **(2) Current status of investment incentives**

### **1) Investment incentives in Laos**

Investment incentives in Laos are stipulated in the Law on Investment Promotion (as amended) (Law No. 14 of 2017) that came into effect on April 19, 2017, and are varied according to the sector and region the capital is invested in. The law encourages investments in the following segments (Article 9), and, the segments (ii), (iii), (v), and (vi) are eligible for additional corporate tax exemption for certain periods:

- 1) Projects that contribute to the research, development, and use of advanced, state-of-the-art technologies and sciences or to the saving of environmentally-friendly natural resource energy;
- 2) Projects that contribute to clean or organic agriculture, seed production, livestock improvement, industrial crop cultivation, forest development, protection of the environment and diversity, regional development and reduction of poverty;
- 3) Processing of environmentally-friendly agricultural products, products of national tradition, original processed goods, and handicraft products;
- 4) Tourism industry focusing on environmentally-friendly and sustainable nature, culture, and history;
- 5) Education, sports, human resources development, vocational skills, vocational training centers, production of teaching materials and sporting goods;
- 6) Advanced health care facilities, medicine and medical equipment plants, manufacturing of traditional medicine, and development of therapy facilities;
- 7) Mitigation of urban traffic congestion, investment, management, and development of public services and infrastructures for the improvement of residential areas, construction of infrastructure for agriculture and manufacturing, commodity transport service, cross-border services;
- 8) Policy banks and microfinance business that fight poverty and help residents of poor areas and communities having difficulty getting bank loans;
- 9) Development and operation of modern shopping malls to promote home-produced products or world-famous brands, development and operation of exhibition halls in the fields of manufacturing, handicrafts, and agriculture fields.

Regional classification under the same Law is as follows (Article 10):

District 1: Poor areas, remote areas, or areas where socioeconomic infrastructure for investment is yet to develop;

District 2: Areas where socioeconomic infrastructure for investment has developed to a certain degree;

District 3: Special Economic Zones and Specific Economic Zones (collectively called SEZ)<sup>10</sup>.

The corporate tax exemption periods under the law are as shown in Table 2.3.5. The corporate tax exemption period is calculated starting from the sales starting date (Article 11 of the same law). After the expiration of corporation tax exemption shown above, the investor has to pay a corporate tax of 24% under the tax law.

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<sup>10</sup> A development project in a Special Economic Zone refers to an investment activity for the development of infrastructure and facilities in a new urban development project. A development project in a Specific Economic Zone refers to an investment activity for the development of infrastructure and facilities based on the situation of individual areas or specific laws and regulations. Activities include development projects such as industrial parks and export processing (tax free) zones, and tourism zones (Article 16 of the former Investment Law).

**Table 2.3.5 Periods of Corporate Tax Exemption under the Lao Investment Incentives Law**

District	Periods of corporate tax exemption for segments specified in Article 9	Additional periods of corporate tax exemption for segments (2), (3), (5), and (6) prescribed in Article 9
District 1	10 years	5 more years
District 2	4 years	3 more years
District 3	Judged in light of SEZ-related laws and cabinet ordinances	

Source: Law on Investment Promotion (Law No. 14 of 2017)

In addition to being exempt from corporate tax, investors in Laos have exemption from customs duties and value-added taxes as shown below:

- a) Customs duties and value-added taxes are not imposed on equipment that cannot be procured or produced in Laos and registered as fixed assets or heavy construction machines or other vehicles that are used directly for production activities. On the other hand, taxation on fossil fuels, gas, heavy oil, automobiles, and other equipment is subject to the provisions of relevant laws. Temporary imports of heavy machinery and vehicles are regulated by the Customs Law.
- b) Raw materials, equipment, and parts imported to be used in the production of processed products for export are exempt from customs duties at the time of importation and are exempted from customs duties at the time of exportation. In addition, value-added taxes on these goods are not imposed at the time of importation.
- c) Value-added tax is not imposed on the use of Laos-produced raw materials, which not natural resources, for the manufacture of finished products or semi-finished products for export.

Basically construction materials and raw materials, equipment, machinery, spare parts, and vehicles to be directly used for production activities are exempt from customs duties and Value Added Taxes at the time of importation based on the master lists<sup>11</sup> approved by relevant authorities.

Other incentives include the following:

- 1) Additional exemption of corporate tax upon an additional investment: In cases where, for business expansion, an investor additionally invests a net income earned from a Lao corporation, it may be exempt from the corporate tax for the next year (Article 14).
- 2) Loss carried forward: If an investor posts losses, the losses can be carried over for the next three years and offset against profits (Article 14). From the fourth year onwards, the remaining losses cannot be offset against profits.
- 3) Exemption of land lease or concession fee: An investor who invests in segments in which investment is encouraged as listed in Article 9 of the same law may be exempt from government's land lease or concession fee (Article 15).

For investment in the preferential fields prescribed in Article 9 of the same Law, the requirement for being eligible to the exemption is to invest at least LAK 1.2 billion (about 18 million yen)" or "to employ 30 or more Lao technicians" or "to employ 50 or more Lao staff members under a labor contract for one year or more "(Article 9 paragraph 2).

Laos has also created SEZs to promote foreign direct investment and other investments, gather them in specific areas, and provide tenants with various benefits. The details of investment incentives granted in SEZs are prescribed by the Decree of the Prime Minister on SEZ.

As shown in Figure 2.3.3 , there are currently ten SEZs in Laos, half of which located in the vicinity of Vientiane. Apart from SEZs near Vientiane, there is no SEZ in the areas along the proposed Hanoi-Vientiane expressway, nor any development plan which is under way.

<sup>11</sup> A master list is an annual import and export plan approved by the authority to receive tax exemptions on raw materials, equipment, spare parts, etc. imported to be used for production activities. (Based on the Instruction of the Minister of Finance No. 3578 dated January 19, 2012)



Source: Website of the Investment Promotion Department, Ministry of Planning and Investment (<http://www.investlaos.gov.la/index.php/>)

**Figure 2.3.3 SEZ Location Map**

**Table 2.3.6 List of SEZs**

No.	Name (Developer)	Location	Establish.	Area (ha)
1.	Savan-Seno Sepecail Economic Zone (Government)	Savanakhet	2003	954
2.	Boten Beautiful Land Specific Economic Zone (Chinese private)	Luangnamtha	2003	1,640
3.	Golden Triangle Sepecial Economic Zone (Government+Chinese private)	Bokeo	2007	3,000
4.	Vientiane Industrial and Trade Area (Government+Chinese Taipei private)	Vientiane Capita	2009	110
5.	Saysetha Development Zone (Government+Laos & Chinese private)	Vientiane Capita	2010	1,000
6.	Phoukhyo Specific Economic Zone (Lao private)	Khammuouan	2010	4,850
7.	Thatluang Lake Specific Economic Zone (Chinese private)	Vientiane Capita	2011	365
8.	Longthanh - Vientiane Specific Economic Zone (Vietnamese private)	Vientiane Capita	2008	557.75
9.	Dongphosy Specific Economic Zone (Malaysia private)	Vientiane Capital	2009	53.94
10.	Thakhek Specific Economic Zone (Government)	Khammuane	2012	1,035
11.	Pakse-Japan SME SEZ (Japanese private)	Champasak	2015	195

Source: Website of the Investment Promotion Department, Ministry of Planning and Investment (<http://www.investlaos.gov.la/index.php/>)

## 2) Investment incentives of Vietnam

In Vietnam, investors are eligible to various tax and expense incentives under the investment law, corporate tax law, import and export customs law, land law, and related laws and regulations.

Since January 1, 2016, the standard corporate tax rate in Vietnam has been 20%, except for the tax rate applied to the income from exploration, exploitation and development of rare or important natural or mineral resources (32 to 50%). Except for specific incomes (from transfer of capital, transfer of a capital contribution right, transfer of an investment project, transfer of an investment opportunity participation right, transfer of real estate, transfer of right to explore and mine mineral resources, overseas business activities, mineral excavation activities, and special sales tax), the corporate tax rate for companies whose annual sales are less than VND 20 billion is 20%.

The fields with investment incentives specified in Appendix I of the Cabinet Ordinance 118/2015/ND-CP dated November 12, 2015 are divided into fields with special investment incentives and fields with investment incentives. Specifically, they are as shown in Table 2.3.7.

**Table 2.3.7 Fields with Investment Incentives in Vietnam**

<b>◆ High-tech, IT, and supporting industries</b>
<b>Fields with Special Investment Incentives</b>
<ol style="list-style-type: none"> <li>1. Application of any high-technology named on the List of High technologies determined by the Prime Minister as technologies to be given priority in investment and development;</li> <li>2. Manufacture of products named on the List of High Tech Products determined by the Prime Minister given incentives in investment and development;</li> <li>3. Manufacture of supporting industry products selected by the Prime Minister;</li> <li>4. Manufacture of products using high-technologies, development by high-tech company; investment in a venture for the development of high-technology; application, research and development of high-technologies in compliance with high-tech laws and regulations, manufacture of biotechnology products;</li> <li>5. Software products based in compliance with IT laws, digital information products, production of major IT products, software services, information security accident prevention and damage control services, information security services;</li> <li>6. Production of renewable energy, clean energy, and energy from waste;</li> <li>7. Production of composite materials, light construction materials, and rare materials;</li> </ol>
<b>◆ Science and technology, production of electronics, machinery, and materials, information technology</b>
<b>Fields with Investment Incentives</b>
<ol style="list-style-type: none"> <li>1. Manufacture of products named on the List of Major Mechanical Products selected by the Prime Minister;</li> <li>2. Investment in research and development (R&amp;D);</li> <li>3. Production of steel pieces using iron ore, high quality steel, and alloys;</li> <li>4. Production of coke and activated coal;</li> <li>5. Production of energy saving products;</li> <li>6. Manufacture of petrochemicals, pharmaceutical chemicals, basic scientific products, plastics and technical rubber parts;</li> <li>7. Manufacture of products with added value of 30% or more (under the guidance of Ministry of Planning and Investment);</li> <li>8. Manufacture and assembly of electronic parts not listed for the Field with Special Investment Incentives;</li> <li>9. Manufacture of motor vehicles, motor vehicle parts, and ships;</li> <li>10. Manufacture of tools, machinery, equipment, and parts not named for the Field of Special Investment Incentives, production machines for agriculture, forestry, and fishery, machines for production of salt, food processing machinery, and irrigation equipment;</li> <li>11. Production of materials replacing asbestos;</li> </ol>
<b>◆ Agriculture</b>
<b>Fields with Special Investment Incentives</b>
<ol style="list-style-type: none"> <li>8. Afforestation, protection and development of forests;</li> <li>9. Aquaculture farming, processing, and storage in agriculture, forestry, and fishery;</li> <li>10. Production, rearing of agricultural crops, livestock, forestry seedlings and marine products;</li> <li>11. Purification, cultivation and production of natural salt;</li> <li>12. Ocean fishery using advanced fishing methods; logistics services for fishery; construction of fishing boat building bases and manufacture of fishing boats;</li> <li>13. Coast guard services;</li> </ol>
<b>Fields with Investment Incentives</b>
<ol style="list-style-type: none"> <li>12. Cultivation, harvesting and processing of herbs; protection and preservation of rare and unique genetic sources and herbs</li> <li>13. Feed production and purification for livestock, poultry and marine products;</li> <li>14. Scientific and technical services for plant cultivation, livestock industry, aquaculture, plant and livestock protection;</li> </ol>

15. Construction, improvement, refurbishment of livestock slaughter/dissection rooms; storage and processing of poultry and livestock;
16. Construction and development of intensive raw material areas for the processing industry;
17. Development of marine products;
◆ Environment protection, infrastructure construction
Fields with Special Investment Incentives
14. Collection, processing, recycle, and reuse of wastes;
15. Construction and operation of functional area infrastructures in industrial parks, export processing zones, high-tech districts, special economic zones;
16. Investment in the construction of water treatment plants, power plants, drainage systems, bridges, roads, railways, ports, seaports, river ports, airports, railway stations and other important infrastructures selected by the Prime Minister;
17. Development of public transport systems in cities
18. Invest in market construction and management projects in rural areas;
Fields with Investment Incentives
18. Construction and development of industrial park infrastructures;
19. Construction of apartments for workers who work at industrial parks, export processing districts, high-tech districts, economic special industrial parks, student dormitories, housing for people needing care under social welfare schemes; Construction of houses for workers; Construction of functional urban areas for workers (including kindergartens, schools, and hospitals);
20. Management of overflowed petroleum, erosion of mountains and banks, prevention and damage control of accidents on shores, beaches, levees and lakes; application of technologies to reduce emissions of ozone depleting substances and greenhouse gases;
21. Investment in projects to operate product exhibition halls, logistics centers, warehouses, supermarkets, and shopping centers;
◆ Education
Fields with Investment Incentives
22. Infrastructure facility project for education and training facilities; investment for the development of non-public educational institutions (kindergartens, general education, and vocational education);
◆ Culture, society, sports, and health care
Fields with Special Investment Incentives
19. Construction of social houses and resettlement houses • • • • • <The rest is omitted>
Fields with Investment Incentives
23. Manufacture of health care equipment, construction of medicine storage warehouse for, natural and man-made disasters, dangerous infectious diseases; • • • • • <The rest is omitted>
◆ Other fields
Fields with Investment Incentives
30. Business activities of the People's Credit Fund, microfinance institutions, etc.

Source: Cabinet Order No. 118/2015/ND-CP (November 12, 2015) Appendix I

The investment incentive areas as stipulated in Chapter 3 of the Law on Investment (2014 Laws No.67) and Cabinet Order No. 118/2015/ND-CP specifying the detailed enforcement regulations are divided into “areas with particularly difficult economic and social conditions” and “areas with difficult economic and social conditions.” Specifically, the provinces and rural districts are, as shown in Table 2.3.8, designated as investment incentive areas.



**Table 2.3.8 Investment Incentive Areas of Vietnam**

No.	Province	Areas with particularly difficult economic and social conditions	Areas with difficult economic and social conditions
17	Hà Nam	—	Districts: Lý Nhân, Thanh Liêm, Bình Lục
20	Ninh Bình	—	Districts: Nho Quan, Gia Viễn, Kim Sơn, Tam Điệp, Yên Mô
21	Thanh Hoá	Districts: Mường Lát, Quan Hóa, Quan Sơn, Bá Thước, Lang Chánh, Thường Xuân, Cẩm Thủy, Ngọc Lặc, Như Thanh, Như Xuân	Districts: Thạch Thành, Nông Cống
22	Nghệ An	Districts: Kỳ Sơn, Tương Dương, Con Cuông, Quế Phong, Quỳnh Hợp, Quỳnh Châu, Anh Sơn	Districts of Tân Kỳ, Nghĩa Đàn, Thanh Chương and Commune of Thái Hòa
23	Hà Tĩnh	Districts: Hương Khê, Hương Sơn, Vũ Quang, Lộc Hà, Kỳ Anh	Districts: Đức Thọ, Kỳ Anh, Nghi Xuân, Thạch Hà, Cẩm Xuyên, Can Lộc

Source: Chapter 3 of the Law on Investment, and Cabinet Order No. 118/2015/ND-CP (only provinces along the Hanoi and Vientiane Expressway extracted)

Reduction and exemption of corporate tax in Vietnam is as described in Table 2.3.9. The incentive period begins with a year when the revenue occurs while tax exemption and reduction begins with a year when the taxable income occurs. If the taxable income does not occur for three years after occurrence of the revenue, tax exemption and reduction begins automatically at the fourth year. Reduction and exemption of corporate tax is applied to the new investment projects and the capacity-widening investment projects complying with the standard of fixed assets and production scale.

**Table 2.3.9 List of Preference and Reduction/Exemption of Corporate Tax in Vietnam**

Tax rate	Conditions	Application period	Tax exemption period	50% reduction period
10%	Income of companies implementing new investment projects in the areas with particularly difficult economic and social conditions, specific economic zone, and high-tech zones	15 years	4 years	9 years
	Income of companies implementing new investment projects in the following fields: Scientific researches and technology development; application of high-tech contained in the of high-tech list preferred for investment and development according to the High-tech Law; fostering of high-techs and high-tech companies; venture investment for the purpose of development of high-techs contained in the high-tech list for preferential development stipulated in the law concerning high-techs; investment to construction and management of the fostering office for high-techs and high-tech companies; investment for particularly-important national infrastructure development according to the law; production of software products; production of composite materials and lightweight construction materials, and rare materials; production of renewal energy, clean energy, and energy from waste treatment; development of biotechnology			
	Income of companies implementing new investment projects in the following environmental protection fields : Manufacturing the environmental contamination treatment equipment and environment monitoring and analysis system; contamination treatment and environmental protection; collection and treatment of wastewater, waste gas, and solid wastes; recycling of wastes			
	Income of high-tech companies, income of agricultural companies that apply high-techs			
	Income of companies complying with either one of following requirements by Implementing the production project of products to which the specific consumption tax is imposed and the new investment projects in all fields excluding the mining project, completing investment of the capital with the fund of minimum 6 trillion dong within three years after issuance of the investment certificate: <ul style="list-style-type: none"> <li>Annual sales being 10 trillion dong for three years from the year in which sales occurred</li> <li>Employees being 3000 or more for three years from the year in which sales occurred</li> </ul>			
	Income of the companies complying with the following requirements by implementing the production project of products to which the specific consumption tax is imposed and the new investment projects in the production field excluding the mining project: Capital scale of minimum 12 trillion dong; Use of technologies examined on the basis of stipulation of High-tech Law and Scientific Engineering Law; spending of total capital within five years from the date when investment was approved according to the Law on Investment			
	Income of companies that implement the new investment project of the products			

Tax rate	Conditions	Application period	Tax exemption period	50% reduction period
	contained in the list of supporting industrial products for preferential development and that comply with the following standards: - Support, according to the stipulations of High-tech Law, to production and assembly of industrial products for high-techs, such as spinning and sewing, leather and footwear, electronic and information technologies, automobile production and assembly, production of products in the machine industry. Industrial products not yet produced domestically by January 1 2015 or that cannot comply with technical standard of EU or equivalent standard.			
10%	Income of publishing companies undertaking publishing activities as per stipulation of the Law on Publishing	Total period	-	-
	Income of newspaper companies undertaking newspaper publishing (including advertisement in newspaper) according to stipulations of the Law on Newspaper			
	Income of companies undertaking investment and management projects of public housing for targets stipulated in Article 53 of the Law on Housing			
	Income of companies undertaking the following activities: Plantation, care and protection of forest; cultivation of agricultural and fisheries products, cattle feeding, breeding, processing in the areas with difficult social and economic conditions; breeding of forestry products in areas with difficult social conditions; production of seeds for plants and cattle; production, mining, and refining of salt (excluding production of salt stipulated in 1 of Article 4, Cabinet Order No. 218/2013/ND-CP); investment to storage of harvested agricultural products and storage of agricultural and fisheries products after harvesting (including investment to direct storage or investment to leasing of fisheries and agricultural products and food storage)			
	Income of companies undertaking education and training and socialization activities in the vocational training, medical care, culture, sports and environment and administration appraisals			
	Income of companies undertaking new investment projects in the field of socialization in areas with particularly difficult economic and social conditions and in areas with difficult economic and social conditions	4 years	9 years	
15%	Income of companies undertaking cultivation, cattle feeding, and processing in agricultural and fisheries industries in areas other than those with particularly difficult or difficult social and economic conditions	Total period	-	-
17%	Income of companies undertaking new investment in areas with difficult social and economic conditions	10 years	2 years	4 years
	Income of companies undertaking following new investment projects: Production of quality steels, production of energy-conservation products, manufacturing of agricultural, forestry, fisheries, and salt manufacturing machinery and equipment, manufacturing of irrigation facilities. production and refining of feeding for cattle, chicken farming, fisheries products, development of transitional profession			
17%	People's credit fund and macro-finance organization	Total period	-	-
20%	Income of companies undertaking new investment projects in the industrial parks (Excluding the industrial parks in the area with well-developed economic and social conditions*)	Total period	2 years	4 years

Source: 3 of Article 16 of Cabinet Order No. 218/2013/ND-CP

According to the Law on Import/Export Tariffs and the Cabinet Order No. 878/2010/ND-CP dated August 13 2010, the import tax exemption benefit may be provided for five years from the production date. This applies to the case of import of raw materials, materials, parts, which are not yet produced in the country, for projects in the specific perennial investment areas subject to import tax benefits or areas with particularly difficult economic and social conditions. Note that projects concerning automobiles, motor bike, air conditioner, electric heater, refrigerator, washing machine, fan, dish washer, CD/DVD player, voice system, iron, electric pot, hair dryer, hand dryer, and other commercial products specified by the prime minister are excluded.

Tax exemption applies to the investment fields or areas receiving import tax benefit, and to the fixed assets including the following related to the investments to the ODA (Official Development Aid) projects:

- a) Machine equipment

- b) Dedicated transport means in the production line not yet used for production in the country, and vehicles used for transfer of workers, including vehicles accommodating 24 or more passengers, and water transport means
- c) Machine and equipment, and parts, members, attachments, accessories, assemblies, dies, auxiliary materials, which are specified in a and b and which will be used either as assembled with the dedicated transport means into one unit or as a unit
- d) Raw materials used for manufacturing of accessory parts, members, attachments, accessories, assemblies, dies, auxiliary materials to be assembled into the machine and equipment stipulated in a which are not yet produced in the country or for manufacturing of machine and equipment installed in the engineering line
- e) Construction materials not yet produced in the country.

The fixed assets relevant to invests in hotels, offices, rental apartments, houses, shopping centers, technical services, supermarkets, golf links, tourist sites, sports yards, playground, diagnosis and treatment clinics, education, culture, finance, banks, insurance, accounting audit, and consultant services, which belong to the investment field with import tax benefits or ODA projects, the initial import tax for equipment to be imported is exempted (note that tax exemption for other products as shown here does not apply when initial import tax exemption is applied). In addition, the import tax is exempted for the products shown below:

- 1) Goods to be imported/exported for the tradeshow, exhibition, and workshop;
- 2) Goods to be imported/exported for processing businesses according to the processing deal contract;
- 3) Seeds and cattle to be imported for the investments in agriculture, forestry and fisheries;
- 4) Goods to be imported for investments in the petroleum gas service field (with rules stipulated);
- 5) Exemption of the export tax of vessels and the export tax of fixed assets in the shipbuilding field (with rules stipulated);
- 6) Raw materials and supplies to be imported for production of software products that cannot be produced within the country;
- 7) Goods to be imported for direct use during scientific research activities and technology development (with rules stipulated).

A company may be exempted from the land rentals (rental revenue) in the cases outlined below according to Articles 18, 19, and 20 of Cabinet Order No. 46/2014/ND-CP, dated May 15 2014 (which apply only in cases where the land is leased directly from the government):

- a) Exemption of land rentals throughout the project implementation period: Investment in the fields of special investment privileges and in the areas with social and economic difficulties
- b) Exemption of land and water surface rentals for the basis construction period concerning the project approved by the competent agency. Note that the period shall not exceed maximum of three years from the date at which the land or water surface lease determination letter is issued.
- c) Exemption of land rentals with limited application period:
  - Exemption for three years concerning the project of investment in the investment-incentive fields
  - Exemption for seven years for investments in the areas with particularly difficult social and economic conditions
  - Exemption for 11 years for investments in in the areas with particularly difficult social and economic conditions, the preferential specific investment field, the investment incentive field in the areas with difficult social and economic conditions

- Exemption for 15 years for investments in the investment incentive field of the areas with particularly difficult social and economic conditions, and in the specific investment incentive field of the area with difficult social and economic conditions
- Others include tax reduction benefit for cooperative association damaged from natural disasters.

In addition, the personal income for individuals working in the specific economic zone founded according to the decision of Prime Minister is reduced by 50%.

### 3) Investment incentives of Thailand

Investment Incentives of Thailand is roughly divided into (I) Activity-based Incentive (Incentive according to the importance of industry type) and (II) Merit-based Incentive (Incentive to promote investment to activities contributing to the country and industry development. Activity-based incentives are as shown in Table 2.3.10.

**Table 2.3.10 Activity-based Incentives of Thailand**

Activity-based incentives for Group A business

Group	Article 31: Corporate income tax exemption	Article 28: Machine import tax exemption	Article 36: Exemption of import tax for raw materials for production of export products	Incentives other than the tax system
A1: Knowledge-based business focusing on designs and research & development (R&D) that contribute to improvement of national competitiveness	8 years (no upper limit) + additional merit-based benefits	✓	✓	✓
A2: Infrastructure business contributing to national development, business using high-techs to create the value-added, for which only limited investment has been made or no investment has been made in Thailand	8 years + additional merit-based benefits	✓	✓	✓
A3: Business using high-techs critical for national development though only a few production bases exist already in Thailand	5 years + additional merit-based benefits	✓	✓	✓
A4: Business whose technology level is not so high as A1-A3, but which enhances the value-added of domestic raw materials and strengthen the supply chain	3 years + additional merit-based benefits	✓	✓	✓

Activity-based incentives for Group B business

Group	Article 31: Corporate income tax exemption	Article 28: Machine import tax exemption	Article 36: Exemption of import tax for raw materials for production of export products	Incentives other than the tax system
B1: Local supporting industries, which are critical for the value chain though not using high-techs	Additional incentives to enhance the competitiveness and additional incentives for decentralization (part of industry types)	✓	✓	✓
B2: Local supporting industries, which are critical for the value chain though not using high-techs	Industry type to which above incentives are not applied	X	✓	✓

Source: Thailand Board of Investment Guide 2016

Note: ✓: applicable, X: not applicable

For incentives according to the degree of contribution to the national and industrial development, the following three types are provided:

- 1) Additional incentives to enhance the competitiveness,

- 2) Additional incentives for decentralization,
- 3) Additional incentives for development of industrial land.

When any investment or expenditure occurs for the purpose of enhancing the competitiveness, such expenditures may be counted for tax exemption as shown in Table 2.3.11.

**Table 2.3.11 Additional Incentives for Investment Intended to Enhance Competitiveness of Thailand**

Type of investment/expenditure	Additional tax exemption (ratio of the amount of investment/incurred expenditure)
1. Research and development of engineering and innovation: In-house research and development/research and development of subcontractors in Thailand, or joint research and development with organizations outside Thailand	200%
2. Support, agreed upon by the BOI, for the technology and human resources development foundation in Thailand, the education institute and dedicated training center in the scientific engineering field, technical training center research and development organization, and governmental agencies	100%
5. License fees for technologies developed in Thailand	100%
6. High-level technical training	100%
7. Development of local suppliers of raw materials and parts (51% or more stocks owned by the Thailand nationality: Support for high-level technical training and assistance	100%
8. Design of the products and package as agreed upon by the BOI: In-house or outsourcing inside Thailand	100%

Additional incentives depending on the investment/expenditure ratio

Ratio of the investment/expenditure for initial three years relative to total sales	Additional exemption period of corporate income tax (upper limit added)
1% or > 200 million baht	1 year
2% or > 400 million baht	2 years
3% or > 600 million baht	3 years

Source Explanation No. 1/2558 dated January 28 2015 of BOI Secretariat

The incentives shown in Table 2.3.12 are added when the company is located in any of the following 20 rural districts, where the income per capita is low: Kalasin, Chaiyaphum, Nakhon Phanom, Nan, Bueng Kan, Buriram, Phrae, Maha Sarakham, Mukdahan, Mae Hong Son, Yasothon, Roi Et, Sisaket, Sakon Nakhon, Sa Kaeo, Sukhothai, Surin, Nong Bua Lamphu, Ubon Ratchathani, Amnat Charoen (excluding the southern border area with separate specific benefits or specific economic zone).

- The three-year corporate income tax exemption period is added, except that, for Group A1 and A2 for which eight-year corporate income tax exemption are already provided, the corporate income tax will be reduced by 50% for further five years after termination of the tax exemption period.

**Table 2.3.12 Additional Incentives for Decentralization of Thailand**

	A1	A2	A3	A4	B1	B2
Exemption of corporate income tax according to the industry type	8 years (no upper limit)	8 years	5 years	3 years	X	X
Additional exemption of corporate income tax	X	X	3 years	3 years	3 years	X
Total of corporate income tax exemption period	8 years (no upper limit)	8 years	8 years	6 years	3 years	✓
50% reduction of corporate income tax for five years after termination of the corporate income tax exemption period	✓	✓	X	X	X	X
Two-fold amount of transport costs, electric bill, and water bills deducted for 10	✓	✓	✓	✓	✓	X

years						
(Translator's note: In addition to the normal depreciation) 25% of infrastructure installation/construction costs deducted additionally	✓	✓	✓	✓	✓	X

Source: Thailand Board of Investment Guide 2016

Note: ✓: applicable, X: not applicable

When the company is located in an industrial park or in a recommended industrial area, one year is added to the corporate income tax exemption period.

**Table 2.3.13 Additional Incentives for Development of Industrial Land in Thailand**

	A1	A2	A3	A4	B1	B2
Exemption of corporate income tax according to the industry type	8 years (no upper limit)	8 years	5 years	3 years	X	X
Additional corporate income tax exemption	X	X	1 years	1 years	X	X
Total of corporate income tax exemption periods	8 years (no upper limit)	8 years	6 years	4 years	X	X

Source: Thailand Board of Investment Guide 2016

Note: X: not applicable

In order to enhance the production efficiency and competitiveness, the BOI authorizes exemption of machine import tax in the following cases:

- 1) Machinery for research and development,
- 2) Machinery for pollution control or contamination treatment,
- 3) Among machinery used in electric and electronic parts manufacturing projects, the machinery imported for modification/improvement, replacement, and increase in the production capacity of existing machinery in the project, regardless of whether the operation start is permitted or not.

#### **4) Essential points the Laos Government can learn from incentives applied in Vietnam and Thailand**

The target industries for investment incentives in Laos correspond to the industries to be fostered according to the basic policies of national development. These industries include (i) scientific technology research and development, (ii) promotion of the industry using the high-level advanced technologies, (iii) development of clean energy, (iv) promotion of environmentally conscious agriculture, cattle feeding, agricultural products processing industry, (v) conservation and promotion of traditional handiworks, (vi) promotion of sustainable nature, culture, historical tourism, (vii) promotion of education and human talent development (human resources development), vocational training, and sports, (viii) development of high-level medical facilities and medicines, promotion of development and manufacturing of medical equipment, (ix) urban development and development of city infrastructures (entry of the private sector), (xi) development of industrial infrastructure, promotion of logistics and cross-border services, (xi) poverty alleviation and micro-finance and (xii) promotion of branding, etc. Instruction has been given that the preferential areas should reflect the results of recent poverty survey.

Vietnam explains the investment incentive measures rather specifically so that investors may not be vexed much about whether or not their business can receive the investment incentive. Concerning the areas, the Vietnamese measures specify which rural district of which province can receive the incentive with the level of incentive.

On the other hand, the Thailand BOI Guide not only designates clearly the industry type and region to which the investment incentive measures are applicable, but also provides necessary supplementary explanations by referring to the problematic cases and countermeasures taken for application of the incentive measures up to now.

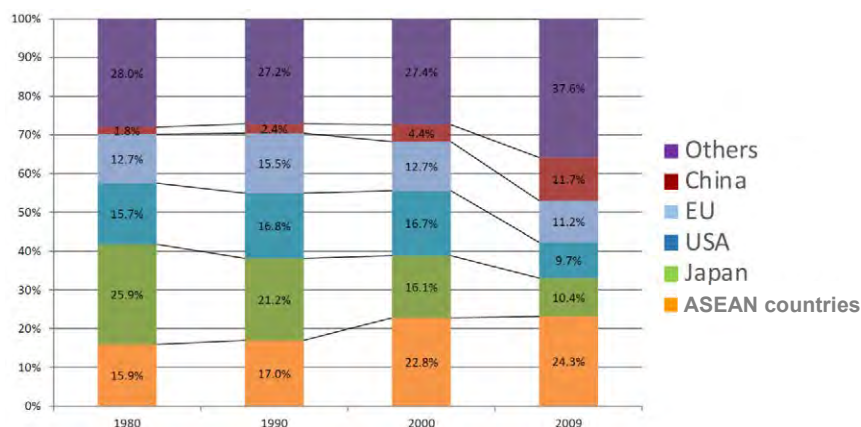
If Laos is to overcome the land-locked disadvantages country and to achieve economic development, economic development and promotion of export must be achieved by development of Hanoi-Vientiane expressway as an opportunity. To recover the huge amount of investment for construction of the expressway, it is essential to collect tolls from the expressway users or by encouraging roadside economic development to increase the tax revenue. This requires attraction of investment for roadside development, and invitation of Japanese and other foreign companies having high technology and abundant funds. The examination of the examples of investment incentives of Vietnam and Thailand indicates that Laos needs to develop and implement competitive measures to be more attractive than the surrounding countries by fully taking into account the characteristics of Laos.

### (3) International specialization system and establishment of the supply chain (bottleneck of concern and countermeasure)

#### 1) State of construction of the supply chain as viewed in the trade among ASEAN countries

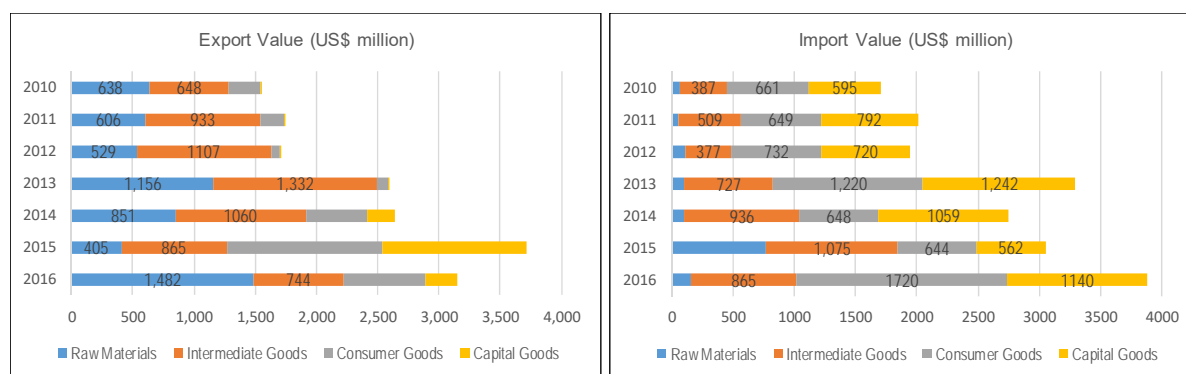
Figure 2.3.4 shows trading partners and regions of ASEAN countries during the 1980 to 2009 period while Figure 2.3.5 shows the export values (breakdown by application) within the ASEAN region. When viewed over the long term, the trading partners of ASEAN countries were Japan, US, and EU, all of which accounted for 50% or more in 1980s as shown in Figure 2.3.5. In 2009, the trade value with these countries and regions decreased to around 30% while the percentage of trade within the ASEAN region, with China and other countries is growing substantially. As shown in Figure 2.3.5, the items whose export values are growing substantially are parts and intermediate goods. This is considered to reflect establishment of the supply chain by foreign (mainly Japanese) companies within the ASEAN region and progress of horizontal specialization within the supply chain.

As shown in Figure 2.3.6, the trade value of intermediate goods for the whole of Asia kept growing till 2014, except for a certain period during which the world trade reduced due to Lehman Crash. Since 2000, the ratio of intermediate goods kept the level of 50%. Though similar data on ASEAN countries are not available, the ratio of intermediate goods in the trade among ASEAN countries is considered to be around 45% up to recently because the trends over 1999 to 2011 was quite similar.



Source: Towards an integrated ASEAN: JICA's efforts to help realize connectivity (The original data from IMF)

**Figure 2.3.4 ASEAN's Major Trade Partners/Regions**



Source: World Integrated Trade Solution

**Figure 2.3.7 Import/Export of Raw Materials, Intermediate Goods, Consumer Goods, and Capital Goods of Laos**

### 3) Bottleneck against positioning of Laos in the world and ASEAN value chain networks

In order to position Laos in the world and ASEAN value chain networks, the most promising scenario is to move a part of supply chain, which has been established in Thailand by Japan, US, or European countries as Thailand plus one, in response to the increase of the labor cost. Actually, the Japanese companies in Thailand are locating their factories in the specific economic zone provided in Savannakhet in the southern part of Laos. Alternatively, Laos can target at attraction of factories of Japanese or US and European companies that intend to shift the supply chain from China to Vietnam.

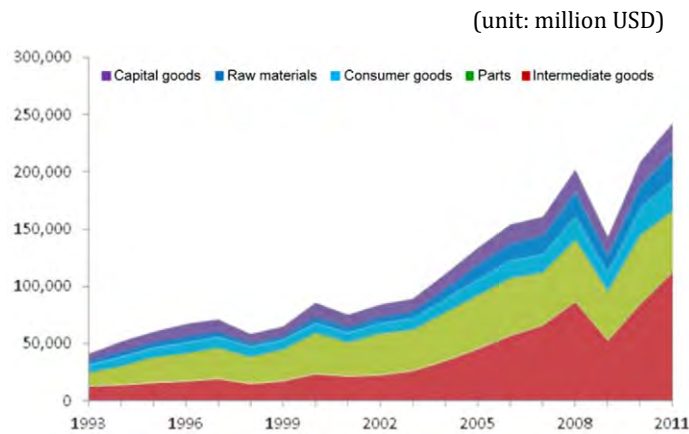
As shown in Figure 2.3.8, however, the GDP per-capita of Laos has increased, overtaking Vietnam during the 2015 to 2016 period. It is currently nearly twice as large as that of Cambodia and Myanmar. As shown in Figure 2.3.9, the wage of workers in Vientiane reached the level similar to that of Hanoi in 2015 while exceeding that of Da Nang, Phnom Penh, and Yangon. Namely, Laos cannot compete with the neighboring countries excluding Thailand and China by attracting labor-intensive type industries featuring inexpensive personnel cost.

### 4) Required measures to position Laos in the world and ASEAN value chain networks

In order to position Laos in the world and ASEAN value chain networks, industry attraction and investment promotion exploiting characteristics of Laos as follows is necessary:

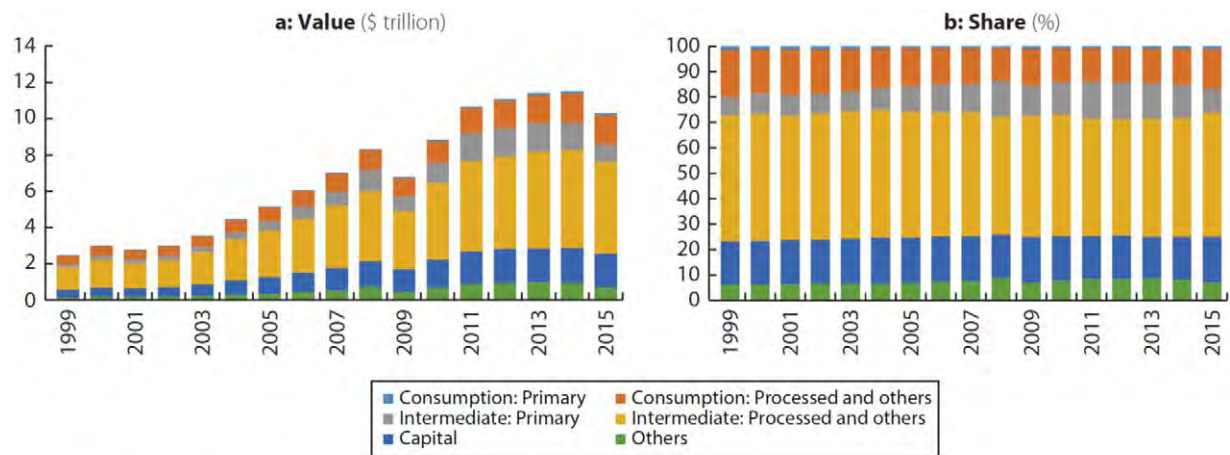
- a) Continuation of hydroelectric power generation development using abundant hydropower potential (which in turn requires strict consideration of environment and society) and attraction of industries using abundant electric power;
- b) Attraction and promotion of industries using clean and abundant water resources;
- c) Promotion of agriculture, cattle feeding, and forestry utilizing wide land resources, and development and investment promotion for processing of these products and export of processed goods;
- d) Promotion of mining industry using abundant mineral resources (except that exploitative mining development that must be avoided);
- e) Attraction of factories to the areas other than Vientiane where the personnel cost is already high;
- f) Participation in and promotion of international logistics by utilizing the merits of bordering on Thailand, Vietnam, China, and Myanmar.





Source: Economic corridors in the Mekong region (Japan Economic Research Institute. The original data from the Research Institute of Economy, Trade, and Industry)

**Figure 2.3.5 Values of ASEAN's Exports of Capital Goods, Raw Materials, Consumer Goods, Parts, and Intermediate Goods**



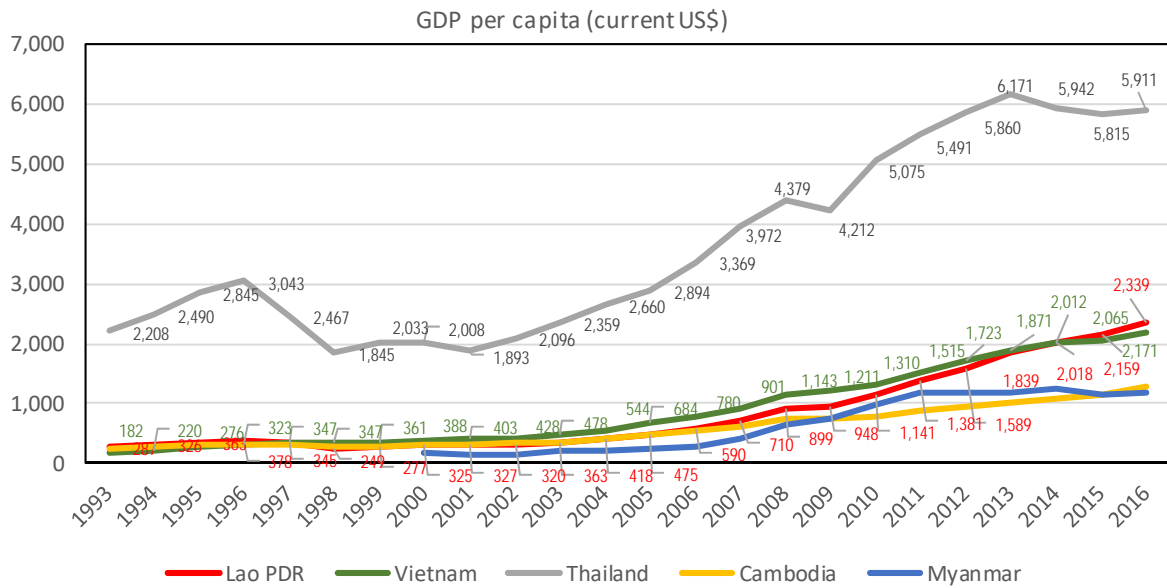
Note: Based on Broad Economic Categories.

Source: ADB calculations using data from United Nations. Commodity Trade Database. <https://comtrade.un.org> (accessed October 2016).

**Figure 2.3.6 Trade of Consumable Goods and Intermediary Commodities among Asian Countries**

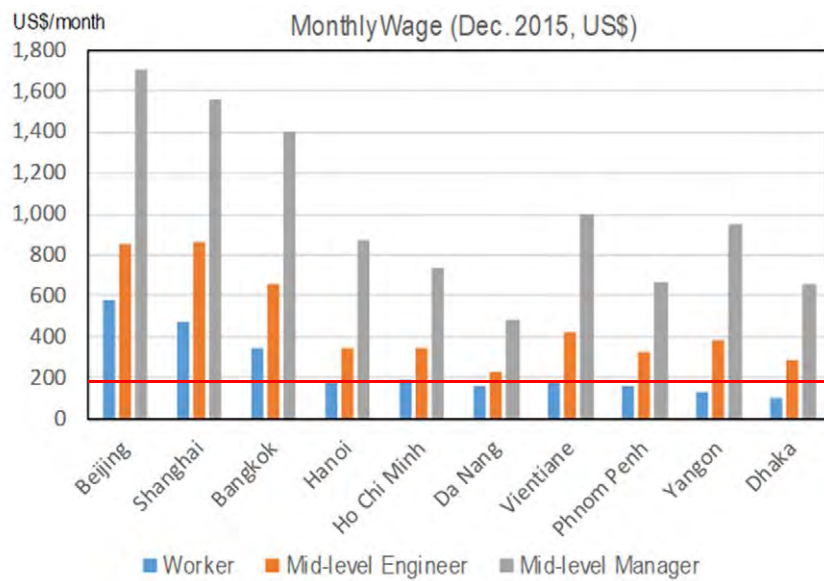
## 2) Transition of import/export of raw materials, intermediate goods, consumer goods, and capital goods in Laos

On the other hand, the ratio of raw materials, intermediate goods, consumer goods, and capital goods of the imports and exports of Laos varies greatly year by year, as shown in Figure 2.3.7. Though no specific trend can be read, the upward trend of the ratio of intermediate goods in the trade value is not apparent at least in the recent two to three years. This is considered to be due to the fact that Laos is not incorporated in the value chain of Asian and ASEAN countries.



Source: World Bank Database

**Figure 2.3.8 GDP in Thailand, Laos, Vietnam, Cambodia, and Myanmar**



(Note) Monthly average wage (basic pay, allowances, social security, overtime, bonus, etc., included) paid by Japanese companies as of December 2015. Worker: workers with business experience of around three years. Mid-level Engineer: Engineers graduating from college and with the business experience of around five years. Mid-level Manager: Manager graduating from college and with the business experience of around 10 years (division chief class)

(Source of data) The 26th comparison of costs related to investment in Asia Oceania major cities and regions (June 2016) (JETRO)

**Figure 2.3.9 Monthly Average Wage in Asian Cities**