DATA COLLECTION SURVEY ON INDUSTRY AND LOGISTICS OF COASTAL PROVINCES OF MEKONG DELTA IN SOCIALIST REPUBLIC OF VIET NAM

FINAL REPORT

SUMMARY

MAY 2019

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NIPPON KOEI CO., LTD.
KOEI RESEARCH & CONSULTING INC.

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Contents

List of Figure

List of Table

Abbreviation

ADB	Asian Development Bank
BOT	Build-Operate-and-Transfer
DARD	Department of Agriculture and Rural Development
DDI	Domestic Direct Investment
DOIT	Department of Industry and Trade
DOT	Department of Transport
EDCF	Economic Development Cooperation Fund
FDI	Foreign Direct Investment
FS	Feasibility Study
GRDP	Gross Regional Domestic Product
HCMC	Ho Chi Minh City
IWT	Inland Waterways Transport
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
MOF	Ministry of Finance
MOIT	Ministry of Industry and Trade
MONRE	Ministry of Natural Resources and Environment
MOT	Ministry of Transport
MPI	Ministry of Planning and Investment
NH	National Highway
ODA	Official Development Assistance
PMU	Project Management Unit
PPP	Public‐Private Partnership
PR	Provincial Road
PSIF	Private Sector Investment Finance
SEZ	Special Economic Zone
SWLC	Vietnam Southern Region Waterways and Transport Logistics Corridor Project
TEU	Twenty-foot Equivalent Unit
USA	United States of America
USD	United States Dollar
VND	Vietnam Dong
WB	World Bank

1 Introduction

1-1 Background of the Study

In the Mekong Delta area, there are two distributaries of the Mekong River, mainly the Tien River and Hau River, and their multiple branches before reaching the coast. In addition, a dense waterway network with large and small channels has been developed to facilitate vessels of weights ranging from 10 to 3,000 tons - class to pass through almost every corner of the region. Thus, inland water transport utilizing the waterway network has important freight distribution routes connecting the area to the outside region.

Meanwhile, the Mekong Delta region, which is a low-lying area, is likely to be affected by saltwater intrusion and freshwater shortage due to the rising sea level caused by climate change. One concern is that negative impacts will harm not only logistics infrastructure, such as waterways, but also industrial development.

From the viewpoint of industrial development, the improvement of transportation infrastructure is recognized as an important issue to cope with the increasing freight volume and traffic volume, as well as to reduce dependence on the waterway network which is vulnerable to climate change, and diversify the means of distribution network. Having this foresight, NH60 has been developed in addition to NH1A, which is the main arterial road in the Mekong Delta. However, it is not enough to realize smooth logistics because of existing and under-developed roads and waterway transport networks. Subsequently, it is necessary to further improve and develop the distribution network.

1-2 Objectives of the Study

JICA is examining candidates for transport infrastructure projects (land transport infrastructure such as road and bridges, water transport infrastructure such as inland/coastal waterways) that should contribute to resolve logistics bottlenecks on land transport and inland/coastal waterways transport and improve logistics in the Mekong Delta coastal area by utilizing Japan's knowledge and experience. Therefore, in this study, JICA Study Team will collect information which is necessary to examine the applicability of Japanese ODA support for transportation infrastructure that contributes to logistics improvement in the four provinces of the Mekong Delta coastal area including Tra Vinh, Soc Trang, Bac Lieu and Ca Mau. Then, JICA Study Team will propose contents of cooperation plan assumed based on the findings in the study.

In the proposal, JICA Study Team will examine the appropriateness of the cooperation plan based on the analysis of the benefit effect obtained by the solution of the bottleneck of the transportation infrastructure in the study area. analyze the collected and organized information and propose the contents of the specific project(s).

Since this study aims to develop the strategy of JICA's cooperation for economic infrastructure development for logistics improvement in the study area, it should be noted that this study does not mean the commitment of the project implementation.

1-3 Study Area

As shown in Figure 1-1, the study area includes the coastal provinces of the Mekong Delta, including Tra Vinh, Soc Trang, Bac Lieu, and Ca Mau Provinces.

Source: JICA Study Team

Figure 1-1 Location Map

1-4 Contents of the Study

a) Identify main products of each provinces of the study area by studying current economic structures and future development.

b) Clarify logistics system and route in each province. Identify bottlenecks of logistics infrastructure which may hinder economic development in the future.

c) Identify bottlenecks in the logistics infrastructure for private companies that are evaluated

as “insufficient level of infrastructure" in attracting their investments.

d) Analyze the risks of climate changes for the logistics infrastructures.

e) Recommend overall scheme for logistics infrastructure improvement program, and prepare some specific projects for smooth and early implementation.

2 Profile of Coastal Provinces of Mekong Delta

2-1 Basic Information

The coastal provinces of Mekong Delta (study area) has an area of 13,560km^2, which is about 33% of total area of Mekong Delta (40,816 km^2). In 2017, it has a population of 4.48 million, which is about 25% of that of Mekong Delta (17.7 million).

Table 2-1 Population of the Study Area in 2017

City/ Province	Total (in 1000)	Male (in 1000)	Female (in 1000)	Labor Population (over 15 years old, in 1000)	Area (㎢)	Population Density (People/㎢)
Tra Vinh	1,046	511	535	602	2,358	443
Soc Trang	1,314	652	662	702	3,312	396
Bac Lieu	894	447	447	564	2,669	334
Ca Mau	1,226	614	612	690	5,221	234
(study area)	4,480	2,224	2,256	2,558	13,560	330
Can Tho city	1,273	634	639	714	1,439	884
HCMC	8,643	4,139	4,504	4,412	2,095	4,126
Viet Nam	93,671	46,253	47,418	54,823	33,123	283

Source: Statistical YearBook2017

GRDP per capita and economic growth rate of the study area are lower than Can Tho City and HCMC. The poverty rate is also nearly twice that of Can Tho City, at 8.66% on average for the four provinces. In particular, the poverty rate in Soc Trang Province is relatively high at 11.85%.

Table 2-2 Economic Index of the Study Area in 2017

City/ Province	GRDP (million USD)	GRDP per capital (USD)	Economic Growth Rate** (%)	Unemployment Rate (%)	Poverty Rate (%)
Tra Vinh	1,800	1,723	8.5	2.94	8.41
Soc Trang	1,940	1,478	5.4	2.98	11.85
Bac Lieu	1,472	1,474	6.0	2.92	8.42
Ca Mau	2,046	1,669	5.0	3.11	5.96
(study area)	7,258	1,680	6.2	2.99	8.66
Can Tho city	3,438	2,704	12.3	3.21	4.60*
HCMC	42,607*	4,930*	7.7	-	-
Viet Nam	223,780	2,389	6.8	2.24	5.80*

Note: *data in 2016 **data in 2015

Source: Statistical YearBook2017, “Investment Environment Survey in Southern Vietnam” by JETRO HCMC Office

The provinces in the study area are promoting the development of industrial parks and SEZs in line with the national and provincial development plans in order to promote the development of the regional economy. With the development of such economic infrastructure, the movement to attract foreign investment is also intensifying. From 2010 to 2017, there were 96 FDIs in 4 provinces in total. In particular, there are many FDI cases in Ca Mau Province and Tra Vinh Province, and it is an FDI candidate area that is almost the same as Can Tho City.

Table 2-3 FDI of the Study Area from 2010 to 2017

City/ Province	Total of FDI		Top 3 countries and Japan for total of FDI (until December 2017)
	number	Approved Amount (million USD)	
Tra Vinh	37	3,076	Korea (12), Taiwan (10), Canada (5), Japan (1)
Soc Trang	11	106	USA (2), Taiwan (1), Australia (1), Korea (1), Japan (0)
Bac Lieu	5	2	Taiwan (2), Australia (2), Korea (2), Japan (1)
Ca Mau	43	87	Australia (2), USA (1), Singapore (1), Japan (1)
(study area)	96	3,271	Korea (15), Taiwan (13), Australia (5), Japan (3)
Can Tho city	51	424	Korea (10)、Hong Kong (8)、Singapore (7), British Virgin Islands (7)、Japan (4)
HCMC	4,476	608,341	Korea (1,453), Japan (1,127), Singapore (1,031)
Viet Nam	14,557	-	Korea (6,549), Japan (3,607), Taiwan (2,534)

Source: Statistical YearBook2017

2-2 Logistics Infrastructure

The main logistics infrastructure of the study area is summarized in Table 2-4. As for the land transport infrastructure, expressways are not developed, and national roads and provincial roads as main roads are maintained at 454 km in Tra Vinh Province, 653 km in Soc Trang Province, 478 km in Bac Lieu Province, and 424 km in Ca Mau Province. The extension of roads below the district road classification including rural roads is about 3,000 km in Tra Vinh Province, but in Ca Mau Province, it is developed at 12,000 km so that shrimp farming in brackish water area can be transported to the processing factories by small trucks quickly. Therefore, the road density (km/km^2) is high at 2.39 in Ca Mau Province, compared to 1.50 in Tra Vinh Province.

As for the water transport infrastructure, Soc Trang Province has a channel length of approximately 3,282 km, and its waterways density is 2.5 to 4 times higher than those of other provinces. The large scaled river port is a private port dedicated to nitrogen fertilizer plant in Ca Mau Province, but the others are small fishing ports. In Bac Lieu Province, there are plans for Ganh Hao sea port and Ho Phong river port, but it is not yet developed.

As for logistics centers, although there are plans in Tra Vinh Province, Soc Trang Province and Ca Mau Province, they have not been implemented yet. The functions of the logistics center include nodes between inland waterway transport and land transport modes, collection, processing, storage, transportation etc., and facilities for such functions include ports, cranes, container yards, warehouses, processing factories etc.

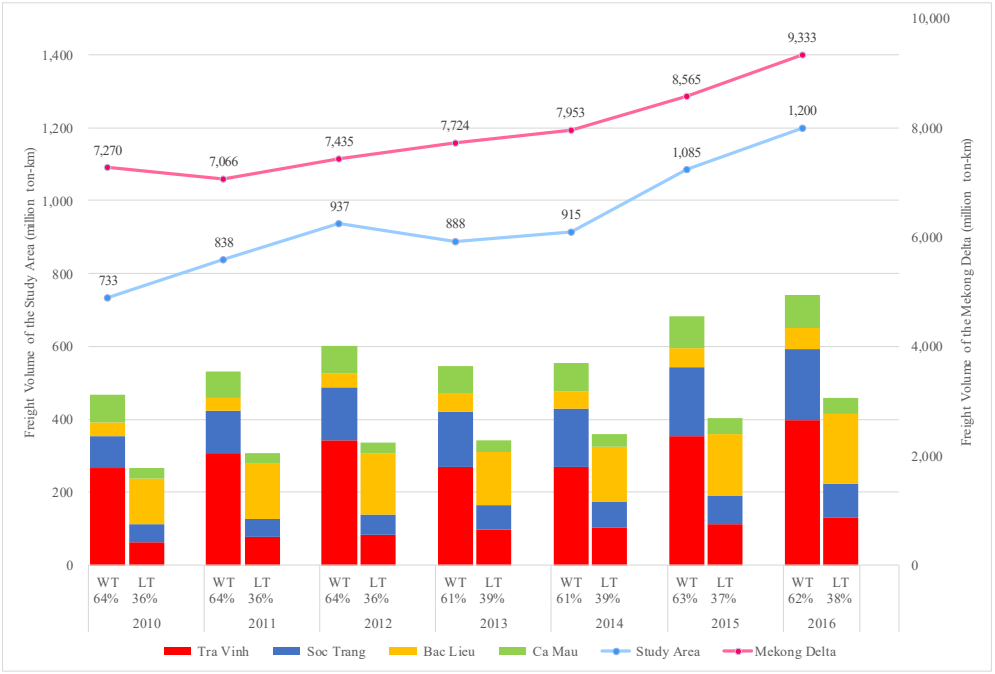
Table 2-4 Existing Logistics Infrastructure of the Study Area

Infrastructure		Tra Vinh	Soc Trang	Bac Lieu	Ca Mau
Land Transport Infrastructure	Expressway (km)	0	0	0	0
	National Highway(km)	236	261	134	162
	Provincial Road (km)	218	392	344	262
	District Road and lower standard road(km)	3,076	6,362	3,666	12,050
	Total(km)	3,530	7,015	4,144	12,474
	Road Density (km/km^2)	1.50	2.12	1.55	2.39
Water Transport Infrastructure	Managed by Central Government (km)	78	113	170	315
	Managed by Local Governments(km)	840	3,169	457	927
	Total(km)	917	3,282	627	1,242
	Waterways Density(km/km^2)	0.39	0.99	0.23	0.24
	River port	- Long Duc port - Dinh An Fish port - Lang Chim Fish port	- Soc Trang port - Long Phu port - Tran De fish port	not invested yet	- Ca Mau port - Dedicated port for gas electric and nitrogen fertilizer plants - Ong Doc port
	Sea port	- Duyen Hai coal port	not invested yet	not invested yet	- Nam Can port
(reference)	Area (km^2)	2,358	3,312	2,669	5,221

Source: Tra Vinh, Ca Mau from "Socio-Economic Development Plan", Soc Trang, Bac Lieu from DOT of provinces

2-3 Logistics Transport Volume and Mode

The freight volume (ton-km) by mode of the study area is shown in Figure 2-1. While the volume of transport in the entire Mekong Delta has been at an average annual growth rate of 4% since 2010, the study area shows a high growth rate at an annual average of 9%. As for the modal split, it has remained at 60% inland waterways transport and 40% in land transport.



Source: General Statistics Office of Viet Nam

Figure 2-1 Freight Volume by Transport Modes (ton-km)

2-4 Regional Development Plan

According to regional development plans in the Mekong Delta, while increasing the industrial ratio of the industrial composition, the target value to increase the production amount of agricultural and fishery products is set. As for logistics, the necessity of multimodal transport utilizing inland waterways transport is emphasized and priority projects are listed. In addition, a policy of reduction of the logistics cost by development of the logistics center is indicated.

Table 2-5 outlines the main development plans.

Table 2-5 Main Development Plans

Development Plan	Content
Decision No. 1581/QD-TTg dated 9/10/2009 Authority: MOC	[Construction planning of Mekong delta to 2020 and vision to 2050] ・ Upgrading NH60, construction of Dai Ngai Bridge, Co Chien Bridge are listed.
Decision No. 68/QD-TTg dated 15/1/2018 Authority: MOC	[Revision of Construction planning of Mekong delta to 2030 and vision to 2050] ・ Development policy of the Mekong Delta region to a region that plays a key role in food, fish and fruit production; that assures national food security and plays a significant role in export of agricultural and fishery products to international markets.
Decision No.11/2012/QD-TTg dated 10/2/2012 Authority: MOT	[Master Plan on Development of Transport in the Mekong Delta Key Economic Region through 2020, with Orientations Toward 2030] ・ Improvement of logistics function ・ Phase wised construction of expressway, improvement of road and inland water transport, enhancement of multimodal transport
Decision No.1012/QD-TTg dated 3/7/2015 Authority: MOIT	[Development Plan of Logistics Center System in the whole country to 2020, orientation to 2030] ・ Establishment of logistics centers in Viet Nam ・ The nationwide planning of logistics centers which aims to reduce logistics cost to 15-17% of GDP in 2030.
Decision No. 245/QD-TTg dated 12/2/2014 Authority: MPI	[Master Plan on Socio-Economic Development of Mekong Delta Key Economic Region through 2020, with orientation toward 2030] ・ Setting target for industries and productions ・ Target of industry structure: primary 17.3%, secondary 37.4%, service 45.3% ・ Target of rice production: 10.2 million tons, aquaculture: 2.42 million tons

Source: JICA Study Team

Currently, no logistics master plan has been formulated in Vie Nam. In 2017, however, a national action plan for logistics development and competitiveness improvement was announced by Prime Minister's decision No.200/QD-TTg. The action plan includes a total of 60 tasks in the fields of organization of logistics system, logistics infrastructure, capacity development and service level improvement of logistics company, logistics market development, and human resource development. Meanwhile, a logistics master plan for the Mekong Delta region is planned to conduct under MOIT.

In each province of the study area, more detailed plans, such as socio-economic development plans and transport development plans, have been formulated that are consistent with the above-mentioned central government development plans.

3 Industry and Logistics of Coastal Provinces of Mekong Delta

3-1 Identified Main Products

The main products of each province were identified through a five-step process:

<Step 1> Summarized production volume of goods in each province.

<Step 2> Based on the results from interviews with major retailers and supplier, the JICA Study Team set the market prices for each product and calculated the (estimated) production values by multiplying the prices with the production volumes obtained from <Step 1>.

<Step 3> From the results of <Step 2>, the JICA Study Team chose the top two products with the highest production values.

<Step 4> Considering the production volume in <Step 2>, the JICA Study Team chose the top two products with the highest share (in volume) in Vietnam's total production.

<Step 5> From the list selected in <Step 3> and <Step 4>, the JICA Study Team chose three main products for each province.

The results of this selection process are shown in Table 3-1.

In general, all four provinces have shrimp and rice as their two main products. For the third product, a specialty product of each province is chosen, i.e., coconut for Tra Vinh, sugarcane for Soc Trang, salt for Bac Lieu, and nitro-fertilizer for Ca Mau.

Table 3-1 Main Products of the Study Area

Product	Tra Vinh	Soc Trang	Bac Lieu	Ca Mau
1st product	Shrimp Highest production value; Share in national production: 7.7%	Shrimp Highest production value; Share in national production: 19.4%	Shrimp Highest production value; Share in national production: 17.9%	Shrimp Highest production value; Share in national production: 23.8%
2nd product	Rice 2nd highest production value; Share in national production: 2.7%	Rice 2nd highest production value; Share in national production: 4.9%	Rice 2nd highest production value; Share in national production: 2.5%	Fish 2nd highest production value; Share in national production: 5.6%
3rd product	Coconut 3rd highest production value; Share in national production: 20.2%	Sugarcane 5th highest production value; Share in national production: 4.9%	Salt 9th highest production value; Share in national production: 4.2%	Nitro-fertilizer 4th highest production value; Share in national production: 25.0%

Source: Statistical YearBook2017

Shrimp has the highest production value in all four provinces, and the total production volume of the four provinces accounts for more than two-thirds of Vietnam's total production. It is recognized as one of the most important products in Mekong Delta as its production value surpasses that of

other products. Also, from the perspective of logistics efficiency, shrimp has an extremely high unit price (production value/production volume) compared to other products.

Table 3-2 Production Volume and Price of Main Products

Products	Tra Vinh		Soc Trang		Bac Lieu		Ca Mau		Total			
	V	P	V	P	V	P	V	P	Volume (V) In 1,000 ton	Price (P) In million USD	P/V	Share in Viet Nam (%)
1. Rice	1,137	291	2,105	539	1,067	273	445	114	4,755	1,219	0.26	11.1%
2. Shrimp	55	484	140	1,224	129	1,128	172	1,497	498	4,334	8.70	68.9%
3. Inland fishes	93	101	103	112	154	168	280	305	632	687	1.09	12.5%
4. Coconuts	263	47	19	3	20	3	31	5	335	60	0.18	25.8%
5. Sugarcane	578	21	890	32	17	0.6	78	2	68	38	0.56	4.0%
6. Salt	5	0.3	2	0.1	36	2	0	0	44	3	0.07	5.2%
7.Nitro Fertilizer	0	0	0	0	0	0	819	274	819	274	0.33	25.0%

Source: Statistical Yearbook 2017

3-2 Identified Logistics Routes for Main Products

Logistics status was confirmed through the following aspects: route, mode, time, volume, and transport cost for the main products.

Table 3-3 Main Products and Items to be Confirmed for the Logistics Status

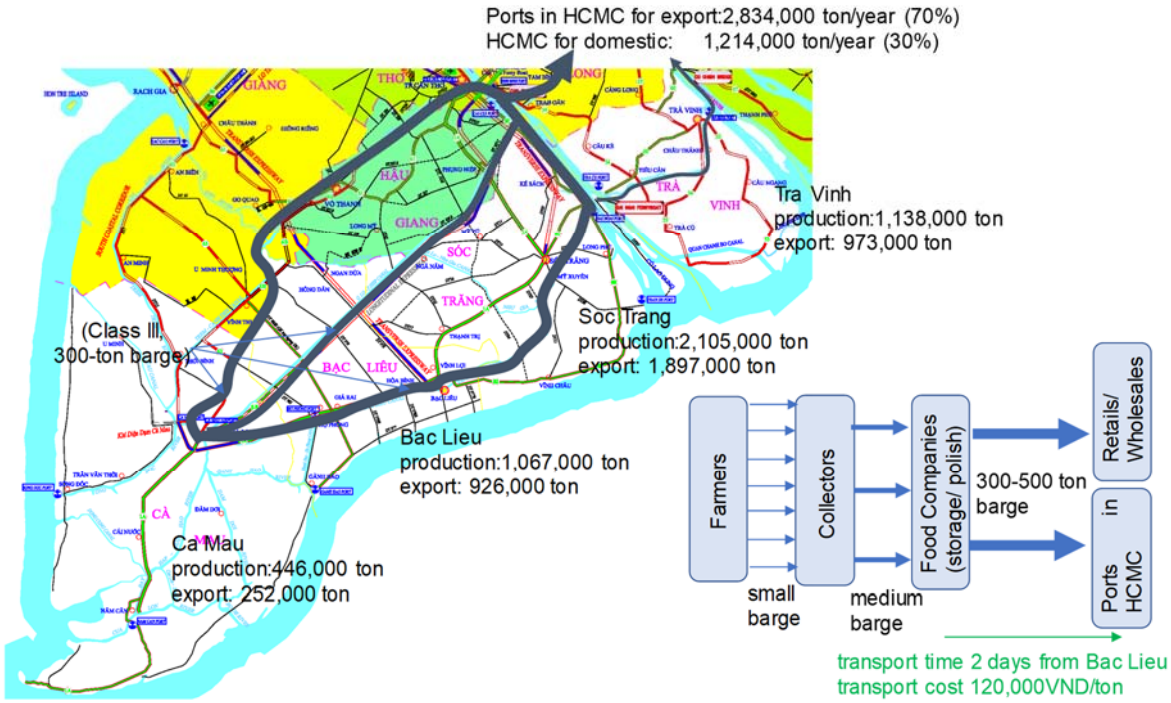
Product	Tra Vinh	Soc Trang	Bac Lieu	Ca Mau	route	mode	time	volume	transport cost
Rice	X	X	X	X	✔	✔	✔	✔	✔
Shrimp	X	X	X	X	✔	✔	✔	✔	✔
Coconuts	X	-	-	-	✔	✔	✔	✔	✔
Sugar	-	X	-	-	✔	✔	✔	✔	✔

Source: JICA Study Team

1) Rice/Paddy

Grains harvested from fields are collected by collectors/agencies. Then, they are purchased by food companies. After that, they are milled into white rice and packed for distribution. The grains are usually transported by small or medium barges to the processing plant via inland water transport (IWT), and white rice is usually transported by 300-500 ton-barges to HCMC for export and domestic consumption via arterial inland waterways. Approximately 70% of the transported rice is for export.

The transport time to HCMC from Bac Lieu is about two days, and the transport cost is about VND 120,000/ton (USD 5.2/ton).



Source: JICA Study Team

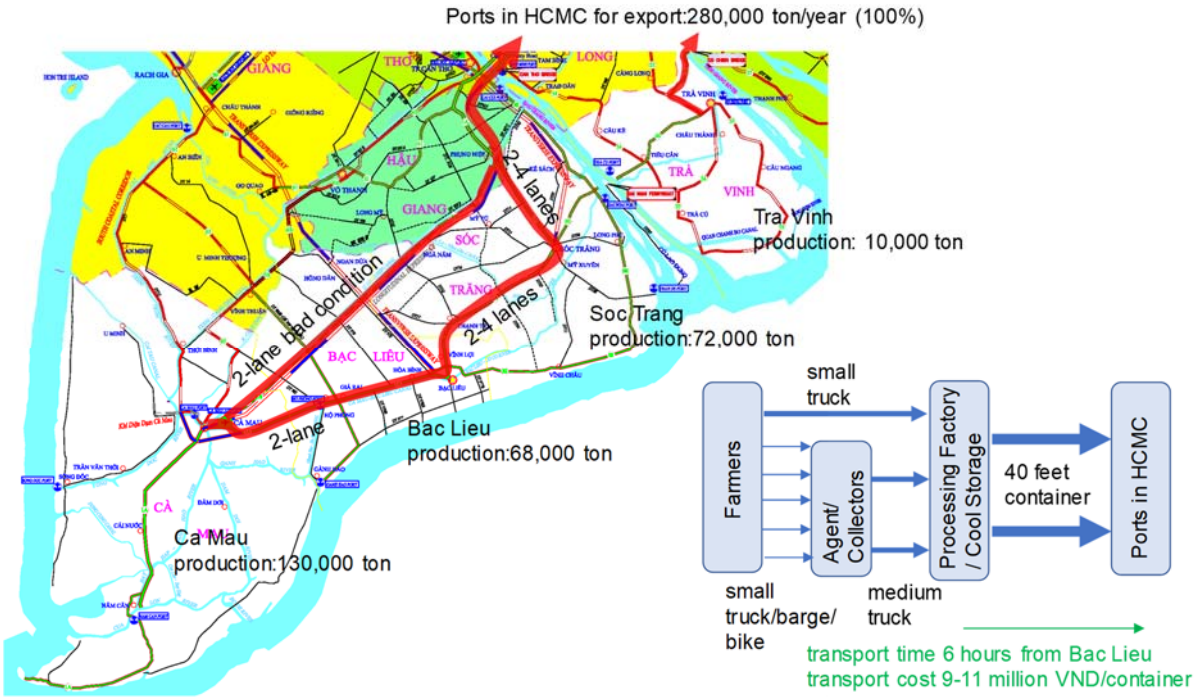
Figure 3-1 Typical Logistics Status of Rice/Paddy

2) Shrimp (Frozen)

Shrimps harvested from farms can be sold directly to processing companies or indirectly via collectors/agencies. From the farms, they are mainly transported by small or medium trucks, but for rural areas where there are no roads, motorcycles and barges are used.

At the processing factories, shrimps are peeled and processed for sushi and tempura or are frozen then stored in warehouses. The products are transported mainly via NH1A by 40-ft containers to the ports in HCMC for export. The export volume is approximately 280,000 tons/year.

The transport time to the ports in HCMC from Bac Lieu is about six hours, and the transport cost for one 40-ft container is about VND 9 to 11 million (USD 380 to 470).



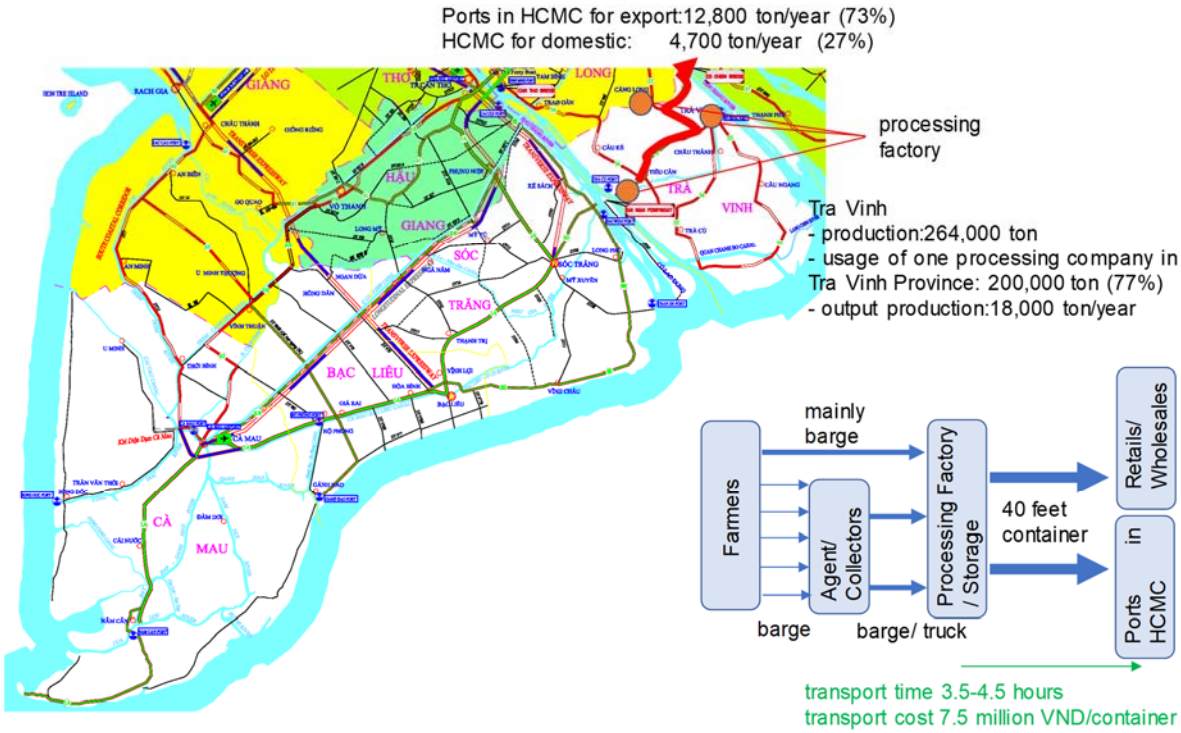
Source: JICA Study Team

Figure 3-2 Typical Logistics Status of Frozen Shrimp

3) Coconuts

The production volume of value-added products from coconuts is 18,000 tons/year, of which 73% is for export, such as activated carbon and anthracite.

Coconuts can be sold directly from farmers to processing companies or indirectly via collectors/agencies. They are mainly transported by barges to the processing factories. Processed products are transported by 40-ft containers to HCMC for export or domestic consumption. The transport time is about four hours, and the transport cost is about VND 7.5 million (320 USD) for one 40-ft container.



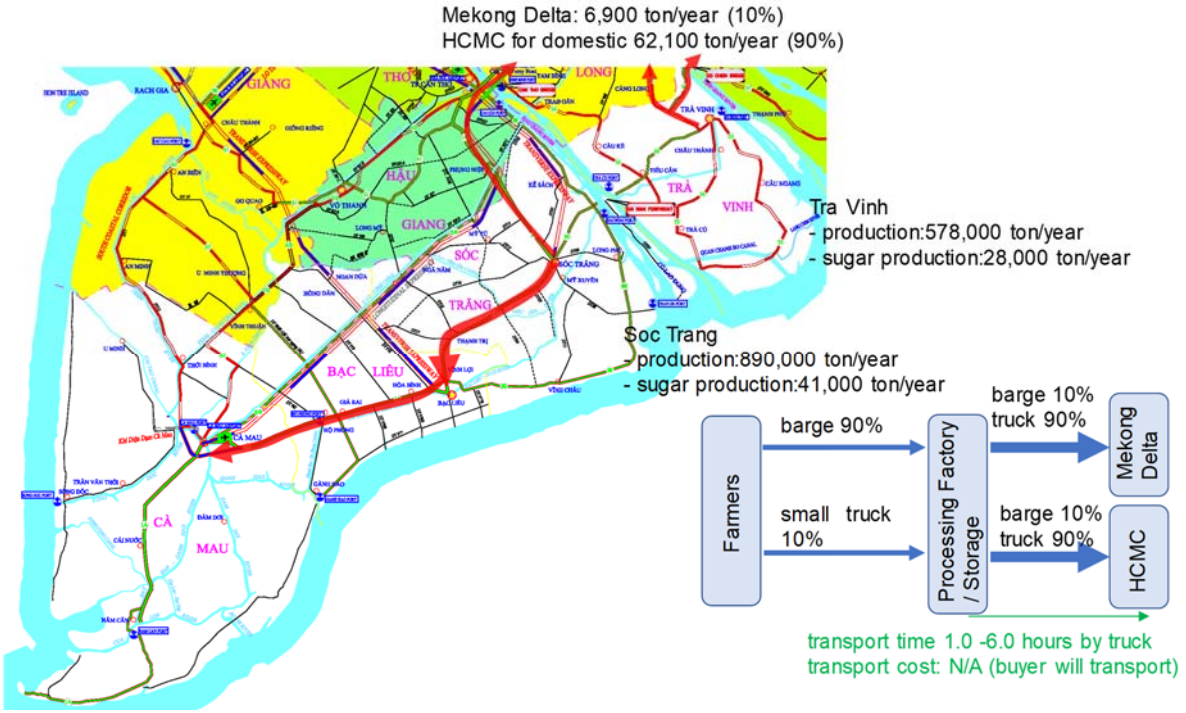
Source: JICA Study Team

Figure 3-3 Typical Logistic Status of Coconuts and Processed Products

4) Sugarcane/Sugar

Sugarcane is the specialty product of Soc Trang and Tra Vinh. Its production in the two provinces is equivalent to 890,000 tons/year and 578,000 tons/year, respectively. From production areas such as Cu Lao Dung Islet of Soc Trang, sugarcanes are transported to processing plants mainly by barges. As the quality of sugarcane deteriorates after cutting, it is necessary to transport the materials to the plants as soon as possible. Regardless, it takes about 20 to 24 hours to transport these goods as IWT at the moment.

After processing, sugar is transported mainly by trucks to HCMC or other provinces in the Mekong Delta. At the time of the survey, sugar is for domestic consumption only – not for export.



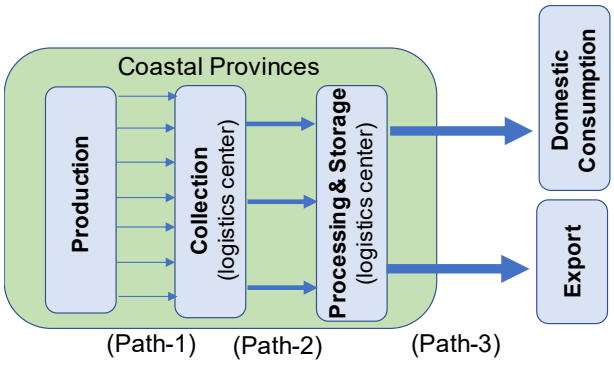
Source: JICA Study Team

Figure 3-4 Typical Logistics Status of Sugarcane/Sugar

It is noted that Nitro-fertilizer produced in Ca Mau has similar supply chain/transport mode typical to that of rice as it also uses IWT, and salt produced in Bac Lieu has similar supply chain/transport mode typical to that of sugarcane/sugar as it uses multi-modal transport comprising of IWT and road transport.

3-3 Logistics Model

In Figure 3-5 and Table 3-4, the JICA Study Team modelled logistics routes and modes confirmed in the previous sections. There are four important nodes: production, collection, processing-storage, and distribution (export-domestic consumption). Connecting these four nodes are three paths with different transport modes used by the JICA Study Team as basis for defining the logistics models.



Source: JICA Study Team

Figure 3-5 Logistics Model

The logistics model for shrimp is indicated as model 1) LT (Land Transport), for rice and nitro-fertilizer, model 2) WT (Waterways Transport), for coconut, sugarcane/sugar and salt, model 3) MT1 (Multimodal Transport1), or model 4) MT2 (Multimodal Transport2).

Table 3-4 Outline of Logistics Model

Model	Mode	Path-1	Path-2	Path-3	Main Products
1) LT	Truck	2-5 ton	5 ton	Container	Shrimp
2) WT	IWT	Small	Medium	Large	Rice, Fertilizer
3) MT1	Multimodal-1	IWT (small)	IWT (medium	Container	Coconuts, Sugarcane/Sugar, Salt
4) MT2	Multimodal-2	IWT (small)	Truck (5 ton)		

Note: LT: Land Transport WT: Waterways Transport MT: Multimodal Transport

Source: JICA Study Team

Table 3-5 shows the infrastructure for road transport and IWT in the logistics models. In Path-1, feeder roads and district roads are used in road transport, and small inland waterways are used in IWT. In Path-2, provincial roads are used in road transport, and medium inland waterways are used in IWT. In Path-3, national roads, e.g., NH1A and NH60, are used in road transport, and arterial inland waterways, e.g., Mekong River and Cho Gao Canal, are used in IWT.

Table 3-5 Infrastructures in the Logistics Model

Model	Prov.	Path-1	Path-2	Path-3
1) LT	TV	FRs, DRs	PRs	NH1A, NH60, NH53
	SC	FRs, DRs	PRs	NH1A, NH60
	BL	FRs, DRs	PRs	NH1A, NH60, NH91C
	CM	FRs, DRs	PRs	NH1A, NH60, QL-PH
2) WT	TV	small	medium	Corridor3
	SC	small	medium	Corridor3, Tien River, Cho Gao Canal
	BL	small	medium	Corridor3,Tien River, Cho Gao Canal
	CM	small	medium	Southern waterway, Corridor3,Tien River, Cho Gao Canal
3) MT1	TV	small	medium	NH1A, NH60, NH53
	SC	small	medium	NH1A, NH60
	BL	small	medium	NH1A, NH60, NH91C
	CM	small	medium	NH1A, NH60, QL-PH
4) MT2	TV	small	PRs	NH1A, NH60, NH53
	SC	small	PRs	NH1A, NH60
	BL	small	PRs	NH1A, NH60, NH91C
	CM	small	PRs	NH1A, NH60, QL-PH

Note: FRs: Feeder Roads, DRs: District Roads, PRs: Provincial Roads QL-PH：Quan Lo-Phung Hiep Road

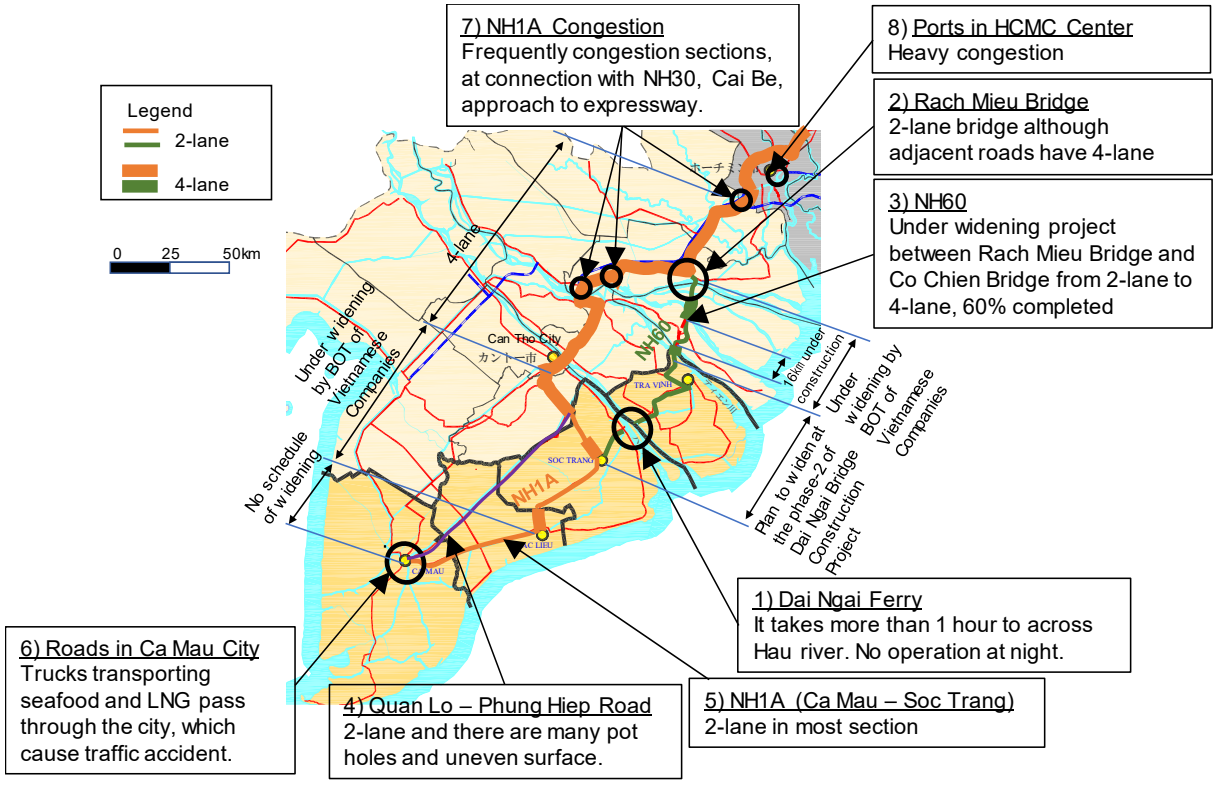
Source: JICA Study Team

3-4 Identified Bottlenecks

In identification of bottlenecks, the JICA Study Team mainly focused on Path-3, which uses infrastructure managed by the central government and has a large volume of inter-provincial traffic. The JICA Study Team then analyzed the information gathered from the field survey, interviews with private companies, and meetings with the local government (DOT, DARD, and DOIT) in order to clarify the bottlenecks in road transport, IWT, and multi-modal transport.

1) Road transport

With regard to road transport network, the JICA Study Team identified eight bottlenecks, including the Dai Ngai Ferry, the two-lane Rach Mieu Bridge, narrow sections of NH1A and NH60, and heavy trucks passing through Ca Mau City.



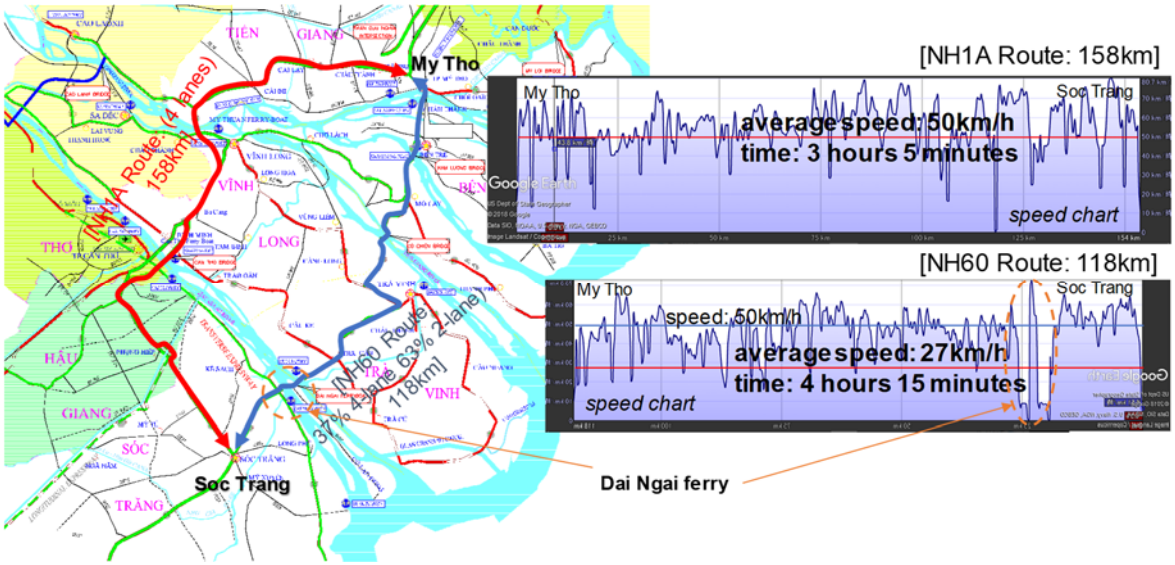
Source: JICA Study Team

Figure 3-6 Bottlenecks on Land Transport

According to the travel time survey on the routes of NH60 and NH1A between My Tho and Soc Trang, which was conducted by JICA Study Team to quantitatively measure the degree of bottleneck on NH60, it takes about 1 hour more in travel time of NH60 case although NH60 (distance 118km) is shorter than 40km from NH1A (158km) because the average speed is as low as 27km/h against 50km/h of NH1A case. One reason for lower average speed is to take about 1 hour crossing and waiting time at Dai Ngai Ferry. The second reason is about 100km of 2-lane section (63% of the

whole section) and it will hinder low speed vehicles and motorbikes from running steady speed. In addition, frequent overtaking is carried out and it is a problem for traffic safety.

Since Dai Ngai Ferry operates only from 4am to 9pm, it is necessary to make a large detour through Can Tho Bridge during night time. In addition, it can access to the mainland from Cu Lao Dung Islet (population 63,973) by only arranging private small boats as a mean to cross the river if the ferry is not operating.



Source: JICA Study Team

Figure 3-7 Bottlenecks on NH60 and Dai Ngai Ferry

2) IWT

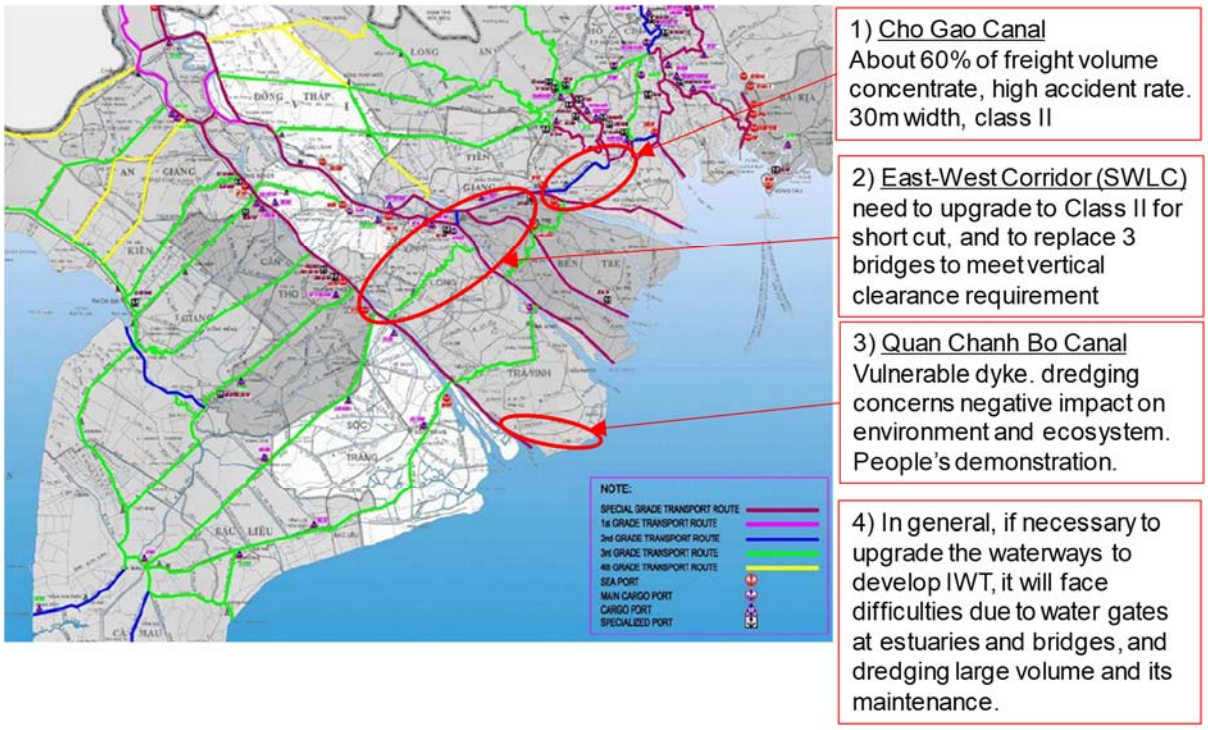
In the IWT network, the JICA Study Team identified four bottlenecks as follows:

i. Cho Gao Canal – chronically congested section due to the high volume of vessels and high rate of traffic accident;

ii. East-West Corridor – standard is insufficient to the demand, and vessels must detour through Long Xuyen and Sa Dec for the logistics to HCMC. If this corridor would be upgraded to the class II, the 90km distance can be shorten and 10hours travel time can be saved;

iii. Quan Chanh Bo Canal – navigation is not stable due to vulnerable dyke system and sedimentation; and,

iv. Existing water gates and bridges that do not have appropriate navigation clearance for IWT.



Source: JICA Study Team, Base Map "Existing Waterways Network" from PMU-Waterways

Figure 3-8 Bottlenecks on the Inland Water Transport

3) Multimodal Transport

(1) Cargo Handling Equipment at IWT Ports

In most cases, rice grains are transported by barges to processing plants and warehouses (mostly owned by food companies). Sometimes, grains are transported by small boats to IWT ports, where they are then loaded to trucks for transport to processing plants. The unloading/loading work is carried out manually and is inefficient, and it has been operating as a custom for a long time in the regions because the handling volume is small and the labor cost is low. It is said that the logistics cost of rice accounts for 30% of the price according to FS of SWLC, so this kind of operation may be considered as a factor in the increase of cost.

(2) Issues of Containerization

The main products of the region, i.e., rice and fishery products, have high potential for container transport. Fishery products are already transported via containers, but rice is still handled as general cargo, and only 4% of the total volume is transported via containers.

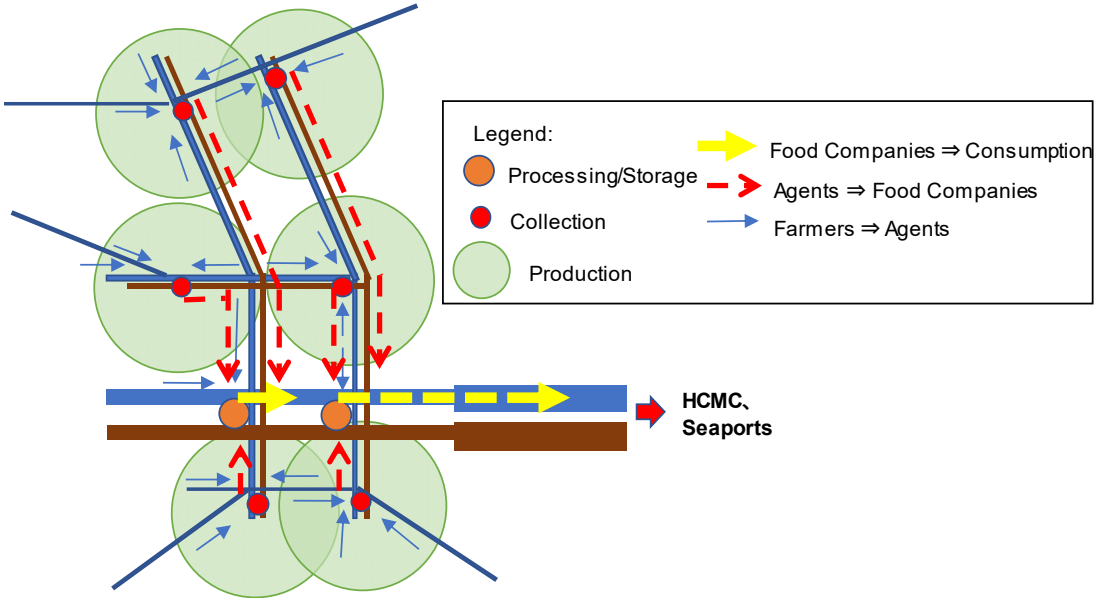
Normally, containerization is done to increase the efficiency of logistics of export goods. However, at present in the Mekong Delta, there are no regular transport lines to ports in HCMC or in Cai Mep – Thi Vai Port partly because there is no logistics center where containers can be accumulated. Also, because the number of containers is still small, it may not generate sufficient profit for the lines.

On the other hand, in the private sector, containerization has already been started. Since 2016,

Saigon Newport has operated a line between Cai Cui Port in Can Tho City and Hai Phong Port in the north using 600 TEU container ships. Also, Cai Cui Port is equipped with gantry cranes and container yards, with the intention to attract international maritime operators. Besides, the largest seafood processing company, Minh Phu, cooperated with Gemadept to develop logistics facilities such as cold storage warehouses and container yards in Hau Giang Province.

4) Logistics Center

As shown in Figure 3-9, pertaining to the logistics status of rice and shrimp production, the logistics cost is high because of dispersed collection points, margins for agents between farmers and food companies, and long distance in moving products.



Source: JICA Study Team

Figure 3-9 Current Supply Chain for Rice and Shrimp Productions

3-5 Results of Interviews

After studying the current status of the study area and analyzing the results of interviews with related government authorities and private companies, the JICA Study Team identified bottlenecks in overseas expansion and in the attraction of private companies as follows:

(1) Issues on Location

In comparison to other regions of Vietnam and other candidate countries for overseas expansion of foreign companies, the study area has the following bottlenecks:

- As cargos are needed to be transported over long distances to HCMC, which is the largest consumption area and the center with major exporting ports, the operating cost is relatively increased because of the expensive transport cost.
- As the areas are located far from the HCMC, the lead time and risk are relatively increased due to the long transport time.

(2) Issues on Logistics Infrastructure

Bottlenecks on logistics infrastructure that may hinder the expansion of foreign companies to the study area are listed as follows:

(a) Undeveloped arterial roads in the region, e.g., NH1A and NH60

Expected to reduce logistics time and increase transport safety

(b) Interrupted transport network due to the absence of Dai Ngai Bridge

- Expected to reduce logistics time and logistics operating cost
- Activate socio-economics, logistics, and mobility of passengers throughout the coastal area of the Mekong Delta, mainly between Tra Vinh and Soc Trang

(c) Delay in construction of HCMC – Can Tho – Ca Mau Expressway

Expected to reduce logistics time and increase transport safety

(d) Undeveloped deep-sea-ports in the study area

Develop logistics hubs in the region

(e) Insufficient promotion of Can Tho Airport as an international airport

The airport opened in 2009 but has not had regular international flights until now. Recently, since April 2019, a direct flight to Kuala Lumpur, the capital of Malaysia, has been in operation. Direct flights to Bangkok, Thailand will also be launched in May 2019. Direct flights to Japan are also expected.

(f) Lack of logistics centers, including bonded warehouses in the Mekong Delta region

Develop logistics hubs in the region

(g) Lack of trusted logistics and transportation development plan in the region

Medium and long-term development plan

(3) Issues Other than Logistics and Transportation

- Poor supporting industries from neighboring regions (necessary materials and equipment must be procured from long-distance suppliers, such as those in HCMC; thus, costs and risks increase)
- Undeveloped economic infrastructure (local road networks, power supply networks, etc.)
- Difficulty in attracting skilled workers (as the region is mainly attracting labor-intensive industries, it is necessary to continuously employ high-quality labor forces)
- Lack of improvement of institutional capability of the local government (lack of Foreign Direct Investment (FDI) attraction strategy, etc.)
- Inconvenient living conditions for corporate representative and accompanying family

3-6 Proposed Countermeasures Against the Identified Bottlenecks

Table 3-6 to Table 3-10 show the proposed countermeasures against the identified bottlenecks.

1) Road Transport

It is necessary to construct a bridge to link the missing section of the coastal arterial national road which is currently connected by the Dai Ngai ferry. Because the Rach Mieu Bridge, which only has two-lane, could not be expanded due to its large scale, it is necessary to construct a new bridge, mainly the Rach Mieu 2 Bridge. To address the problem of heavy trucks passing through Ca Mau City, the construction of a bypass road may be an effective solution. It is expected that the congestion in NH1A from HCMC to Can Tho and other local congested points will be resolved by constructing a parallel expressway. Also, construction of ring roads and diverting freight to ports outside of HCMC, such as Cai Mep – Thi Vai Port, are essential for resolving congestion at ports in HCMC due to the concentration of freight.

Table 3-6 Proposed Countermeasures Against the Identified Bottlenecks on Land Transport

No.	Bottleneck	Proposed Countermeasure
LT: Land Transport (truck)		
LT-1	Dai Ngai Ferry (NH60)	New bridge
LT-2	Narrow (2 lanes) of Rach Mieu Bridge (NH60)	New bridge
LT-3	Narrow sections of NH60	Widening
LT-4	QL-PH road	Improvement
LT-5	Narrow sections of NH1A (Ca Mau – Soc Trang)	Widening
LT-6	Truck inside pass through Ca Mau City	New construction of bypass
LT-7	Congested sections on NH1A (Can Tho – HCMC)	Expressway construction
LT-8	Heavy congestion in HCMC	Ring Roads

Source: JICA Study Team

2) IWT

To resolve the identified bottlenecks in IWT, it is necessary to upgrade the system by expanding the substandard routes, securing sufficient water depth by dredging, and replacing water gates and bridges with insufficient clearances.

Table 3-7 Proposed Countermeasures Against the Identified Bottlenecks on IWT

No.	Bottleneck	Proposed Countermeasure
WT: Inland Waterway Transport		
WT-1	Heavy congested section of Cho Gao Channel	Upgrade
WT-2	Lower class of East-West (water) Corridor	Upgrade
WT-3	Sedimentation of Quan Chanh Bo Channel	Dredging with dyke construction
WT-4	Existing water gates and bridges	Replacement

Source: JICA Study Team

3) Multimodal Transport

Renewal of equipment, such as cranes, for unloading cargo from IWT to processing plants or to trucks is now being carried out by private companies. In the case of transporting rice grain, it is not efficient to install unloading equipment in dispersed small-scale collection yards. However, for containerization, it is necessary to have stable freight volumes and convenient regular transport lines.

A logistics center can be considered as a countermeasure for such multimodal transport bottlenecks. For the construction of a regional logistics center, the important point is whether the logistics cost could be reduced and whether convenience could be increased compared to current conditions. Also, it is necessary to consider the differences of the situation of each industry. A master plan development for logistics system optimization is essential.

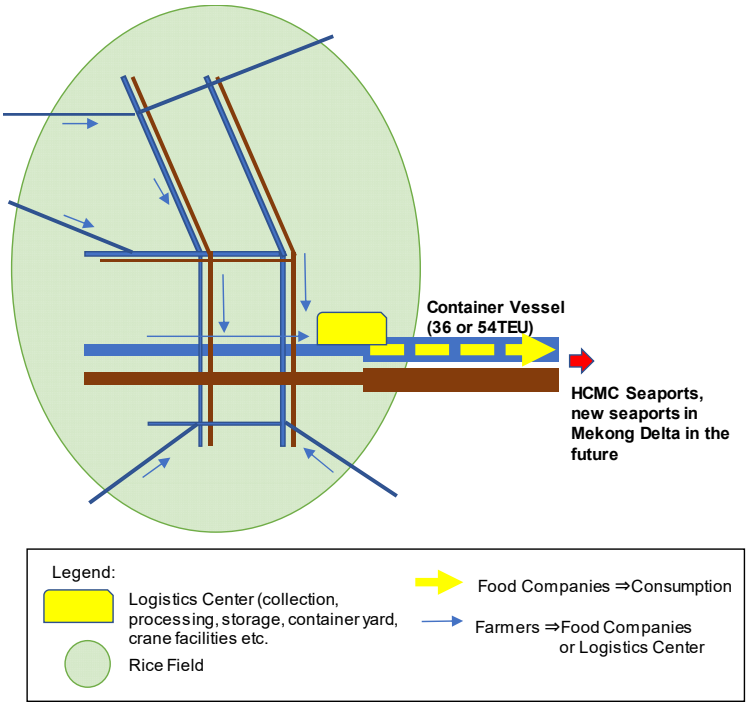
Table 3-8 Proposed Countermeasures Against the Identified Bottlenecks on Multimodal Transport

No.	Bottleneck	Proposed Countermeasure
MT: Multimodal Transport		
MT-1	Insufficient capacity of loading/unloading facilities at river ports	Preparation of Master Plan for Regional Logistics Center
MT-2	Not feasible container operation due to low volume	

Source: JICA Study Team

4) Logistics Center

As described in the above discussion on multimodal transport, the establishment of the logistics center could reduce some intermediate stages of inbound transport, which could potentially lead to a decrease in collecting trips from production sites to the consolidated center. A reduction in the number of stops in the supply chain is expected to generate high level of economic efficiency through reducing inbound transport cost, warehousing, and handling cost. To materialize the regional logistics center, it is necessary to establish a master plan development for logistics system optimization.



Source: JICA Study Team

Figure 3-10 Supply Chain of Rice Case after Introduction of Logistics Center

Table 3-9 Proposed Countermeasures Against the Identified Bottlenecks on Logistics Center

No.	Bottleneck	Proposed Countermeasure
LC: Logistics Center		
LC-1	Dispersion of collection yards and processing/storage	Preparation of Master Plan for Regional Logistics Center

Source: JICA Study Team

5) Proposed Countermeasures Against the Identified Bottlenecks from the Viewpoints of Private Companies

As increased logistics cost due to long transportation to the exporting port is the main bottleneck from the perspective of private companies, it is necessary to construct an exporting port (deep-sea port) close to the manufacturing area. Regarding the issue of the undeveloped regional logistics center, it is necessary to have a master plan to trigger the development of a logistics system and hub-and-spoke distribution system in the region.

Table 3-10 Proposed Countermeasures Against the Identified Bottlenecks from the Viewpoints of Private Companies

No.	Bottleneck	Proposed Countermeasure
PV: Hearing results from Private Companies		
PV-1	NH1, NH60, Dai Ngai bridge, etc.	Acceleration of project implementation
PV-2	HCMC - Can Tho – Ca Mau expressway	Acceleration of project implementation
PV-3	Far distance to seaports	Dinh An (Tra Vinh), Tran De (Soc Trang), - Hon Khoai (Ca Mau)
PV-4	Can Tho international airport	Open international flight
PV-5	No Regional Logistics Centers	Preparation of Master Plan
PV-6	Low Institutional Capacity of local Governments	Capacity development

Source: JICA Study Team

3-7 Risk of Climate Change

1) Damage caused by Climate Change (Historical Data)

Based on the disaster prevention reports prepared by each province, the actual damages to infrastructure and industry from abnormal natural disasters that are considered to be the effects of recent climate change are summarized as below:

a) Tra Vinh Province

In 2018, the damages of heavy rains and cyclones on rice, vegetables, and fruit production amounted to about VND 1,049 billion.

High tides in October 2018 caused erosion of about 50 m of sea dykes and flooding on 428 ha of orchards and 10 ha of vegetable farms.

b) Soc Trang

In 2017, a series of heavy rains damaged 2,418 ha of onion farms and caused flooding on sugarcane farms (317 ha).

In 2018, high tide amounted to a loss of about VND 8,612 billion on several infrastructures and industries, such as:

- Collapse of sea dykes and roads
- Flooding on roads (total 6.4 km)
- Flooding on rice fields (total 1,327 ha)
- Flooding on sugarcane farms (total 1,444 ha) and causing a decrease in productivity of about 10%
- Flooding on orchards (877 ha)
- Flooding on seafood farms (72 ha)
- Salinity intrusion was observed more than 50 km away from the sea, at 8.3 g/L.

c) Bac Lieu

In 2016, Bac Lieu declared that they were under a state of natural disaster as there was a big wave that destroyed dykes and bridges and even caused salinity intrusion and damaging aquaculture. The total damage incurred from the disaster was about VND 650 billion.

In 2018, an unusual high tide that occurred from 31 January to 4 February and combined with big waves damaged multiple sections of sea dykes. A record high tide of +2.42 m caused flooding ranging from 5 to 50 cm in multiple areas.

d) Ca Mau

On average, the province has been experiencing erosions of about 20 to 25 m/year on the western seacoast and about 45 to 50 m/year on the eastern seacoast, losing a total area of about 450 ha/year.

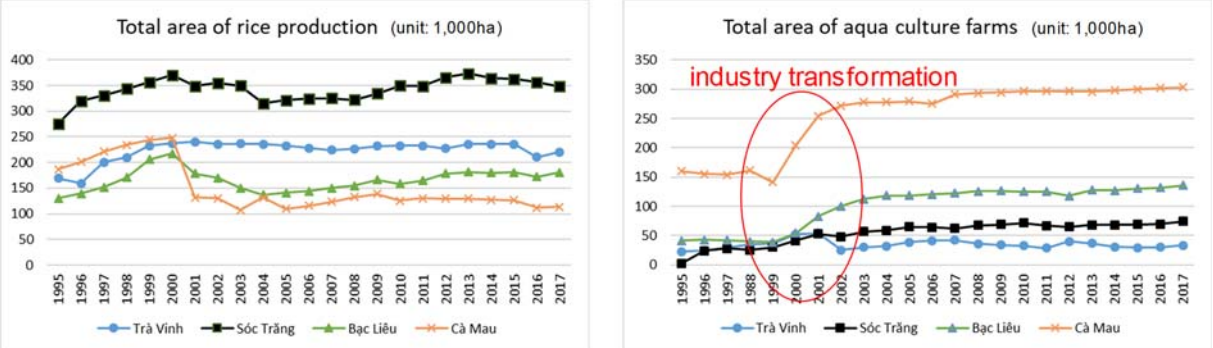
In 2016, drought and salinity intrusion caused a loss of about VND 1,500 billion on the following:

- Agriculture/aquaculture production: 51,074 ha of rice fields, 15,000 ha of orchards and vegetables, and 155,890 ha of shrimp farms
- 113 km of canals and roads were damaged by erosion

In 2018, a high tide destroyed about 73 m of dykes and caused flooding on 47 km of road.

2) Case of Industry Transformation by Climate Change (Fact)

In Ca Mau, since around 2000, the industry transformation policies have been implemented. Initially, the area of shrimp farms, in comparison, was only 60% of the cultivation area of rice, but after 20 years in 2017, the area of shrimp farms is now three times larger than rice cultivation areas.



Source: Statistical YearBook

Figure 3-11 Change of the Area of Rice Production and Aquaculture Farms

3) Risk of Climate Change

In 2016, MONRE issued forecasted results of temperature changes and precipitation changes based on climate changes scenarios. In the study area, it is anticipated that temperature will increase from 0.4 ℃ to 4.5 ℃, and precipitation will increase from -2.4% to 29%. The main products of the region, e.g., shrimp and sugarcane, are very sensitive to temperature and salt concentration. Therefore, rapid changes in the environment in case of extreme weather events, such as heatwave or heavy storms, may cause disease and will cause a decrease in production volume.

Table 3-11 Forecasted Changes in Average Temperature

Unit: ℃

Province	Low Scenario			High Scenario		
	2016～2035	2046～2065	2080～2099	2016～2035	2046～2065	2080～2099
Tra Vinh	0.4 – 1.2	1.0 – 2.0	1.2 – 2.6	0.6 – 1.2	1.4 – 2.6	2.7 – 4.5
Soc Trang	0.4 – 1.2	1.0 – 2.0	1.2 – 2.5	0.6 – 1.2	1.4 – 2.6	2.7 – 4.3
Bac Lieu	0.4 – 1.3	1.0 – 2.0	1.2 – 2.5	0.6 – 1.2	1.4 – 2.5	2.7 – 4.2
Ca Mau	0.4 – 1.2	1.0 – 2.0	1.2 – 2.5	0.6 – 1.3	1.3 – 2.5	2.7 – 4.3

Source: Scenarios of climate changes in Vietnam, MONRE

Table 3-12 Forecasted Changes in Annual Rainfall

Unit: %

Province	Low Scenario			High Scenario		
	2016～2035	2046～2065	2080～2099	2016～2035	2046～2065	2080～2099
Tra Vinh	4.9 – 16.3	5.7 – 26.8	4.1 – 30.0	5.6 – 17.5	8.4 – 21.5	9.0 – 28.2
Soc Trang	7.2 – 15.0	2.2 – 19.5	4.0 – 23.7	5.1 – 16.7	10.4 – 20.6	9.8 – 28.3
Bac Lieu	5.0 – 13.9	2.3 – 20.5	4.3 – 22.8	6.4 – 18.0	10.1 – 23.3	8.5 – 29.0
Ca Mau	2.1 – 14.0	-2.4 – 14.7	-0.3 – 19.5	2.2 – 11.7	6.0 – 16.2	3.7 – 22.9

Source: Scenarios of climate changes in Vietnam, MONRE

MOT also carried out a project in cooperation with University of Transport in HCMC to assess the impacts of climate change on IWT in Vietnam. In the research, there are three scenarios for sea level rise which became the basis for evaluation of impacts on infrastructure of IWT.

Table 3-13 Scenarios for Sea Level Rise

Scenario	2050	2100
Low	17cm – 26cm	33cm – 66cm
Medium	23cm – 27cm	59cm – 75cm
High	26cm – 30cm	69cm – 99cm

Source: Assessment of impacts of climate change on IWT in Vietnam, MOT & University of Transport HCMC

Table 3-14 Forecasted Impacts on Infrastructure of IWT due to Sea Level Rise

Scenario (2100 max case)	Ports to be submerged	Ratio of bridges over Class V of IW which become insufficient vertical clearance (< 3.5m)
Low (66cm)	60%	35%
Medium (75cm)	70%	50%
High (99cm)	100%	80%

Source: Assessment of impacts of climate changes on IWT in Vietnam, MOT & University of Transport HCMC

In a low scenario where the sea level rises 66 cm at maximum in 2100, 60% of the IWT ports would be submerged, and 35% of bridges over inland waterways of class V would become insufficient vertical clearance (<3.5 m). In a medium scenario, 70% of ports would be submerged, and 50% of bridges would become insufficient vertical clearance. In a high scenario, all the ports would be submerged, and 80% of bridges would become insufficient vertical clearance.

This class V of inland waterway is a small and medium scale waterway standard in the province that is used for transportation of rice etc. from the production area to the processing site, and there are many small bridges and water gates as mentioned above. There is a concern that these inland waterways would be bottlenecks such as inability to navigate due to lack of clearance and waiting for tides. For this reason, in distribution of rice and other goods where inland water transportation is mainly used from the production area to the processing plant, it is expected to shift to land transportation by small trucks along with the development of feeder roads.

4 Proposed Logistics Projects

4-1 Implementation Status of the Proposed Logistics Projects

Table 3-1 to Table 3-4 show the status of the proposed logistics projects.

Table 4-1 Status of the Proposed Logistics Projects (Land Transport)

No.	Proposed Project	Status
LT: Land Transport (Truck)		
LT-1	Dai Ngai Bridge Construction Project	In the process of the Prime Minister's approval on the Pre-FS, under appraisal by MPI and MOF
LT-2	Rach Mieu 2 Bridge Construction Project	MOT will propose the implementation by using the state budget instead of an ODA because of the urgency of the project
LT-3	NH60 Widening Project	The section between Rach Mieu Bridge and Co Chien Bridge is on-going by BOT scheme and progress is 60%. Widening at the section between Co Chien Bridge and Soc Trang is planned to execute at the phase-2 of Dai Ngai Bridge Construction Project.
LT-4	QL-PH Road Improvement Project	On-going by state budget, under preparation of shop drawing
LT-5	NH1A (Ca Mau – Soc Trang) Widening Project	On-going by BOT scheme for the sections of Can Tho – Soc Trang - Bac Lieu. No project for the section of Bac Lieu – Ca Mau
LT-6	Ca Mau City Bypass Construction Project	Once approved by MOT in 2010, but at present no fund is available
LT-7	HCMC-Can Tho – Ca Mau Expressway Construction Project	HCMC-Trung Luong: in operation Trung Luong – My Thuan: on-going by BOT scheme, progress is 16%, and completion is 2020. My Thuan - Can Tho: Under selection of the investor. As for 2nd My Thuan Bridge, FS was approved in October 2018, and the financial source will be state budget. Can Tho - Ca Mau Section: It was planned in the Master Plan after 2030, but MOT will propose to the PM to implement it before 2030.
LT-8	RR3 and RR4 Construction	RR3: Section-1: Tan Van – Nhon Trac is under negotiation for BOT and ODA (EDCF). Section-2: My Phuoc – Tan Van section was completed by BOT of Binh Duong Province. Section-3 and 4: PPP scheme was proposed in FS of ADB and waiting for PM's approval. RR4: approved in MP

Source: JICA Study Team

Table 4-2 Status of the Proposed Logistics Projects (IWT)

No.	Proposed Project	Status
WT: Inland Waterway Transport		
WT-1	Southern Waterway Logistic Corridor (SWLC) Project for Cho Gao Canal	Project proposal was submitted to MPI and MOF for appraisal, the financing of World Bank (WB) is expected.
WT-2	SWLC Project for East-West Corridor	
WT-3	Quan Chanh Bo Canal Improvement Project	There is surplus budget of about VND 1,500 billion, and MOT proposed the PM to utilize it for dyke construction etc.
WT-4	Upgrading Existing Bridges and Water Gates	It includes WT-1 and 2.

Source: JICA Study Team

Table 4-3 Project Status of the Proposed Logistics Project (Multimodal)

No.	Proposed Project	Status
MT: Multimodal Transport		
MT-1 and MT-2	Preparation of the Master Plan of Regional Logistics Center	MOIT issued “the Planning on development of logistics center system in the whole country to 2020, orientation to 2030” but conceptualization only

Source: JICA Study Team

Table 4-4 Project Status of the Proposed Logistics Project (Logistics Center)

No.	Proposed Project	Status
LC: Logistics Center		
LC-1	Preparation of the Master Plan of Regional Logistics Center	Refer to MT1 and 2

Source: JICA Study Team

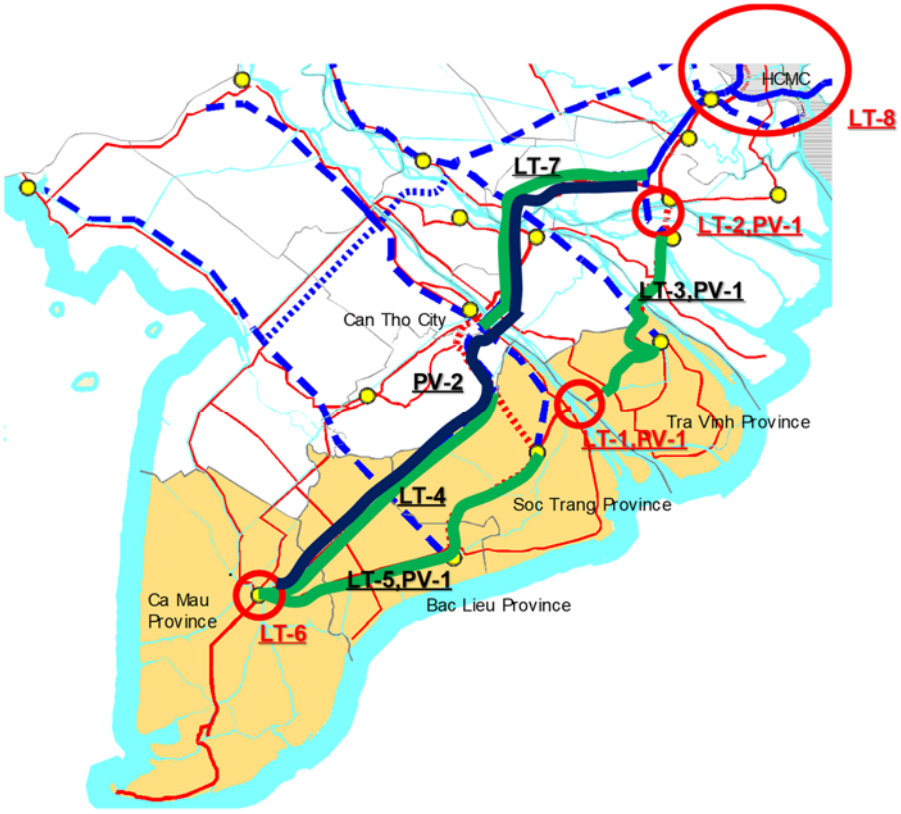
Table 4-5 Project Status of the Proposed Logistics Project (Private Company)

No.	Proposed Project	Status
PV: Hearing results from Private Companies		
PV-1	NH1A and NH60 Widening Project, Dai Ngai bridge Construction Project	NH1A: Refer to LT-5 NH60: Refer to LT-2 and 3 Dai Ngai Bridge: Refer to LT-1
PV-2	HCMC-Can Tho – Ca Mau Expressway Construction Project	Refer to LT-7
PV-3	Deep Seaports Construction Project (Dinh An, Tran De, Hon Khoai)	Planning stages and calling for investment
PV-4	International flight in Can Tho International Airport	Opening of international flights
PV-5	Preparation of the Master Plan of Regional Logistics Center	Refer to MT1 and 2
PV-6	Institutional Capacity Development of Local Governments	No plan

Source: JICA Study Team

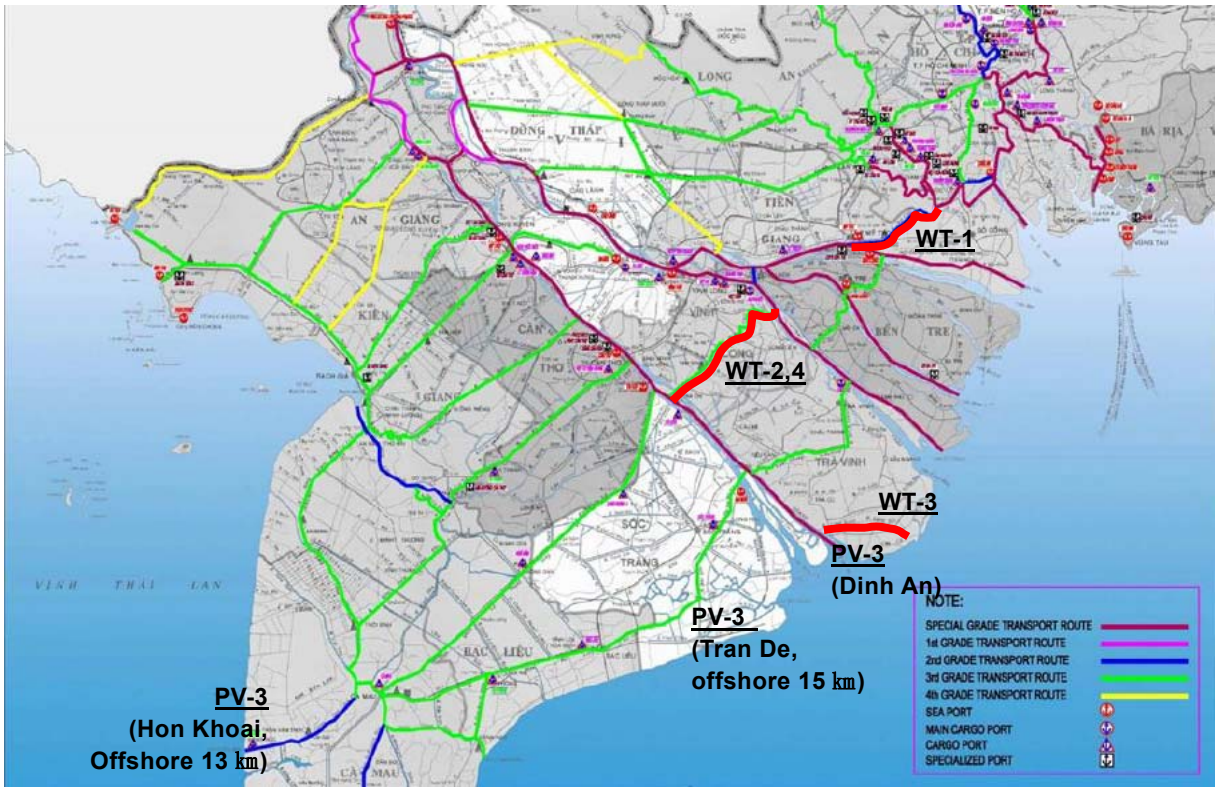
Among the projects listed in the above tables, LT-3, LT-4, LT-5, LT-7, and PV-4 are categorized as on-going projects, and LT-2, LT-8, and WT-1 to WT-4 are categorized as the projects where financial procurement is in sight. The projects LT-1, LT-6, MT-1 to 2, LC-1, PV-3, PV-5, and PV-6 have not found any sources of finance.

The locations of the several projects are shown in Figure 4-1 and Figure 4-2.



Source: JICA Study Team

Figure 4-1 Location of Land Transport Projects



Source: JICA Study Team, base map "existing waterways network" from PMU-Waterways

Figure 4-2 Location of IWT and Seaport Projects

4-2 Effective Projects

4-2-1 Setting Multi-Criteria

For the projects including LT-1, LT-6, MT-1 to 1, LC-1, PV-3, PV-5, and PV-6 which have not found any financial sources as categorized in "3-1 Implementation Status of the Proposed Logistics Projects", initial evaluation of the projects will be conducted to select the appropriate projects for Japan ODA based on the multi-criteria in Table 4-6.

Table 4-6 Multi-criteria for the Initial Evaluation of the Project

Evaluation Item		Criteria	Score	Viewpoints of the Evaluation
A. Consistency with Vietnam Development Plan	a1) listed in Master Plan	with	2	Whether the project is listed in the development plans of the central or local government, or they have intension on the development or not
		without	0	
B. Resolve the bottlenecks on regional social and economic development	b1) improve traffic and logistics condition	large	2	Whether the project will improve the traffic and logistics conditions in terms of quality, time and distance or not
		small	0	
	b2) resolve missing link	large	2	Whether the project will remove the missing link and shorten the time and distance or not
		small	0	
	b3) improve accessibility to gateway and development area	large	2	Whether the project will improve the accessibility to the metropolitan area, ports and industrial parks etc. or not
		small	0	
	b4) resolve bottlenecks from viewpoints of private companies	large	2	Whether the project contributes to the increase of FDI and DDI in the Mekong Delta region or not
		small	0	
	b5) Effective countermeasures on the climate change	with	2	Whether the project involves implementation of effective countermeasures against negative impacts on infrastructure and industry due to sea level rising from climate change or not
		without	0	
C. Appropriateness for Japan ODA	c1) Applicable Japan technology	high	2	Whether the project has applicability of STEP or Japanese Technology or not
		low	0	
	c2) Benefit for Japanese companies	high	2	Whether the project would bring benefit to Japan or Japanese companies in direct/indirect or not
		low	0	
	c3) Possibility of other financial sources than ODA	low	2	Whether the project is considerable for PPP/BOT scheme or not
		high	0	
	c4) Urgency	high	2	Progress status of adjacent projects
		low	0	

Source: JICA Study Team

4-2-2 Evaluation Results

The evaluation results are summarized in Table 4-7.

Table 4-7 Evaluation Results

Projects	A	B					C				Total Score	Rank
	a1	b1	b2	b3	b4	b5	c1	c2	c3	c4		
Dai Ngai Bridge Construction Project (LT-1)	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	20/20	1
Ca Mau City Bypass Construction Project (LT-6)	**2**	**2**	0	**2**	0	0	0	0	0	**2**	8/20	4
Regional Logistics Center Master Plan (LC-1, MT-1,2, PV-5)	**2**	**2**	0	**2**	**2**	**2**	0	**2**	0	**2**	14/20	2
Deep Seaports (PV-3)	**2**	**2**	0	**2**	**2**	**2**	0	**2**	0	0	12/20	3
Capacity building of local government (PV-6)	0	0	0	0	**2**	**2**	0	**2**	0	0	6/20	5

Source: JICA Study Team

The Dai Ngai Bridge Construction Project (LT-1) received high scores for all evaluation items. In b1), b2), ferry is not operated at night and is canceled at times of bad weather, but bridge construction will make possible to access in 24 hours and be effective not only in terms of logistics but also social aspects. In b3), the accessibility from the coastal area of Ca Ma, Bac Lieu, and Soc Trang provinces to the HCMC metropolitan area and export ports is improved. In b4), it cannot be expected to contribute to the increase of FDI only by this bridge construction. However, from the results of the interviews with local companies in this study, enterprises in Tra Vinh province will expand business opportunities by DDI, such as construction of a second plant to Soc Trang province. In b5), building a road network can promote a modal shift from inland waterways traffic, which is vulnerable to climate change. For c1), the project has a possibility to apply Japanese technology for deep foundation such as steel pipe sheet pile (SPSP) and bridge monitoring system of the large-scale cable bridge with a 450 m maximum and which rests on very soft ground condition. For c2), since many of the marine products such as shrimp, which is the main product of the coastal area, are exported to Japan, it is expected to improve the profitability of Japanese processing companies by reducing logistics costs through NH60 and by reflecting it to the price. In c3), although the Dai Ngai bridge had been tried to be built by PPP/BOT in the past, it had failed because of the low profitability of the project and the number of toll booths on the Route NH60 being too large. At the present, the Vietnamese side has a desire to implement it with Japanese ODA loan. Because of the urgency of the project in c4), NH60 has proceeded with the bridge construction and road widening through a BOT scheme from the HCMC side. MOT is currently considering the second Rach Mieu bridge as another highly urgent project to be financed with the government fund. Therefore, it is important to eliminate the last missing link at the same time when related projects are completed in order to make the most effective trunk road in the Mekong Delta coastal area.

Ca Mau City Bypass Construction Project (LT-6) is not suitable for Japanese ODA as there is no need for Japanese technology, and the benefit to Japan is not expected at present.

Master plan formulation (LC-1, MT-1, MT-2, PV-5) of a regional logistics center is related to deep seaport development, and it is essential to promote a systematic logistic system and hub and spoke

system with the logistics center. It is expected to contribute to business attraction and industry promotion. Based on this master plan, if the Japanese logistics companies, port operators, or manufacturers intend to expand their business to the region, support for basic infrastructure development with Japanese ODA under PPP scheme and/or utilization of JICA Private Sector Investment Finance (PSIF) may be considered.

A deep seaport to the Mekong Delta (PV-3) is highly requested by private companies, and FDI from companies, including Japanese companies, is expected to increase. In b5), the current situation is that inland waterways transport, such as for rice products, is carried over a long distance to HCMC's export port, but if an export port can be built near the production area, it can minimize the use of inland waterway transportation that is more vulnerable to climate change. As for c3), according to the local government and local newspapers, it has a policy to invest with private funds. However, since the scale of the project is too large, the possibility of financing schemes, such as PPP utilizing ODA like the Lach Huyen Port, is also considered.

Since the local administrative capacity improvement project (PV-6) is not of the nature that should be implemented by the technical assistant scheme in a Japan ODA, the JICA Study Team recognizes that it is an issue to be tackled by the local government referring to the provinces of Ba Ria - Vung Tau and Long An, which are leading in FDI invitation in addition to the development of hard infrastructure.

4-2-3 Proposal of Effective Projects

At present, the freight volume in the Mekong Delta coastal area is extremely small compared to the HCMC metropolitan area where industrial concentration is progressing. However, since the agricultural and fishery industry is prosperous and the area has an abundant labor force, there is a high potential to consolidate the industries. In order to realize this, it is desirable to construct a logistics system from a long-term perspective in the form that includes a precedent of hard infrastructure (MOT is authorized agency) followed by a soft infrastructure (MOIT is authorized agency) such as a logistics center and one-stop service facility thereafter.

Based on the above evaluation in 4-2-2, the JICA Study Team proposes the following projects as effective support methods for that purpose:

A. Short Term

1. Implementation of Dai Ngai Bridge Construction Project as the priority project to resolve the missing link on the arterial land transport network.
2. In parallel, acceleration of NH60 widening project and Rach Mieu 2 Bridge Construction Project to ensure smooth traffic along the whole NH60.

B. Long Term

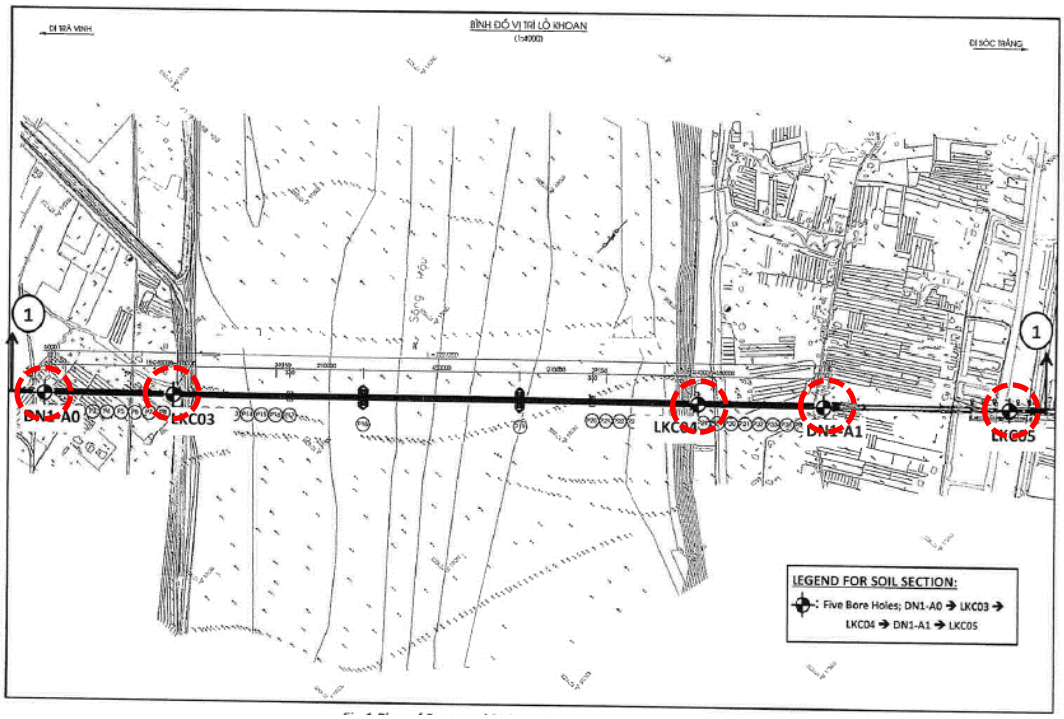
3. Preparation of the Master Plan of Regional Logistics Center, and study the freight transport management to promote and accelerate the development of structured logistics system and hub and spoke system
4. A step-by-step implementation of priority projects based on the Master Plan (regional logistics center, access roads, river ports, deep seaports etc.)

Project	Year	2019	2020	2021	2022	2023	2024	2025	2026
A.Short term									
Dai Ngai Bridge Construction Project	(assumed Japan ODA)								
	Prime Minister approval of Pre-FS								
	preparatory survey/FS								
	loan agreement								
	detailed design								
	construction								
NH60 Widening Project	(BOT)								
Rach Mieu 2 Bridge Construction Project	(assumed state budget)								
B.Long term									
Regional Logistics Center Master Plan	(MOIT)								
Logistics Project (1) Logistics Project (2) Logistics Project (3)	*A step-by-step implementation of priority projects based on the Master Plan*								

Source: JICA Study Team

Figure 4-3 Project Implementation Schedule (Assumption)

In the implementation of the Dai Ngai Bridge construction project, the selection of the foundation type affects the project cost because it is a large scaled bridge on deep soft ground. According to the report on "Dai Ngai Bridge Construction Project" by the Ministry of Economy, Trade and Industry (METI) in February 2016, boring survey (120m to 130m in length) was conducted at 5 locations on the land as shown in Figure 4-4. The ground condition in the river has not been grasped due to lack of boring data. In the next stages of the Vietnamese FS or JICA's preparatory survey, the boring survey in the river is required in order to examine the applicability of the Steel Pipe Sheet Pile foundation (SPSP) and estimate the project cost in more accurate.



Source: "Dai Ngai Bridge Construction Project, Final Report, February 2016" by METI

Figure 4-4 Existing borings location

4-3 Initial Evaluation of the Priority Project

4-3-1 Dai Ngai Bridge and NH60 Widening Project

1) Project Effects on the Logistics

Compared to NH1A, which plays a major role in logistics infrastructure of the region, the route using NH60 is 40 km shorter but takes one hour longer in travel time. After the construction of Dai Ngai Bridge, Rach Mieu 2 Bridge and the expansion of NH60, the route is expected to have the equivalent travel speed with that of NH1A 50km/h, i.e., the travel time would be reduced to two hours from four hours at present. At that time, compared with the route using NH1A, the route using NH60 could be 40 km shorter, and the travel time for a one-way trip would be earlier about one hour. In addition, if the approach roads to Dai Ngai Bridge are aligned differently from existing NH60, it is possible to further reduce the travel distance.

As a result, in the logistics from the Mekong Delta coastal area to the HCMC direction, significant reductions in time and distance can be expected, so positive effects can be expected in regional logistics as described below:

- Resolution of the missing link in road transport network and possible 24 hours access/transportation
- Among the main products identified in this survey, fishery products such as frozen shrimp will reap the relatively higher benefit from the construction of the Dai Ngai Bridge. According to one Japanese fishery processing company in the study area, they do not use expressways to reduce transportation costs. Therefore, by using NH60, fuel cost can be saved by shortening transportation time and distance, and also the toll fee becomes the lowest compared to other routes, so there is much demand as an alternative of logistics routes.

  Regarding toll fee, the toll fee for the case that the Dai Ngai Bridge was constructed and the expressway was extended to Can Tho is assumed and it is summarized in Table 4-8. As a result, the toll fee through NH60 is the lowest, specifically VND 65,000 for passenger cars and VND260,000 for 20 feet container trucks, the toll fees of both vehicles will be only 36% compared to the case using NH1A + expressway.

Table 4-8 Assumed Toll Fee between HCMC and Soc Trang

Unit: VND

Route	Toll Booth	Passenger Car	Truck (20 feet)
NH60	Dai Ngai 2 Bridge (Soc Trang - Cu Lao Dung Islet)	No toll collection if the bridge is constructed by ODA.	
	Dai Ngai 1 Bridge (Cu Lao Dung Islet – Tra Vinh)		
	Co Chien Bridge BOT toll booth	35,000	140,000
	Rach Miue Bridge BOT toll booth	30,000	120,000
	Total	**65,000**	**260,000**
NH1A	Soc Trang BOT toll booth	25,000	100,000
	Can Tho BOT toll booth	30,000	120,000
	Cai Lay BOT toll booth	25,000	100,000
	Total	**80,000**	**320,000**
NH1A + Expressway	Soc Trang BOT toll booth	25,000	100,000
	Can Tho BOT toll booth	30,000	120,000
	Cai Lay BOT toll booth	This toll booth will be removed when the expressway in parallel with NH1A is constructed.	
	Expressway (HCMC-Can Tho 125km)	125,000	500,000
	Total	**180,000**	**720,000**

Source: JICA Study Team

- Reduction of 80 km in round trip would be equivalent to a reduction of USD 35-40 in fuel cost for transportation of one 40-ft-container. It is approximately 8% of the transport cost between Soc Trang and HCMC. And, maintenance cost such as lubricant cost can be saved.
- Improved efficiency of transport service operation (increase in the number of trips per day)

2) Project Effects on Balanced Development

From the viewpoint of logistics infrastructure development, industrial accumulation (FDI) is promoted along NH1A but the road condition along NH60 is relatively low, and there is a serious logistics bottleneck of Dai Ngai Ferry. Therefore, the industrial accumulation (FDI) along NH60 stagnates. Since there are areas for industrial park development in the study area, improving the road condition of NH60 will contribute to the increase FDI.

3) Project Effects on Support for the Ethnic Minorites

The study area shows lower GRDP and higher poverty rates than Can Tho City and the national average, indicating that the coastal area of the Mekong Delta is behind in socio-economic development. This may be due to the geographical factors that infrastructure development such as roads and bridges has been delayed because the land is divided by the Mekong River tributaries and development costs will become larger, and it is located far from the HCMC metropolitan area.

In addition, Soc Trang and Tra Vinh have the largest Khmer population in Vietnam, i.e., 397,014 and 317,203 respectively, and they are socially vulnerable in terms of income, percentage of the own

motorcycles, educational background and high percentage engaged in primary industry. Annually, there are several Khmer festivals organized in Soc Trang attracting many participants from Tra Vinh. Besides, there would be a high demand of transport from the two communities which usually come to visit pagodas in another area.

Therefore, connection with two provinces which have the largest Khmer communities by construction of Dai Ngai Bridge will contribute to improve their living standard by activating the regional economy including primary industry and promoting regional tourism by establishing new public transportation routes.

4) Other Project Effects

In addition, the following derivative effects are also expected:

- Acceleration and promotion of the construction of hub-and-spoke distribution network in the region will increase attraction to domestic and foreign investors.
- Mitigation of traffic congestion, as well as enhancement of traffic safety on NH1A.
- Activation of regional economy and promotion of regional tourism by establishing new public transportation routes
- Provision of the 24 hours access to public service for the residents in Cu Lao Dung Islet (population: 63,973) eliminating the impact of weather.

4-3-2 Rice Logistics Center

In the research named, “A Multi-Stage Impact Assessment Method for Freight Transport Management Measures, The Example of Vietnamese Rice Production and Logistics (2016)”, Ms. Nguyen Thi Binh (Vietnam-German University) quantified the impacts of the establishment of Regional Rice Logistics Center and the improvement of NH1A on rice logistics system in the Mekong Delta, such as modal shift from road to IWT, Total Logistics Cost (TLC), safety, and environment. The results are summarized in Table 4-9.

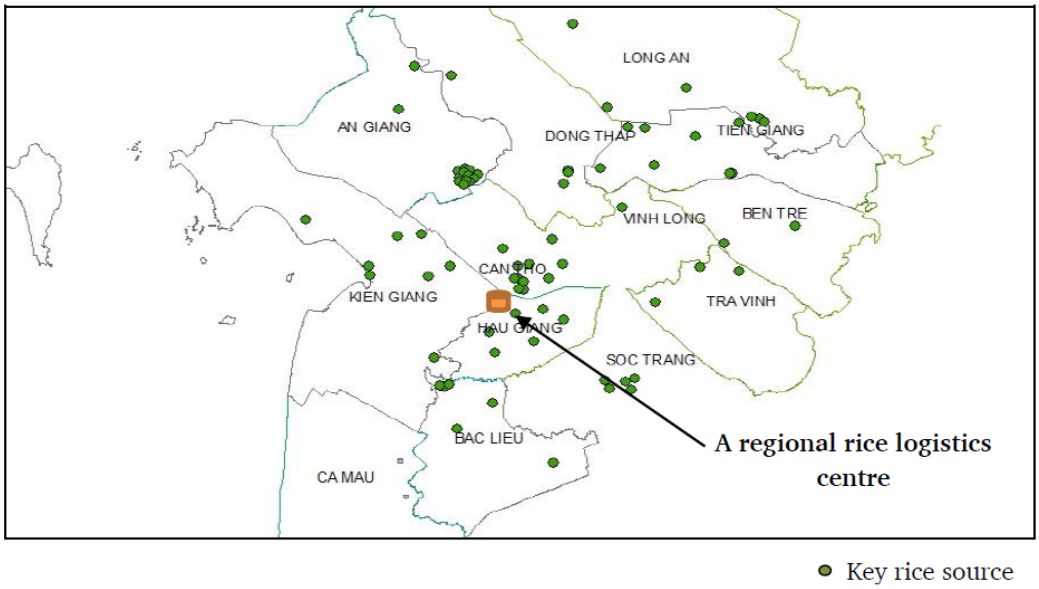
Table 4-9 Impacts of Improvement of Logistics Infrastructure on Rice Logistics System

Aspects of impact	Unit	Base scenario	Scenario 1	Scenario 2	Scenario 3
Rice freight transport					
Number of ton-km by road	million ton-km	126.84	98.44	131.75	97.74
Number of ton-km by IWT	million ton-km	3,012.94	2,811.34	2,999.96	2,635.05
Economic efficiency					
Total logistics cost per year	million US$	**153.08**	**129.49**	**129.23**	**114.05**
- Transport cost	million US$	*100.61*	*90.59*	*79.42*	*76.86*
- Warehousing cost	million US$	*33.46*	*20.91*	*31.56*	*19.96*
- Handling cost	million US$	*19.01*	*17.99*	*18.25*	*17.22*
Shipping inventory cost for road transport	million US$	**0.31**	**0.19**	**0.17**	**0.14**
Safety					
Cost of damaged rice shipments in transport	million US$	**17.57**	**16.28**	**17.52**	**15.29**
Accident cost caused by rice freight transport	million US$	**6.34**	**4.92**	**6.59**	**4.89**
Environment					
Total emission cost per year (CO_2, SO_x,NO_x)	million US$	**12.39**	**8.32**	**12.24**	**7.53**
Total cost of different scenarios	million US$	**189.69**	**159.21**	**165.76**	**141.90**
Change compared to Base scenario	%		**-16.1%**	**-12.6%**	**-25.2%**

Remarks：Scenario 1：Establishment of Regional Rice Logistics Center (assumed to be in Hau Giang Province), Scenario 2：Improvement of NH1A from Mekong delta to HCMC, Scenario 3：Establishment of Regional Rice Logistics Center and Improvement of NH1A
Source:「A Multi-Stage Impact Assessment Method for Freight Transport Management Measures, The Example of Vietnamese Rice Production and Logistics (2016)」 Author：Ms. Nguyen Thi Binh

In Scenario 1 (Establishment of Regional Rice Logistics Center), from production to milling, storage, and transportation to food companies, there are many intermediate agencies; thus, the transport distances are increased, resulting in higher logistics cost. By establishing the Regional Rice Logistics Center, which process the rice effectively reducing the operation in dispersed collection yards, it is expected that farmers can directly sell their products by road or IWT. The candidate location for the center is in the middle of the rice cultivation area which is located near IWT and arterial road network such as the Xa No Canal, NH61, and NH1A, and is bordered by Can Tho City, Kien Giang Province, and Hau Giang Province. The facility would have a 60,000-ton storage and two lines of drying and milling machines (with export quality and capacity of 50 ton/hour).

As a result, by shortening the transportation distance and enhancement of the warehouse operations efficiency, and from the reduction of damage to rice during transportation, and reduction of greenhouse gases such as CO_2, the total logistics cost is reduced by 16.1% compared to the base scenario.



Source：「A Multi-Stage Impact Assessment Method for Freight Transport Management Measures, The Example of Vietnamese Rice Production and Logistics (2016)」 Author：Ms. Nguyen Thi Binh

Figure 4-5 Proposed Location of Regional Rice Logistics Center

In Scenario 2 (improvement of NH1A from Mekong delta to HCMC), it is expected that the travel speed of trucks to HCMC can be increased, and the reduction of fuel cost may decrease the logistics cost. However, in rice logistics, IWT has a definite economic advantage; thus, the modal shift from IWT to road transport may be small, and the benefit of this solution would be limited.

In Scenario 3 (Establishment of Regional Rice Logistics Center and Improvement of NH1A), it was showed that the logistics cost can be reduced by 25.2% by combing both soft and hard infrastructure development to maximize the efficiency of the logistics system.

However, this analysis was conducted for rice production only. A similar approach for analyzing the main products of the study area, such as fishery products, should be considered.

5 Summary and Recommendations

5-1 Summary

In this survey, following points are confirmed.

1. Main products of the coastal provinces of Mekong Delta (the study area) were identified: rice, fertilizer, shrimp, coconuts, sugar, and salt by volume, as well as shrimp, rice, fish, and fertilizer by price.
2. Logistics status of the main products were observed: shrimp, fish through NH1A, rice and fertilizer by IWT, sugar, and coconuts by multimodal transport to HCMC and seaports, and they are classified into typical four logistics model (route, mode).
3. Bottlenecks on the logistics network in the region were identified: eight bottlenecks on the land transport, including Dai Ngai ferry and no bypass in Ca Mau City, four bottlenecks on the IWT, including heavy congestion of Cho Gao Canal, two bottlenecks on the multimodal, including insufficient capacity of riverports and issue on the containerization, one bottleneck of dispersion of collection yards and processing/storage on the logistics center, and six bottlenecks, including deep seaports, from the hearing results from private companies.
4. Historical damages on the infrastructure and industry from climate change were confirmed based on the DARD's reports, and industry transformation from rice production to shrimp production was observed in Ca Mau.
5. Forecasted damages due to climate change on riverports and IW were confirmed.
6. Countermeasures and projects to resolve the identified bottlenecks were proposed.
7. Initial evaluation of the priority projects was conducted. Dai Ngai Bridge Construction Project showed that positive effects, such as the strengthening of the logistics network in the region, the shortened distance, and the reduction of transport cost in addition to other various effects are expected.

   As for the regional rice logistics center, it was showed that the logistics cost can be reduced by 25.2% by combing both soft and hard infrastructure development to maximize the efficiency of the logistics system.

5-2 Recommendations

In this study, following projects in short and long term are proposed.

A. Short Term

1. Implementation of the Dai Ngai Bridge Construction Project as the priority project to resolve the missing link on the arterial land transport network.
2. In parallel, acceleration of NH60 widening project and Rach Mieu 2 Bridge Construction Project to ensure smooth traffic along the whole NH60.

B. Long Term

3. Preparation of Master Plan of Regional Logistics Center, and the study on Freight Transport

Management to promote and accelerate the development of structured logistics system and hub and spoke system should be carried out.

4. A step-by-step implementation of priority projects based on the Master Plan of Regional Logistics Center